Verification of Contracting Prohibitions

I, (authorized official) _____ [insert name and title], on behalf of Bidder, verify that:

1) Bidder does not engage in any of the activities listed in the clause entitled “Contracting Prohibitions” set forth in the solicitation documents and contract; and

2) This verification will apply to any contract awarded to Bidder.

Date: _____

Bidder Firm Name: _____

Signature: _____

Name: _____

Title: _____

_____

Notary Public (Seal)

My Commission Expires: _____

DALLAS-FORT WORTH INTERNATIONAL AIRPORT BOARD

BUSINESS DISCLOSURE FORM

It is recommended this form be completed by a governing person, governing authority, or legal counsel.

Information about Entity Submitting Bid/Proposal/Offer

(This information must match the information provided on the Bid/Proposal/Offer.)

Business Name:					
Business Address:			**Mailing Address:**		
City	**State**	**Zip**	**City**	**State**	**Zip**
Business Web Address:					
Business Phone:			**Business Fax:**		
Contact Person:			**Contact's Phone No.:**		
Contact's E-Mail Address:					

I. Entity Ownership Information

(Check the appropriate box and provide requested details below.)

Business Structure: (Please check only one box)

☐ Partnership ☐ Limited Partnership ☐ Limited Liability Partnership

☐ Sole Proprietorship ☐ Joint Venture ☐ Limited Liability Company ☐ Corporation ("C")

IF CORPORATION, please check all the type(s) below that are applicable:

☐ For Profit or ☐ Non Profit ☐ Public or ☐ Private

☐ S Corporation ☐ Professional ☐ Parent-Subsidiary ☐ Close

State of Incorporation, Registration or Formation:

State: **Month:** **Year:**

Name(s) of Owner(s) or Partners (or Owner of DBA if applicable)
Please indicate if any such individual(s) were employed by DFW Airport and the dates employed:

Name of Joint Venture Participants, if applicable
Please indicate if any such individual(s) were employed by DFW Airport and the dates employed:

UNLESS PUBLICLY TRADED list all individuals, partnerships, corporations or other entities having *at least 10%* ownership in the business *and indicate their percentage of ownership*. Please indicate if any such individual(s) were employed by DFW Airport and the dates employed. Attach additional sheets if necessary.

Form Completion Date:

NOTICE – CONLICT OF INTEREST

Conflict of Interest: It is the responsibility of the Respondent to fully examine and investigate their team's current contracts and engagements, prime and/or subconsultant/subcontractor, with the Airport for any contract executed after March 27, 2024. Contracts executed prior to March 27, 2024, will be grandfathered in and are not affected by this Conflict of Interest statement described below.

Companies can choose to work with DFW Airport in one of two ways, either by proposing/contracting as a firm in Section A – Owner Services below or Section B – Construction Services below, but not both. You must choose to do business with DFW Airport through the Owner Services or through Construction Services, you may not be on contracts in both Section A and Section B at the same time, unless grandfathered in above.

Section A – Owner Services

Companies proposing as Primes and Subconsultants/Subcontractors in the Section A - Owner Services section will be able to serve in multiple roles on Section A - Owner Services without any conflict of interest. However, to avoid any conflicts of interest, if your company is working on or proposing to work on an Owner Services contract in any capacity, you will not be able to work as a Contractor (Prime or Sub) and VICE VERSA.

Section B – Construction Services

Companies proposing as Primes and Subconsultants/Subcontractors in the Section B – Construction Services section can serve in multiple roles on Section B – Construction Services without any conflict of interest. However, to avoid any conflicts of interest, if your company is working on or proposing to work on a Construction Services contract in any capacity, you will not be able to work on an Owner Services contract as Prime or Subconsultant/Subcontract or VICE VERSA.

Section A – Owner Services	Section B – Construction Services
Airside Civil Design and Design Services	Civil Competitive Bidding (Design-Bid-Build)
Landside Civil Design and Design Services	Facility Competitive Bidding (Design-Bid-Build)
Facilities Design and Design Services	Civil Design-Build
Airport Holdroom Concept Design Services	Building (Facility) Design-Build
Concessions and Customer Experience Design Services	Construction Manager-at-Risk
SADF Treatment and Recovery Program Master Plan and Design Services	Competitive Sealed Proposal
Master Plan and Master Architect Services	Construction Manager-Agent
Automated People Mover Architectural and Engineering Services	Job Order Contract
Roofing and Waterproofing Consulting Services	
Airside Civil Program Management and Construction Support Services	
Landside Civil Program Management and Construction Support Services	
Facilities Program Management and Construction Management Services	
Civil Quality Assurance Inspection Services	
Facility Quality Assurance Inspection Services	
Civil Commissioning Services	
Facility Commissioning Services	
Retro-Commissioning and Infrastructure Conditioning Services	

Section A – Owner Services (Continued)
Survey Services
Cost Estimating and Analytics Services
Code Inspection and Plan Review Services
Material Testing and Inspection Services
Structural Inspection and Review Services
Airport Planning Services
Signage Master Planning and Visioning Services
On Call Planning Implementation Support Services
Master Assessment Facilities and Systems Services
Master Assessment Civil Infrastructure and Systems Services

CONFIRMATION OF NO CONFLICT-OF-INTEREST FORM TO BE COMPLETED BY THE RESPONDENT

It is the responsibility of the Respondent to fully examine and investigate their team's current contracts and engagements, prime and/or subconsultant/subcontractor, with the Airport. By signature below, the Respondent (Prime Contractor/Consultant) confirms it has reviewed for itself and for any proposed subconsultant or subcontractor the "Notice - Conflict of Interest" document provided in this Solicitation and that neither the Respondent nor the subcontractors or subconsultants proposed in response to this Solicitation have a conflict of interest as identified in the "Notice - Conflict of Interest" document.

_____
Airport's Solicitation Number and Name

_____
Signature of Respondent (Prime Contractor/Consultant)

_____
Name and Title of Signatory

_____
Name of Respondent
Prime Contractor/Consultant Company

_____
Date

DFW DALLAS FORT WORTH INTERNATIONAL AIRPORT

COMMITMENT TO SMALL BUSINESS ENTERPRISE (SBE) PARTICIPATION FORM

(This form is required as part of the bid/proposal submission.)

The SBE goal for Solicitation/Contract # _____ is _____%.

***NOTE**: The BDD will only credit SBE participation that is certified by an approved certification entity at the time of bid/proposal submission. DBE,MBE OR WBE certificates are not accepted for SBE credit. Effective 11-07-2025, in addition to having a valid certification, SBEs must also have a place of business in the Airport's market area[1] at the time of bid/proposal submission for credit towards meeting a contract goal.*

The undersigned Contractor has satisfied the requirements of the bid/proposal specifications in the following manner (Please check (✔) the appropriate space):

☐ Self-Performance: The proposer, a certified SBE firm, is committed to meeting or exceeding the SBE goal through self-performance.

☐ Self-Performance & Percentage Participation: The proposer, a certified SBE firm, is committed to meeting or exceeding the SBE goal, with a minimum of _____% self-performance and a minimum of ____% SBE subcontracting participation on this contract.

☐ Percentage Participation: The proposer is committed to meeting or exceeding the SBE goal, with a minimum of _____% SBE subcontracting participation on this contract.

☐ The Contractor is unable to meet the SBE goal of _____% and is committed to a minimum of ___% SBE utilization on this contract and submits documentation demonstrating good faith efforts.

☐ The Contractor is unable to meet the SBE goal of _____% and submits documentation demonstrating good faith efforts.

Name of Prime Contractor:_____

_____

Signature Title

_____

Printed Name Date

[1] The Airport's market area is defined as Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall, Somervell, Tarrant, and Wise counties.

Instructions for Commitment to Small Business Enterprise (SBE) Participation Form

(Note: this form requires the prime contractor to complete, sign, and date prior to bid/proposal submission.)

Contract Number: Enter the Ref.# or Solicitation No. from Bonfire Portal. **SBE Goal:** Enter the SBE percentage goal noted in the Project Description for the solicitation in the Bonfire Portal.

Select only one option which best describes the SBE commitment detailed in the submission:

- **Self-Performance:** Select this option if the Prime bidder/proposer is SBE certified and will meet the SBE goal through self-performance. Note that an SBE Prime who chooses to self-perform to meet the SBE goal must perform at least 30 percent of the total cost of its Contract with its own work force to satisfy the commercially useful function requirement.
- **Self-Performance & Percentage Participation:** Select this option if the Prime bidder/proposer is SBE certified and will meet the SBE goal through self-performance and a percentage of SBE subcontracting participation. Note that an SBE Prime who chooses to self-perform to meet the SBE goal must perform at least 30 percent of the total cost of its Contract with its own work force to satisfy the commercially useful function requirement. Enter participation percentage for both self-performance and SBE subcontracting participation. The percentages noted must match the percentages noted on the Final Schedule of Subcontractors for Work to be self-performed by the Prime and Work to be completed by SBE Subcontractors.
- **Percentage Participation:** Select this option if the SBE goal will be met through SBE subcontracting participation only. Enter the participation percentage proposed for SBE subcontracting participation. The percentage must match the percentage noted on the Final Schedule of Subcontractors for Work to be completed by SBE Subcontractors.

The following options require Good Faith Effort documentation be submitted at the time of bid/proposal submission. (*Reference to Section C. Goals and Good Faith Efforts in the SBE Special Contract Provisions.)* The submission of good faith efforts documentation is a matter of responsiveness and shall include a specific response to each of the criteria listed. Failure of the Contractor to demonstrate adequate good faith efforts as to any one of the criteria established shall render the overall good faith showing insufficient and the bid/proposal non-responsive.

- The Contractor is unable to meet the SBE goal of ___% and is committed to a minimum of ___ % SBE utilization on this contract and submits documentation demonstrating good faith efforts.
- The Contractor is unable to meet the SBE goal of ___% and submits documentation demonstrating good faith efforts.

Name of Prime Contractor: Enter name of Company bidding or proposing.

Signature: The Prime Contractor's authorized representative must sign this form.

Title: Enter title of Prime Contractor's authorized representative.

Printed Name: Enter the first and last name of the authorized representative. **Date:**

Enter date of executed Prime Contractor signature.

INTENT TO PERFORM CONTRACT AS A SBE SUBCONTRACTOR[1]

Submission of the **Intent to Perform as a SBE Subcontractor** form for each SBE firm shall constitute a representation by the Prime Contractor to the Airport Board that it believes such SBE to be certified as a SBE to perform the work as designated, the SBE has a place of business in the Airport Board's market area and the SBE is not affiliated with the Contractor as defined herein. It shall also represent a commitment by the Contractor that if it is awarded the Contract, it will enter in a subcontract with such SBE for the work described at the approximate price and percentage set forth.

PRIME CONTRACTOR / CONSULTANT			
Contract / Solicitation Number:			
Name of Prime Contractor:			
Address, City, State and Zip Code:			
The Prime Contractor designates the following person as their high-level official designated to administer and coordinate the efforts to carry out the SBE policy on behalf of the Prime Contractor.			
Name:		Title:	
E-Mail Address:		Phone Number:	

DECLARATION OF PRIME CONTRACTOR

I HEREBY DECLARE AND AFFIRM that as a duly authorized representative of the Prime Contractor stated above, I have personally reviewed the material and facts set forth in this form. To the best of my knowledge, information and belief, the facts and representations contained in this form are true and the owner or authorized agent of the SBE firm stated above signed this form in the place indicated, and no material facts have been omitted. The undersigned affirms that the Prime Contractor has no ownership or financial interest in the SBE subcontracting firm stated below. Except as authorized by the Vice President of Business Development Department or designee, the undersigned shall enter into a formal agreement (which shall include all audit and records provisions required by the Board) with the listed SBE firm for work as indicated by this form within ten (10) business days after receipt of the contract executed by the Airport. The undersigned will, if requested, provide said Vice President or the designee a copy of that agreement within five (5) business days of the written request. Pursuant to State Law, any person [entity] who makes a false or fraudulent statement in connection with the participation of a SBE in any locally funded project or otherwise violates applicable program requirements may be referred for prosecution.

Signature of Prime Contractor:		Date	

SBE SUBCONTRACTOR / SUBCONSULTANT / SUPPLIER AT ANY TIER			
The Airport requires that minority/women business enterprises be certified as SBEs by an approved certification agency as defined in the SBE Program Policy and Procedures. Effective 11-07-2025, in addition to having a valid certification, SBEs must have a place of business in the Airport's market area[1] at the time of bid/proposal submission for credit towards meeting a contract goal.			
Does the undersigned SBE subcontractor has a place of business in the Airport's market area?		☐ Yes ☐ No	
Is the undersigned SBE subcontractor affiliated with the Prime Contractor as defined in the SBE Program Policies and Procedures?		☐ Yes ☐ No	
Name of SBE Subcontractor:			
Address, City, State and Zip Code:			
Contact Person:			
E-Mail Address:		Phone Number:	
Scope of Work: (where applicable specify "supply" or "install" or both)			
Price and Percentage:	$ (%)		
SBE Certification #:		Certification Agency:	
If the SBE shown above is not a direct first tier subcontractor, subconsultant or supplier to the Prime Contractor shown above, please indicate the name of the subcontractor, subconsultant or supplier and tier level that will be utilizing your participation for SBE credit.			
Percentage (%) of the proposed subcontract described above will be sublet and/or awarded to a Non-SBE subcontractor. ***(Complete this box ONLY if subcontracting to a Non-SBE subcontractor.)***			_____ %

DECLARATION OF SBE SUBCONTRACTOR

I HEREBY DECLARE AND AFFIRM that as a duly authorized representative of the Subcontractor stated above, the facts and representations contained in this form are true. The undersigned affirms that the Prime Contractor has no ownership or financial interest in the SBE subcontracting firm stated above. I also agree, for good and valuable consideration (including the opportunity to participate in this solicitation as a proposed subcontractor), the receipt and sufficiency of which is hereby acknowledged, that if the Subcontractor performs any work for the Prime Contractor as the result of a contract awarded to the Prime Contractor for this solicitation, the Subcontractor will maintain and the Board shall have the right to examine and make copies of all records, documents, books, statements, checks, invoices, and any other supporting evidence deemed necessary by the Board to substantiate compliance with the terms of this Contract, including any Change Orders. Such right of examinations shall include, but not be limited to, reasonable access to and cooperation by all Subcontractor personnel. Subcontractor agrees to provide the Board with retrievals of computer-based records or transactions that the Board determines to be necessary to conduct any audits. Subcontractor agrees that there shall be no charge to the Board for Subcontractor's costs of providing records, documents, and assistance for audits, and to provide to the Board within seven (7) calendar days all records, documents, retrievals, and other assistance requested.

Signature of SBE Subcontractor		Date	

1 Any named person, firm, partnership, corporation, association or joint venture as herein provided identified as providing work, labor, services, supplies, equipment, materials or any combination of the foregoing, under contract to a prime contractor on an Airport contract at any tier.

2 The Airport's market area is defined as Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall, Somervell, Tarrant, and Wise counties.

Instructions for Intent to Perform as a SBE Subcontractor Form

(Note: This form requires both the prime contractor and the SBE subcontractor to complete, sign and date prior to bid/proposal submission.)

PRIME CONTRACTOR/CONSULTANT

Contract/Solicitation Number: Enter the Ref. # or Solicitation No. from Bonfire Portal.
Name of Prime Contractor: Enter name of Company bidding or proposing.
Address, City, State and Zip Code: Enter physical address for company.
The Prime Contractor designates the following person as their high-level official designated to administer and coordinate the efforts to carry out the SBE policy on behalf of the Prime Contractor.
Name: Enter the first and last name of the Prime Contractor's designated representative as required above.
Title: Enter title of Prime Contractor's designated representative.
E-Mail Address: Enter the email address for the Prime Contractor's designated representative.
Phone Number: Enter a phone number for the Prime Contractor's designated representative.

DECLARATION OF PRIME CONTRACTOR

Signature of Prime Contractor: The Prime Contractor's designated person must sign this form.
Date: Enter date of executed Prime Contractor signature.

SBE SUBCONTRACTOR / SUBCONSULTANT / SUPPLIER AT ANY TIER

Does the undersigned SBE subcontractor have a physical place of business in the Airport's relevant market area? Select Yes or No
Is the undersigned SBE subcontractor affiliated with the Prime Contractor as defined in the SBE Program Policies and Procedures? Select Yes or No
Name of SBE Subcontractor: Enter the name of the SBE subcontractor or supplier.
Address, City, State and Zip Code: Enter the physical place of business address located in the Airport's relevant market area for the SBE subcontractor/supplier.
Contact Person: Enter the first and last name of the SBE subcontractor/supplier designated representative.
Email Address: Enter email address for the SBE subcontractor/supplier designated representative.
Phone Number: Enter the phone number for the SBE subcontractor/supplier designated representative.
Scope of Work: Provide a brief description of the scope of work or services to be performed by the SBE subcontractor. Where applicable, specify 'supply' or 'install' or both.
Price and Percentage:

- **Request for Bids**: Enter the subcontractor/supplier dollar amount and associated percentage of work to be performed by the SBE subcontractor/supplier. The percentage should be calculated against the Prime Contractor's total dollar amount bid and match the dollar amount and percentage noted on the Final Schedule of Subcontractors.
- **Request for Proposals**: Note the Price as Not Applicable or N/A. Enter the percentage of work to be performed by the SBE subcontractor/supplier. The percentage should be calculated against the Prime Contractor's total percentage proposed (100%) and match the percentage noted on the Final Schedule of Subcontractors.

SBE Certification #: Enter the certification number shown on the SBE subcontractor/supplier certificate.
Certification Agency: Enter the name or abbreviation of the certification agency shown on the SBE subcontractor/supplier certificate.
If the SBE subcontractor identified above is not the direct first tier subcontractor, subconsultant or supplier to the Prime Contractor shown above, please indicate the name of the subcontractor, subconsultant or supplier and tier level that will be utilizing your participation for SBE credit: Enter the subcontractor's name and tier level that will be utilizing the services of the SBE subcontractor.

The percentage (%) of the proposed subcontract described above will be sublet and/or awarded to a Non-SBE subcontractor. (Complete this box ONLY if subcontracting to a Non-SBE subcontractor.): Enter the percentage of work that will be subcontracted to a Non-SBE subcontractor only if applicable.

DECLARATION OF SBE SUBCONTRACTOR

Signature of SBE Subcontractor/Supplier: The SBE Subcontractor/Supplier's designated person must sign this form.
Date: Enter date of executed SBE Subcontractor/Supplier signature.

Exhibit B

DALLAS FORT WORTH INTERNATIONAL AIRPORT

SCHEDULE OF SUBCONTRACTORS (FINAL)

Prime Bidder/Contractor:_____

☐ SBE ☐ NON-SBE

Contract Number: _____ **Contract Name**:_____

As part of the procedures for the submission of a completed bid/proposal, all bidders/proposers are required to identify ALL participating subcontractors applicable to the above project and include this completed form as part of the bid. Check all Certification Status categories that apply to each subcontractor. Verify that the proposed SBE subcontractor has a place of business in the Airport's Relevant Market Area[3] (not applicable to DBE goals). **NOTE: Certification certificate(s) MUST be attached to this form or bid/proposal will be deemed non-responsive.** The submission of this information is considered an issue of responsiveness, and the Airport Board will not award a contract to any Contractor who has not supplied this documentation. Use additional sheets if necessary.

Name of Subcontractor(s)	Certification Status[2] (check the applicable)		Relevant Market Area[3]	Description of Material or Service Being Provided or Performed	NAICS Commodity Code	Dollar Amount and Percentage of Work	
	SBE	NON	COUNTY			$$$	%
	Dollar Amount & Percentage: Work to be completed by Non-SBE Subcontractors						
	Dollar Amount & Percentage: Work to be completed by SBE Subcontractors						
	Dollar Amount & Percentage: Work to be self-performed by the Prime						
	Total Dollar Amount & Percentage of Work (The Total Amount shall equal the amount proposed on summary of bid/proposal page).						100%

PRIME CONTRACTOR'S CERTIFICATION

The above information is true and complete to the best of my knowledge and belief. I further understand and agree that if awarded the contract, this certification shall be attached thereto and become a part thereof. Failure to provide accurate and complete information or exercise positive, good faith efforts (as defined by the Board's SBE Program) in support of the Board's small business intent and objective may result in being considered non-responsive to the Board's requirements. Furthermore, it is understood and agreed that, if awarded a contract by the Airport Board, the Contractor will not make additions, deletions or substitutions to this certified list of SBE subcontractors without the consent of the Board's Vice President of Business Development Department (BDD) or designee through the submittal of the *Form 102, Request for Approval of Change to Final Schedule of Subcontractors* if this is determined to be the final schedule. The BDD reserves the right to ensure compliance with the Board's SBE programs as deemed necessary including but not limited to audits of submitted SBE information applicable to the Contractor/subcontractors participating on the contract.

Name and Title of Authorized Representative_____ Date:_____

(Please print or type)

Signature:_____ E-mail Address:_____

Any named person, firm, partnership, corporation, association or joint venture as herein provided identified as providing work, labor, services, supplies, equipment, materials or any combination of the foregoing, under contract to a prime Contractor on an Airport contract at any tier.

[2] In order to credit the participation of small businesses, firms must be certified as SBEs by a certification agency approved by the Airport Board as defined in the SBE Policies and Administrative Procedures.

[3] In addition to having a valid certification, the SBE must have a place of business in the Airport's relevant market area at the time the bid/proposal is submitted for credit towards meeting an SBE goal.

Instructions for Schedule of Subcontractors

(Note: This form requires the prime contractor to sign and date prior to bid/proposal submission.)

Name of Prime Bidder/Contractor: Enter name of company bidding or proposing and certification status (SBE or Non-SBE).
Contract Number: Enter the reference number or solicitation number from the Bonfire portal.
Contract Name: Enter the Project name from the Bonfire portal.

List all subcontractors and suppliers the Prime Bidder/Contractor intends to use in performing the work of the project, including non-SBEs. Only certified SBEs identified, and the levels of participation listed for each at the time of bid/proposal submission will be considered in determining whether the Contractor has met the SBE goal.

Name of Subcontractor(s): Enter the name of the proposed subcontractor. This includes subconsultants and suppliers.
Certification status: Select the certification status of the proposed subcontractor. (SBE or NON-SBE)
Relevant Market Area: Enter the name of the county where the SBE subcontractor's physical place of business is located. The Airport's Relevant Market Area consists of Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall, Somervell, Tarrant, and Wise countiesonly.
Description of Material or Service Being Provided or Performed: Provide a brief description of the work that will be performed by the subcontractor.
NAICS Commodity Code: Enter the NAICS code(s) that correspond to the description of material or service being provided or performed by the subcontractor.
Dollar Amount and Percentage of Work:

- **Request for Bids (RFB)**: Enter the subcontractor/supplier dollar amount and associated percentage of work to be performed by the SBE subcontractor/supplier. The percentage should be calculated against the Prime Contractor's total dollar amount bid. The dollar amount and percentage must match the dollar amount and percentage noted on the Intent to Perform as an SBE Subcontractor form, if the Intent to Perform form is applicable).
- **Request for Proposals (RFP)**: Note the Price as Not Applicable or N/A. Enter the percentage of work to be performed by the SBE subcontractor/supplier. The percentage should be calculated against the Prime Contractor's total percentage proposed (100%). The percentage must match the percentage noted on the on the Intent to Perform as an SBE Subcontractor form, if the Intent to Perform form is applicable).

Dollar Amount & Percentage: Work to be completed by Non-SBE: If RFB, enter the subtotal dollar amount and percentage of work to be performed by Non-SBE subcontractors. If RFP, enter percentage only.
Dollar Amount & Percentage: Work to be completed by SBE Subcontractors: If RFB, enter the subtotal dollar amount and percentage of work to be performed by certified SBE subcontractors. If RFP, enter percentage only.
Dollar Amount & Percentage: Work to be self-performed by the Prime: If RFB, enter the subtotal dollar amount and percentage of work to be performed by the prime bidder/ contractor. If RFP, enter percentage only.

Total Dollar Amount & Percentage of Work: Enter the TOTAL dollar amount and percentage of work. The total dollar amount shall equal the amount proposed on the summary of bid/proposal page. The total percentage of work must equal to 100% (% Work to be performed by non-SBE subcontractors + % SBE subcontractors + % prime bidder/contractor self-performance)

Name and Title of the Authorized Representative: Enter the full name and title of the authorized representative signing on behalf of the company.
Date: Enter date of executed Authorized Representative signature.
Signature: The authorized representative must sign this form.
Email Address: Enter the email address for the authorized representative.

GOOD FAITH EFFORT (GFE) Criteria

NOTE: Include a response to GFE criteria and support documentation in bid/proposal only if the SBE goal is not achieved.

The following factors are taken into account when assessing a good faith effort response. These factors are minimally considered as good faith efforts and demonstrate specific initiatives made in attempting to achieve the applicable contract-specific Small Business Enterprise (SBE) goal. These factors should not be considered as a template, checklist or some quantitative formula. Proposers are required to meet all factors outlined below and provide support documentation in order for the good faith effort plan to be assessed. Mere pro forma efforts are not good faith efforts to meet the SBE contract requirements. This means that a bidder/proposer must show that it took all necessary and reasonable steps to achieve an SBE goal or other requirement of this GFE which, by their scope, intensity, and appropriateness to the objective, could reasonably be expected to obtain sufficient SBE participation, even if they were not fully successful. DFW will evaluate the GFE on quality, quantity, and intensity of the different kinds of efforts that the bidder/proposer has made, based on the regulations and the guidance in Code of Federal Regulations. **NOT SUBMITTING PROPER SUPPORT DOCUMENTATION IS NOT EVIDENCE OF A PROPER DEMONSTRATION OF GOOD FAITH EFFORT. SUBMITTAL OF THE CRITERIA, WITH NO ADDITIONAL DOCUMENTATION, WILL NOT BE CONSIDERED ADEQUATE DEMONSTRATION OF GOOD FAITH EFFORT.** Proposers are not limited to these particular areas and may include other efforts deemed appropriate. Complete form and attach support documentation only if the SBE goal is not achieved. For additional guidance concerning Good Faith Efforts, please refer to the Electronic Code of Federal Regulations (CFR 49 part 26 Appendix A).

GOOD FAITH EFFORT FACTORS
Conducting market research to identify small business contractors and suppliers and solicit through all reasonable and available means the interest of all certified SBEs that have the capability to perform the work of the contract. This may include attendance at any pre-bid or pre-proposal meetings to discuss subcontracting and supplier opportunities (acceptable documentation shall include copies of the meeting sign-in sheets with contractor name noted as signed-in) and business matchmaking meetings and events, advertising and/or written notices, posting of Notices of Sources Sought and/or Requests for Proposals, written notices or emails to all SBEs listed in the State and/or Local respective directories of firms that specialize in the areas of work desired (as noted in the SBE directory) and which are located in the area or surrounding areas of the project. *The Contractor should solicit this interest as early in the acquisition process as practicable to allow the SBEs to respond to the solicitation and submit a timely offer for the subcontract. The bidder should determine with certainty if the SBEs are interested in taking appropriate steps to follow up initial solicitations at least three (3) business days prior to bid opening.*
Selecting portions of the work to be performed by SBEs in order to increase the likelihood that the SBE goals will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units (for example, smaller tasks or quantities) to facilitate SBE participation, even when the prime contractor might otherwise prefer to perform these work items with its own forces. This may include, where possible, establishing flexible timeframes for performance and delivery schedules in a manner that encourages and facilitates SBE participation.
Providing interested SBEs with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation with their offer for the subcontract.
Negotiating in good faith with interested SBEs. It is the bidder's responsibility to make a portion of the work available to SBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available SBE subcontractors and suppliers, so as to facilitate SBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of SBEs that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional Agreements could not be reached for SBEs to perform the work.
A bidder using good business judgment would consider a number of factors in negotiating with subcontractors, including SBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using SBEs is not in itself sufficient reason for a bidder's failure to meet the contract SBE goal, as long as such costs are reasonable. Also, the ability or desire of a prime contractor to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Prime contractors are not, however, required to accept higher quotes from SBEs if the price difference is excessive or unreasonable.

Not rejecting SBEs as being unqualified without sound reasons based on a thorough investigation of their capabilities. The contractor's standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. non-union status) are not legitimate causes for the rejection or non-solicitation of bids in the contractor's efforts to meet the project goal. Another practice considered an insufficient good faith effort is the rejection of the SBE because its quotation for the work was not the lowest received. However, nothing in this paragraph shall be construed to require the bidder or prime contractor to accept unreasonable quotes in order to satisfy contract goals. *A prime contractor's inability to find a replacement SBE at the original price is not alone sufficient to support a finding that good faith efforts have been made to replace the original SBE. The fact that the contractor has the ability and/or desire to perform the contract work with its own forces does not relieve the contractor of the obligation to make good faith efforts to find a replacement SBE, and it is not a sound basis for rejecting a prospective replacement SBE's reasonable quote.*
Making efforts to assist interested SBEs in obtaining bonding, lines of credit, or insurance as required by the recipient or contractor.
Making efforts to assist interested SBEs in obtaining necessary equipment, supplies, materials, or related assistance or services.
Effectively using the services of available advocacy/business community organizations; contractor associations; local, State, and Federal business assistance centers; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of SBEs.
At a minimum, DFW will review the performance of other bidders/proposers in meeting the contract goal. For example, when the apparent successful bidder/proposer fails to meet the contract goal, but others meet it, DFW may reasonably raise the question of whether, with additional efforts, the apparent successful bidder/proposer could have met the goal. As provided in §26.53(b)(2)((vi), the bidder must submit copies of each SBE and non-SBE subcontractor quote submitted to the bidder when a non-SBE subcontractor was selected over a SBE for work on the contract to review whether SBE prices were substantially higher; and contact the SBEs listed on a contractor's solicitation to inquire as to whether they were contacted by the prime. Pro forma mailings to SBEs requesting bids are not alone sufficient to satisfy good faith efforts under the rule.
A promise to use SBEs after contract award is not considered to be responsive to the contract solicitation or to constitute good faith efforts.

FOR DFW BUSINESS DIVERSITY & DEVELOPMENT USE ONLY:

Plan Reviewed by:_____

Date:_____

Signature of Business Specialist/Manager:_____

Recommendation: Approval:_____ Denial:_____

Bid Bond

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____

as Principal, and _____ as Surety, are hereby held and firmly bound unto the Dallas Fort Worth International Airport Board, as BOARD, in the penal sum of

_____

($ _____) Dollars for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

SIGNED this _____ day of _____, 20___

The Condition of the above obligation is such that whereas the Principal has submitted to the Dallas Fort Worth International Airport Board, a certain Bid, attached hereto and hereby made a part hereof to enter into a contract in writing, for project Rental Car Center Bus Roads and Bridge Rehabilitation
Contract No. PA1689 .

NOW, THEREFORE,

(a) If said Bid sall be rejected, or in the alternate,

(b) If said Bid shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said Bid) and shall furnish a bond for the firm's faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said Bid,

then this obligation shall be void; otherwise the same shall remain in full force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

IN WITNESS WHEREOF, this instrument is executed in two copies, each one of which shall be deemed an original, this the _____ day of _____, 20___.

PRINCIPAL

Company: _____

Signature: _____

SURETY: _____

Signature: _____

The Resident Agent of the Surety in Dallas or Tarrant County, Texas, is:

Name: _____

Address: _____

_____

BID DETAIL

1) This is a solicitation for bids on the construction of the project detailed in the contract documents. The Contractor shall be responsible for reviewing all existing conditions associated with the work prior to commencement of work activities.

2) The Board reserves the right to reject any bid for any reason, including if, on the face of the bid received, it is clear that acceptance of the bid would not comply with any applicable bidding laws, rules, or regulations.

3) The undersigned Contractor, declares that the only person or parties interested in this Bid as principals are those named herein; that this Bid is made without collusion with any other person, firm, or corporation; that he has carefully examined the Bid Requirements, all incorporated references and Appendices, and the conditions and classes of materials of the Work; and will provide all the necessary supervision, labor, machinery, tools, supplies, equipment, transportation and other facilities, apparatus, and other means of construction and will do all the Work and furnish all the materials called for by such, in the manner prescribed therein and according to the requirements therein set forth, and to perform all other obligations imposed by the Contract Documents for the prices named in the Bid Schedule hereinafter appearing.

4) It is understood and agreed that if awarded the Contract, the Work will commence within ten (10) calendar days after the date of the Notice to Proceed and that the total Work will be completed in accordance with the Schedule of Construction set forth herein.

5) It is further understood that the Prevailing Wage Rates TX20260294 revised 01/02/2026, issued by the Department of Labor as established by law are to govern the Work. The Contractor certifies that he has examined the wage rate determination and that prices bid are based on compliance with said determination.

6) Accompanying this Bid is the required Bid Guaranty consisting of Bid Bond in the amount of five percent (5%) of the total Bid, or in the case of bid alternates, five percent (5%) of the highest total Bid.

7) In the event of the award of a Contract, the undersigned will deposit with the Board a Contract Performance Bond and a Payment Bond as required by the Contract Documents, guarantying faithful performance of the Contract, and any payment of all labor, materials and other sundry items, in accordance with the Contract Documents, and will deliver certificates of insurance evidencing insurance required by the Contract Documents.

8) The Work proposed to be done shall be fully completed and finished to the entire satisfaction of the Board.

9) The undersigned certifies that the price contained in this Bid has been carefully reviewed and is submitted as correct and final.

10) In conformity with the Special Provisions, the amount of liquidated damages for this Contract shall be as shown in Article 1.0, of the Special Provisions.

11) The Mobilization fee shall not exceed eight (8) percent of the total Contract Amount total Base Bid Amount. Should the total amount entered in the bid proposal for mobilization exceed eight percent (8%) of the total base bid amount, the bid shall be deemed non-responsive.

BID DETAIL

11) In accordance with Special Provisions, Article 5, the value of the Work performed by the Contractor with its own employees shall not be less than twenty percent (20%) of the Contract Sum.

12) Ancillary/Integral Professional Services – Contractor certifies that in selecting an architect, engineer or land surveyor, etc., to provide professional services, if any, that are required by the specifications, Contractor shall not do so on the basis of competitive bids but shall make such selection on the basis of demonstrated competence and qualifications to perform the services in the manner provided by Section 2254-004 of the Texas Government Code.

13) Certificate Regarding Debarment And Suspension – By submitting a bid under this solicitation, the Contractor or offeror certifies that at the time the Contractor or offeror submits its bid that neither it nor its principals are presently debarred or suspended by any Federal department or agency from participation in this transaction.

14) The contract, if awarded, shall be to the lowest responsive, responsible Contractor whose bid, conforming with all material terms and conditions of the invitation for bids, is the lowest in price.

15) When alternates are used, the Board reserves the right to Contract for any combination of Base and or Alternates stated, or none of the above. Contractor must bid on the base and all alternates. Bids addressing only the base or alternate items will be considered non-responsive.

16) Without limiting the Contractor's other obligations, Contractor's pricing for each line item must carry its full share of the cost of Work, plus its share of overhead and profit. Contractor shall avoid nominal pricing for some lines and enhanced pricing for other lines. DFW reserves the right to reject any bid or pricing that is materially unbalanced.

17) The undersigned, in submitting this Bid and endorsement of same, represents that he/she is authorized to obligate his/her firm, and that he/she has read this entire Solicitation package, is aware of the covenants contained herein and will abide by and adhere to the expressed requirements.

THE BIDDER AGREES THAT IT'S BID, INCLUDING THE SUMMARY OF BID FORM, WHEN ACCEPTED BY THE AIRPORT SHALL CONSTITUTE A CONTRACT EQUALLY BINDING BETWEEN THE BIDDER AND THE AIRPORT. Acceptance shall take the form of an Acceptance Letter or Purchase Order issued by the Airport, or a Contract document issued by the Airport and executed by both parties, followed by a Notice to Proceed issued by the Airport. Each of these forms constitutes a legal contract equally binding between the Successful Bidder and the Airport. After Bid acceptance, no different or additional terms shall become part of the Contract without a properly executed change order.

The DFW Airport Board, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders or offerors that it will affirmatively ensure that any contract entered into pursuant to this advertisement, small business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

BID DETAIL

_____

(OFFICIAL NAME OF BIDDING FIRM)

_____

(Contractor's Address (City, State, Zip))

_____

(Contact Phone Number)

SUBMITTED BY:

_____

(Printed Name of Person Signing Bid)

_____

(Title of Person Signing Bid)

_____

(Email)

_____

(Date Signed)

By: _____

(Signature of Bidding Firm's Authorized Agent)

INSTRUCTIONS TO BIDDERS

NOTICE: The Bidder shall refer to General Provisions and Special Provisions herein for bid requirements in addition to the following:

Contractor agrees to construct the agreement project in accordance with the contract terms, plans and specifications and to complete the work within the project schedule number of consecutive calendar days from the date set forth in the Notice to Proceed in accordance with the Bid Table Schedule and Unit Prices for the amount submitted.

In conformity with Technical Specifications Section 01 71 13, and Special Provisions Article 4 the Mobilization fee shall not exceed eight percent (8%) of the total Base Bid Amount. Should the total amount entered in the bid for mobilization exceed eight percent (8%) of the total base bid amount, the bid shall be deemed non-responsive.

In conformity with Special Provisions, Article 5, the value of the Work performed by the Contractor with its own employees shall not be less than twenty percent (20%) of the Contract Sum.

1) **Instruction to Bidders**
   a) References and Prior Experiences – All Contractors bidding on this project are required to have completed three (3) similar projects comparable to the subject project in complexity, design, level of finish-out, and size within the past six (6) years. Contractor must describe why their reference projects qualify as comparable projects as described above.
      i) Bidders submitting bids without this experience and relative summaries may be deemed non-responsive.
   b) As-Built Drawings – Caution must be exercised when using any Board "As-Built" drawings. The accuracy of these drawings are not guaranteed by the Board, and total reliance on them by consultants and other Bidders is at their risk. Bidders performing sub-surface work should contact Dallas-Fort Worth Airport Maintenance, Documentation Section, at (972) 973-6125 prior to any excavation.
   c) Quality Assurance / Quality Control Testing – Bids are to be prepared in accordance with Contract Documents which state that the Board will perform and pay for all Quality Assurance tests required for acceptance of the Work and the establishment of penalties relating to deficient Work. The Bidder is to perform and pay for all Quality Control testing it deems necessary to ensure that the Work meets Specification requirements. Costs for the Quality Control tests are to be included in Bid Items.
   d) Ancillary/Integral Professional Services – In selecting an architect, engineer or land surveyor, etc., to provide professional services, if any, that are required by the specifications, bidder shall not do so on the basis of competitive bids but shall make such selection on the basis of demonstrated competence and qualifications to perform the services in the manner provided by Section 2254-004 of the Texas Government Code and so shall certify to the Board with its bid.
   e) Title VI Solicitation Notice – The DFW Airport Board, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d to 2000d-4) and the Regulations including amendments thereto, hereby notifies all bidders that it will affirmatively ensure that any contract entered into pursuant to this advertisement, complies with all federal nondiscrimination and civil rights laws based on race, color, national origin, sex, creed, age, disability, genetic information in consideration for an award.

2) **Contracting Prohibitions:**
   a) **Bid Rejection:** Board will reject any Bid from a Bidder that:

i) boycotts Israel;
ii) contracts with or provides supplies or services to a foreign terrorist organization;
iii) engages in certain scrutinized business operations in Sudan, Iran or with a designated foreign terrorist organization; or
iv) has been complicit in the Darfur genocide during any preceding 20-month period.[i]

b) **"Boycott Israel" Defined:** "Boycott Israel" means refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations specifically with Israel, or with a person or entity doing business in Israel or in an Israeli-controlled territory, but does not include an action made for ordinary business purposes.

c) **Verification of Contracting Prohibitions:** Each Bidder must execute and submit with its Bid the Verification of Contracting Prohibitions form. That verification will: [i] form a material part of its Bid; and [ii] will be incorporated into any awarded contract.

d) Pursuant to Section 2274.002, Texas Government Code, enacted by SB 13 in the 2021 Regular Session, the Contractor hereby represents that it (i) does not boycott energy companies; and (ii) will not boycott energy companies.

e) Pursuant to Section 2274.002, Texas Government Code, as enacted by SB 19 in the 2021 Regular Session, the Contractor hereby represents that it (i) does not have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association; and (ii) will not discriminate during the term of the contract against a firearm entity or firearm trade association.

3) Bid Submittal: Bids must be submitted via the DFW Airport EUNA Procurement portal (formerly Bonfire) by the due date and time listed in the Events schedule and then publicly opened and read aloud. Contractor agrees its Bid is valid for a minimum of sixty (60) calendar days after the opening thereof.

4) Addenda and Interpretations – Requests for interpretation of the RFB must be received in accordance with the Solicitation Events schedule. Only substantive items, as determined by the Board, will be addressed in the form of written addenda, which, if issued, will be posted in the EUNA Procurement portal (formerly Bonfire). Failure of any Contractor to retrieve and review any such addendum shall not relieve such Contractor from any obligations under its Bid as submitted. All addenda issued shall become part of the Contract Documents. The Board may elect to not respond to all inquiries in this manner.

5) Pre-bid Conference – A Pre-Bid Conference may be scheduled as detailed in the EUNA Procurement (formerly Bonfire) Events schedule, at which time questions may be received and submitted in the system. Addenda will be prepared, if needed, to clarify any items brought up at the Pre-Bid Conference. To enhance the opportunity for a successful RFB, RFP or RFQ submission, the Airport highly encourages a representative from your company that will complete bidding documents including SBE forms and submittals for the bid, proposal or statement of qualifications to attend all pre-bid, pre-proposal or pre-qualification statement meetings.

6) **Bid Package Review –** Before submitting your bid, please take note of the following.

a) Contractor Qualifications – When applicable to the specifications, please ensure that all certifications, licensing or other requested qualifications verification forms or information necessary to validate the prime or subcontractors qualifications to provide products or services are included in the bid package.

b) Read/Confirm Intent To Comply – Contractor has read all Contract Forms, Special Provisions, General Provisions, Technical Specifications, Plans and all other material provided in the Request for Bid and confirms their intent to comply with all stated provisions.

c) Any questions, concerns and/or request for modification to the subject solicitation documents, including the Plans, Specifications, Agreement and Provision Terms, must be submitted in writing prior to the solicitation Q&A deadline. If selected as the preferred firm, any attempts to negotiate these items after selection may be grounds for declaring an impasse. To promote an efficient process that results in a contract, if an impasse is declared the Airport Staff reserve its right to proceed with the next preferred firm in accordance with applicable law, including Texas Government Code 2269. The Board will seek to have a settled agreement with the most preferred firm prior to requesting Airport Board approval.

d) Proofreading – Contractor has proofread all documents to ensure all information provided by the Contractor is accurate and responsive to the solicitation specifications. The Board is not responsible for errors made by the Contractor.

e) Accuracy – Contractor has reviewed and confirmed all mathematical and numerical entries to ensure accuracy and commitment to honor pricing as submitted. The Board is not responsible for errors made by the Contractor. In cases when unit priced bid forms are included, the Airport will tabulate bids based on the unit prices bid and quantities shown in the bid or based on a predetermined group of items selected for evaluation purposes. In the case of conflict between unit prices and extended prices, unit prices shall prevail. In cases when the total bid amount stated by the bidder does not match the total from the unit price bid calculation, the total calculation from the unit price bid calculation shall prevail.

f) Insurance Compliance – Contractor has contacted insurance agent or representative to verify its ability to meet the stated insurance requirements and, if awarded a contract, that it will meet the insurance requirements as detailed in Exhibit A of the Agreement.

g) Bid must be submitted in the Solicitation system by the deadline expiration date.

h) Supplier Registration – While not a requirement of the bid submittal, Contractor has registered in the Board's Supplier Registration System, which is required for contracting with the Board. https://www.dfwairport.com/business/opportunities/procurement/supplier-self-service.

i) The Contractor shall provide the Owner, for its review and approval, with its Labor Burden and all actual costs used to calculate its Labor Burden for the Contractor and all the Contractor's subcontractors, within 21 days of the notification of award of the Contract or no later than the date of the execution of the Contract, whichever is earliest; should Contractor fail to do so such that Owner cannot approve Contractor's Labor Burden and all actual costs used to calculate its Labor Burden within 21 days of the notification of award of the Contract or no later than the date of the execution of the Contract, whichever is earliest, then the Owner may, at its discretion require the Contractor to perform all Work by Force Account, and its payment shall be as provided in the subsection titled PAYMENT FOR FORCE ACCOUNT WORK.

7) Non-Compete Agreements or Clauses - By submission of a bid or the execution of a contract, Bidder/Contractor agrees that the Board will not be bound by any non-compete agreements or similar agreements that inhibit the Board's right to award and execute a contract to any company that submits a bid to the Board.

8) Determination of Non-Responsible Bidder - The Board may disqualify a Bidder as non-responsible and its bid shall not be considered for reasons including, but not limited to, the following:

a) Reason for believing collusion exists among the Bidders.

b) Where the Bidder, any subcontractor, supplier, or the Surety on any bond given, or to be given, is in litigation with the Board, or with either the cities of Dallas or Fort Worth, or where such litigation is contemplated or imminent, in the sole opinion of the Board.

c) The Bidder being in arrears on any existing Contract, Change Order, Delivery Order and/or other Contract Action.
d) The Bidder having defaulted on a previous Contract.
e) Lack of competency, in the judgment of the Board, as revealed by pertinent factors, including but not limited to, experience and equipment, financial statement, questionnaires or previous work performance, or current performance, on Airport projects.
f) Uncompleted work that, in the judgment of the Board, will prevent or hinder the prompt completion of additional work if awarded.
g) Where the Bidder, or subcontractor thereof, in the judgment of the Board, has failed to perform in a satisfactory manner on a previous contract.
h) Where a Bidder or subcontractor thereof has failed to disclose a potential conflict of interest or discovered to have a conflict of interest in accordance with the Board's Code of Business Ethics.
i) Where a Bidder, its subcontractor, or individual officer/principal of the bidder or subcontractor is under criminal indictment or been convicted of a criminal offense.
j) The Airport has a performance scorecard process to evaluate contractor/vendor performance. The purpose of the scorecard is to evaluate contractor/vendor performance and record performance ratings for tracking and documentation. The Airport reserves the right to apply the scorecard results to (1) the evaluation of companies responding to our solicitation opportunities and (2) to consider debarment of companies from solicitation opportunities for up to two years.

9) Determination of Non-Responsive Bid - The Board may disqualify a Bid as non-responsive and it shall not be considered for reasons including, but not limited to, the following:

a) The Bid shows any omissions, alterations of form, additions, or conditions not called for, unauthorized alternate bids, or irregularities of any kind, in the sole determination of the Board.
b) Unbalanced value of any items.
c) Improper or insufficient bid guaranty, if required.
d) Bid did not meet specifications.
e) Bid did not contain all requested/required documents, submittals and /or samples.
f) The ability to prove that the project can be executed per the bidder's baseline schedule.
g) Inadequacy of project resources assigned required per contract.

10) Cone of Silence - To ensure a proper and fair evaluation, the DFW International Airport has established a cone of silence applicable to all Competitive Selection Processes, including RFQs, RFPs and RFBs. The cone of silence is designed to protect the integrity of the procurement process by shielding it from undue influences. The cone of silence will be imposed on all Competitive Selection Processes beginning with advertisement for the same and ending with the Board's selection for RFQs, RFPs or the Board's award for a RFB. The Cone of Silence begins when the solicitation is advertised/released and ends after the contract/purchase order is awarded, noting that release of some information is restricted by law. Potential bidders/proposers shall not discuss any aspect of a released solicitation with Airport personnel with exception to the contract administrator/ buyer listed in the solicitation.

[i] See Texas Government Code; Chapter 2252; Subchapter F; Prohibition on Contracts with Certain Companies (including Sections 2252.152 and 2252.153); Chapter 2270; Prohibition on Contracts with Companies Boycotting Israel; and Chapter 2270; Prohibition on Investing Public Money in Certain Investments (including Sections 2270.0001, 2270.0052, 2270.0102 and 2270.0152).

REFERENCES AND EXPERIENCES

The undersigned Contractor requests that the following person(s) be contacted to secure their comments concerning past performance of a similar project. A summary of contractor's and subcontractor's staffing and experience (if applicable) must be attached in addition to the below. **Bidders submitting bids without this experience, resumes and relative summaries may be deemed non-responsive.**

Must attach resumes of your Project Manager and Superintendent.

1	Public or private owner, large municipalities, or airport.	
	Contact Person	
	Mailing Address	
	Email / Phone	
	Type of experience as required in the Instructions to Bidder	
2	Public or private owner, large municipalities, or airport.	
	Contact Person	
	Mailing Address	
	Email / Phone	
	Type of experience as required in the Instructions to Bidder	
3	Public or private owner, large municipalities, or airport.	
	Contact Person	
	Mailing Address	
	Email / Phone	
	Type of experience as required in the Instructions to Bidder	

Name of Prime Contractor: _____

Signature _____

Printed Name & Date _____

INSURANCE PROVISIONS

A. DEFINITIONS FOR INSURANCE PROVISIONS

1. "We", "us", or "our" means the Dallas/Fort Worth International Airport Board.
2. "You" or "your" means the vendor, contractor, tenant, consultant, engineer, architect, and their agents, servants, employees, or other party to a contract with us.
3. "Contract" means the contract, purchase order, Invitation for Bid, or similar memorandum or agreement.
4. For purpose of defining Additional Insured and Waiver of Subrogation, the term "Dallas Fort Worth International Airport Board (the Board) and the Cities of Dallas and Fort Worth, Texas" (the Cities) shall also mean the elected officials, boards, officers, employees, agents and representatives of the Board and the Cities.

B. GENERAL REQUIREMENTS

1. You shall, at your own expense, maintain in effect not less than the following coverages and limits of insurance, which you shall maintain with insurers. If your coverage fails to comply with these requirements, you agree to amend, supplement or endorse the existing coverage to comply, at no additional cost to us, and to maintain such insurance through the end of the contract, warranty period, or other specified time period, whichever is longer. ANY deviation from the requirements outlined below requires the prior written approval of the Board's Assistant Vice President of Risk Management.
2. All required policies must be written through a company approved to transact that class of insurance business in the State of Texas, with a minimum rating of 'A -',and 'VII' by A. M. Best Company. If the rating of any insurer should fall below this standard, you shall cause the policy to be replaced promptly by an acceptable insurer.
3. All required policies, except policies for workers' compensation, professional liability and pollution liability, shall designate the below mentioned parties as **"Additional Insureds".**
    a. **"Dallas Fort Worth International Airport Board and the Cities of Dallas and Fort Worth, Texas"**
4. All required policies shall **Waive the insurer's right of Recovery or Subrogation** against the Board and the Cities.
5. If any policy is in excess of a self-insured retention (SIR), the amount of such SIR must be clearly identified. We reserve the right to reject any SIR exceeding $100,000.
6. All required policies must be primary with respect to coverage provided for the Board.
7. All required policies must be non-contributory with other coverage or self-insurance available to the Board.
8. All required Liability policies, except Pollution & Professional, must be written on an "Occurrence Form." Neither "Modified Occurrence" nor "Claims-Made" policies are acceptable, and the Contractor will be in contractual default if your insurance is "Modified Occurrence" or "Claims Made." If the Pollution or Professional Liability policy is Claims-Made, the Retroactive Date must be on or before the contract date or the date of the Contractor's first professional service to the Board, your first exposure to pollutants, or first work that may give rise to a pollution liability claim, related to our contract.
9. All required liability policies must cover cross-suits between insureds.
10. All required liability policies must contain a "severability of interests" provision.

C. REQUIRED COVERAGE LIMITS

1. **Workers' Compensation** — **Texas Statutory Coverage**
2. **Employer's Liability Insurance** — **$500,000** Each Accident
   $500,000 Each Disease, Each Employee
   $500,000 Each Disease Policy Limit
3. All employees, leased or co-employees, independent contractors, and employees of subcontractors and vendors, occupants of the building as tenants, sub-tenants or sub sub-tenants, performing work for the Board, or entering upon the Board's premises, must be covered by Texas Workers' Compensation.
4. If Contractor is a sole proprietorship without employees and which will not be using any subcontractor(s) in the performance of the Contract Work, it may substitute the following for workers compensation insurance: The Contractor must provide the Board's Risk Management Department (Risk Management) with a Hold Harmless and Indemnification Agreement in the form attached in the "Proposal Response Forms" section.
5. **Commercial General Liability (CGL)**

Limit Any One Occurrence	**$1,000,000**
Damage to Rented Premises	**$100,000**
Personal and Advertising Injury	**$1,000,000**
Policy Aggregate	**$2,000,000**
Products and Completed Operations Aggregate	**$2,000,000**

6. CGL coverage applies unless you provide only trucking, (no premises or operations other than driving, loading/unloading), or garage operations, (see below).
7. Aggregate limits of General Contractors or construction contracts General Liability policies shall be "per project" or "per location," as appropriate. If any aggregate limit is reduced by 25% or more by reserved and/or paid claims, the contractor must notify the Board and promptly reinstate the required aggregates.
8. If the contractor's operations involve excavation, grading, filling, backfilling, road or similar construction, General Liability policy shall not contain exclusions for subsidence or earth movement.
9. If the contractor's operations involve any construction, General liability policy shall not contain exclusions for hazards of explosion ("X"), collapse ("C") or underground ("U").
10. If the contractor's operations involve any construction, reconstruction, repair or similar work, General liability policy shall not contain any exclusion for such work.
11. **Business Automobile Liability**
    Combined Single Limit for Each Accident — **$500,000**
    a. Coverage must apply to all vehicles (owned, non-owned, or hired) operating on our site/location, or transporting our people or property off our site, except vehicles operated by you or your employee(s) commuting in personal vehicles to our parking facilities, in which case you must only carry Employer's Non-Ownership coverage, (same limit), and ensure that such vehicle(s) are personally insured.
    b. Auto pollution liability coverage is required on vehicles hauling hazardous cargo.
    c. If your operations are solely a garage (vehicle maintenance and repair), you must carry Garage Liability, instead of Business Auto Liability, but the Garage Liability must not be limited to auto liability only, and the same limit applies.
12. **Excess/Umbrella Liability**: Total limits can be satisfied through any combination of Primary and Excess/Umbrella Liability insurance policies. The Umbrella Liability policy must be maintained at all times during the terms of this Agreement. Policy must be on an "occurrence basis" and coverage must follow form or be at least as broad as the underlying Primary insurance.

D. ADDITIONAL COVERAGE AND LIMITS THAT MAY BE REQUIRED as needed for

specific contracts. Note that additional limits may be required if warranted by exposure.

1. **Pollution Liability Insurance** (if exposure to pollutants) **$1,000,000**
    a. If you have any exposure to asbestos, lead, mold, (including any work which could, if not performed properly, lead to mold or fungal contamination), petroleum products, contaminated soils, or other pollutants, you shall provide appropriate Pollution Liability or Environmental Impairment insurance.
    b. If the Pollution Liability policy is Claims-Made, the Retroactive Date must be on or before the contract date or the date of the contractor's first exposure to pollutants, or first work that may give rise to a pollution liability claim, related to our contract.
2. **Cyber Security Liability Insurance: $1,000,000**
    a. The policy must cover liabilities for financial loss resulting or arising from acts, errors & omissions in rendering professional services; including, but not limited to, Third Party losses due to security failures in connection with technology services, internet professional services, security and privacy liability, technology errors and omissions; and, must include coverage for First Party Expenses including notification, credit monitoring, and credit repair services. The Policy must cover Contractor and all subcontractors / subconsultants of Contractor, individuals or other entities providing professional service concerning this Contract. The insurance coverage will include coverage for claims due to programming errors, software performance, or the failure of Contractor's work to perform according to the Contract and will be renewed or an extended reporting period provided, together totaling two years after work completed or expiration of this contract, whichever is later.

E. ADDITIONAL REQUIREMENTS

1. If you are a crane/rigging operator or will hoist or move property of others in connection with our contract, you must have 'care, custody & control' exclusion deleted from your Commercial General Liability policy, or provide Rigger's Liability coverage at least equal to the highest replacement cost of materials to be hoisted or moved.
2. If your vehicles carry materials belonging to others in connection with our contract, you must carry Cargo Liability coverage, at least equal to the highest value of property to be carried on a single vehicle, with terminal coverage at least equal to the highest value of property at one terminal, owned or controlled by you.
3. If you will store, warehouse, or otherwise have custody of property belonging to others in connection with our contract, you must have Warehousemen's Liability, Bailee's Customers' Goods, Garage-Keeper's Legal Liability or equivalent coverage at least equal to the highest value of property in your custody.
4. If our contract calls for you to construct a structure, you must purchase and maintain "All-Risk" Builders Risk insurance for the full completed value of the structure and contents, including all changes and sufficient limit to fund full and immediate reconstruction under adverse conditions. This policy shall name Dallas Fort Worth International Airport Board as Loss Payee, as their interest may appear.
5. If you transport materials, equipment, machinery or furnishings to, or store such property on, our construction site, you must carry an "All-Risk" Installation Floater with coverage at least equal to the greatest concentration of value, (including the cost of transit, installation labor and testing).
6. If you use rented equipment or tools on our job site or premises, you must carry Rented Equipment coverage sufficient to repair or replace damaged equipment.
7. If your work involves administration of Airport Funds, you must furnish a Third Party Fidelity Bond that must remain in effect for the term of the contract, as

modified and/or extended. The Board shall be named as "Obligee".

8. Should this Contract require the use of Subcontractors, it will be the sole responsibility of the General Contractor to either endeavor to require Subcontractors to provide and maintain the insurance limits and coverages required herein or provide said insurance coverage for the subcontractor by designating the Subcontractor as an additional insured either by a blanket additional insured endorsement, or by specific endorsement.
9. The General Contractor shall endeavor to verify that such Subcontractors are in compliance with all contractual insurance requirements.
10. The General Contractor shall assume all liability for those Subcontractors who do not meet the insurance requirements.
11. Access to the Air Operations Area will not be granted without verification of insurance coverage as required.

F. CERTIFICATION OF INSURANCE

1. Upon execution of the contract or prior to commencement of work, whichever is first, you shall provide your contract administrator with a current insurance certificate by emailing your certificate to dfwcoi@dfwairport.com, with your contract number and business name in the subject line. Please copy your contract administrator on email submissions. You shall cause your insurance data to be kept current with DFW Board for the period of time you are liable for your product or work, but not less than through the warranty period of our contract.
2. Fax or e-mail insurance certificates to the following:
   Email: dfwcoi@dfwairport.com
   FAX: (972) 973-5651
3. You further agree, upon our oral or written request, to furnish copies of certificates of insurance, certified by an authorized representative of the insurer(s), within ten (10) days of request.
4. You shall provide to the Board's Risk Management department, at least thirty (30) days prior to cancellation, except ten (10) days for non-payment of premium of cancellation of any required coverage. You shall then arrange acceptable alternate coverage to comply with our requirements and provide an updated insurance certificate.
5. No policy submitted shall be subject to limitations, conditions or restrictions that are inconsistent with the intent of the Insurance Requirements to be fulfilled by you. The Board's decision thereon shall be final.
6. Approval, disapproval or failure to act by the Board regarding any insurance obtained by you shall not relieve you of full responsibility or liability for damages and accidents as set forth herein. Neither shall the bankruptcy, insolvency or denial of liability by the insurance company exonerate you from liability.
7. No special payment, except when separate line item is provided, shall be made by the Board for any insurance that the Contractor may be required to carry; all are included in the Contract amount and the Contract unit prices.

Request Number: REQ00004440
Contract Number: PA1689
Contract Title: Rental Car Center Bus Roads and Bridge Rehabilitation

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYY)

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER **INSURANCE AGENT'S BUSINESS NAME** **ADDRESS** **CITY, STATE ZIP CODE**	CONTACT NAME: **INSURANCE AGENT'S MAIN CONTACT NAME** PHONE (A/C, No. Ext): **INSURANCE AGENT'S TELEPHONE NO.** FAX **INSURANCE AGENT FAX NO.** (A/C, No): E-MAIL ADDRESS: **INSURANCE AGENT'S EMAIL ADDRESS**
INSURED **YOUR COMPANY NAME** **ADDRESS** **CITY, STATE, ZIP CODE**	INSURER(S) AFFORDING COVERAGE — NAIC# INSURER A: ABC Insurance Company — 11111 INSURER B: DEF Insurance Company — 22222 INSURER C: GHI Insurance Company — 33333 INSURER D: JKL Insurance Company — 44444 INSURER E: MNO Insurance Company — 55555 INSURER F:

COVERAGES CERTIFICATE NUMBER: REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN. THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYY)	POLICY EXP (MM/DD/YYY)	LIMITS	
A	GENERAL LIABILITY [ ] COMMERCIAL GENERAL LIABILITY [ ] CLAIMS-MADE [X] OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: [X] POLICY [ ] PRO-JECT [ ] LOC	Y	Y	Policy Number	MO/DAY/YR	MO/DAY/YR	EACH OCCURRENCE DAMAGES TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS-COMP/OP AGG	$1,000,000 $100,000 $10,000 $1,000,000 $2,000,000 $2,000,000
B	AUTOMOBILE LIABILITY [X] ANY AUTO [X] ALL OWNED AUTOS [ ] SCHEDULED AUTOS [X] HIRED AUTOS [X] NON-OWNED AUTOS	Y	Y	Policy Number	MO/DAY/YR	MO/DAY/YR	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$500,000
	[ ] UMBRELLA LIAB [ ] [ ] EXCESS LIAB [ ] CLAIMS-MADE [ ] DED [ ] RETENTION $						EACH OCCURRENCE AGGREGATE	
C	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? Y/N [ ] **(Mandatory in NH)** If yes, describe under DESCRIPTION OF OPERATIONS below	N/A	Y	Policy Number	MO/DAY/YR	MO/DAY/YR	[X] WC Statutory Limits [ ] OTH-ER E.L. EACH ACCIDENT E.L. DISEASE – EA EMPLOYEE E.L. DISEASE – POLICY LIMIT	 $500,000 $500,000 $500,000
D	POLLUTION LIABILTIY			Policy Number	MO/DAY/YR	MO/DAY/YR	LIMIT	$1,000,000

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

Dallas Fort Worth International Airport Board and the Cities of Dallas and Fort Worth, Texas are included as Additional Insureds with respects to the GENERAL LIABILITY and AUTO LIABILITY. A WAIVER OF SUBROGATION in favor of the Dallas Fort Worth International Airport Board and the Cities of Dallas and Fort Worth, Texas applies with respects to the GENERAL LIABILITY, AUTO LIABILITY, and WORKERS COMPENSATION Policies.

CERTIFICATE HOLDER	CANCELLATION
Dallas Fort Worth International Airport Board **2400 Aviation Drive** **PO Box 619428** **DFW Airport, TX, 75261**	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS. AUTHORIZED REPRESENTATIVE

Date/Time Printed: 4/2/2026, at 11:07 AM
Risk Profile: 107-NSNA

SAMPLE

Request Number: REQ00004440
Contract Number: PA1689
Contract Title: Rental Car Center Bus Roads and Bridge Rehabilitation

ADDITIONAL REMARKS SCHEDULE

Page_____of _____

ACORD	NAMED INSURED YOUR COMPANY NAME ADDRESS CITY, STATE, ZIP CODE
POLICY NUMBER	
CARRIER / NAIC CODE	EFFECTIVE DATE:

ADDITIONAL REMARKS

THIS ADDITIONAL REMARKS FORM IS A SCHEDULE TO ACORD FORM,
FORM NUMBER:_____ FORM TITLE: _____

E	Cyber Lability	Policy Number	MO/DAY/YR	MO/DAY/YR	LIMIT	$1,000,000

SAMPLE

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Date/Time Printed: 4/2/2026, at 11:07 AM
Risk Profile: 107-NSNA

EFFECTIVE 11/07/2025

SBE PROGRAM IN EFFECT

Please review all Bids/Proposal Documents CAREFULLY!

FAILURE to comply with the new requirements will deem your Bids/Proposals Non-Responsive with no Further Consideration.

SBE Participation (Not included in Page Count Limit)

SBE Participation Checklist For:

a. *Request for Bids (RFB)* – Goods and Services including Best Value

b. *Request for Bids (RFB)* – Construction

Request for Qualifications (RFQ) – Architectural/Engineering Services, Design & Design Management Services and Program Management/Construction Management Services

c. *Request for Proposal (RFP)* – Goods and Services including Best Value

☐ A. SBE Commitment Form (completed and signed)

☐ B. Final Schedule of Subcontractors with ALL SBE and Non-SBE partners. (completed and signed).

☐ C. Intent to Perform Forms for each SBE (completed and signed by both Prime & Sub)

☐ D. SBEs have a physical place of business in the Airport's Relevant Market Area (Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall, Somervell, Tarrant and Wise counties)

☐ E. Good Faith Effort (GFE) Criteria (If applicable)

☐ F. **SBE Plus** Current Certificates for all SBE firms identified

☐ G. Draft Joint Venture Agreement (if applicable)

☐ H. Please ensure the SBE % listed on the Commitment Form matches the % on the Final Schedule of Subcontractors Form and the aggregate % of all Intent to Performs.

AFFIRMATION

I HEREBY AFFIRM THAT THE ABOVE INFORMATION IS TRUE AND COMPLETE TO THE BEST OF MY KNOWLEDGE AND I HAVE READ THE SBE CONTRACT PROVISIONS.

PRINTED NAME AND TITLE OF AUTHORIZED OFFICIAL:

_____

SIGNATURE: _____

DATE:_____

SMALL BUSINESS ENTERPRISE (SBE) SPECIAL CONTRACT PROVISIONS

Notification is hereby given that an SBE Contract Specific Goal has been established for this Contract. The Contractor/vendor has committed to percent (%) SBE participation of the total dollar value of this Contract including any change orders and/or modifications throughout the term of this Contract/agreement. The commitment is a contractual commitment upon execution of the Contract.

A. GENERAL REQUIREMENTS

1. It is the policy of the Dallas/Fort Worth International Airport Board of Directors ("Airport Board") to support the growth and development of Small Business Enterprises ("SBE") that can successfully compete for Airport prime contracting and subcontracting opportunities.

2. A "Contractor" is defined as one who participates, through a Contract or any other contractual agreement. For purposes of these Provisions, a Contractor is one who seeks to do business with the Airport Board by submission of a bid or proposal on any such contract or subcontract. A Contractor includes but is not limited to a Contractor, consultant, developer or vendors.

3. It is the policy of the Airport Board to ensure non-discrimination in the award and administration of Airport Board Contracts. Consequently, the Contractor must fully comply with the requirements of the Airport Board's Small Business Enterprise Program Policy and Administrative Procedures in proposing and performing hereunder.

4. The Contractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this Contract. The Contractor shall carry out applicable requirements of the Airport Board's SBE Program Policy and Administrative Procedures. Failure by the Contractor to carry out these requirements is a material breach of this Contract, which may result in the termination of this Contract or such other remedy, as the Airport Board deems appropriate. The Contractor shall insert an Article containing all of the provisions of this Section, including this paragraph, in all subcontracts hereunder, except altered as necessary for the proper identification of the contracting parties and the Airport Board under this Contract.

5. The Business Development Department ("BDD") is responsible to ensure compliance with the Airport Board's SBE Program Policy and Administrative Procedures. BDD has the mission to proactively facilitate and maximize business and capacity building opportunities for SBEs by collaborating with internal customers and implementing effective innovative programs and approaches for prime and subcontracting opportunities.

6. The Contractor specifically agrees to comply with all applicable provisions of the Airport Board's SBE Program Policy and Administrative Procedures and any amendments thereto. SBE and Non-SBE subcontractors also agree to comply with all applicable provisions of the Airport Board's SBE Program Policy and Administrative Procedures ("Policies"). BDD and or the Airport Board may make changes to the existing policy, procedures and contract provisions. Any future

changes supersede past policies, procedures, contract provisions. The Contractor and subcontractors are responsible to be aware of future changes.

1. The Contractor shall maintain records showing:

   a. Subcontract/supplier awards, including awards to SBEs;

   b. Specific efforts to identify and award such Contracts to SBEs, such as when requested copies of executed Contracts with SBEs to establish actual SBE project participation.

B. ADMINISTRATIVE REQUIREMENTS

1. All Contractors are charged with knowledge of and are solely responsible for complying with each requirement of the Policies in submitting a bid/proposal and, if awarded a Contract, in performing the work described in the Contract documents. These instructions are intended only to generally assist the Contractor in preparing and submitting a compliant bid/proposal. Should any questions arise regarding specific circumstances, Contractors must consult with the BDD office at 972-973-5500.

2. The Contractor shall appoint a high-level official to administer and coordinate the Contractor's efforts to carry out its SBE contractual commitments.

3. The Contractor agrees to submit monthly reports of payments and subcontract and/or supplier awards to SBEs and Non-SBEs in such form and manner and at such times as the Airport Board shall prescribe.

4. The Contractor shall provide BDD access to all books, records, accounts and personnel. Such access will be used for, among other purposes, determining SBE participation and compliance with the Policies. All Contractors may be subject to interim and post-contract SBE audits. Audit determination(s) regarding Contractor's compliance with the Policies may be considered and have a bearing on consideration of the Contractor for award of future Contracts.

C. GOALS AND GOOD FAITH EFFORTS

1. Determining Responsive, Non-Responsive and Good Faith Efforts (Pre-Award)

   a. Each Contractor must comply with the terms and conditions of the SBE Program Policy and Administrative Procedures in making its bid or proposal and, if awarded the Contract, in performing all work thereunder. A Contractor's failure to comply with any Rules or Regulations promulgated pursuant thereto, or any additional requirements contained herein may render a bid or proposal non-responsive and may constitute cause for rejection.

      i. Responsive; compliance with requirements. If a bid/proposal meets the Contract Specific Goal or shows an adequate good faith effort in accordance with the SBE Program Policy and Administrative Procedures, then BDD shall notify the procuring department to regard the bid/proposal as responsive.

i. Non-Responsive; failure to meet requirements. If a bid/proposal subject to a Contract Specific Goal does not provide the necessary information, documentation or forms outlined in the SBE Program Policy and Administrative Procedures, then BDD shall notify the procuring department to regard the bid/proposal as non-responsive. Such determination shall result in no further consideration of the bid/proposal by the Airport Board and is not appealable.

b. If BDD establishes a Contract Specific Goal, the goal will be stated in the Advertisement and Invitation to Bid. In order to comply with the bid/proposal requirements of the solicitation and the SBE Program Policy and Administrative Procedures, a Contractor must either meet the Contract Specific Goal or demonstrate that the Contractor has made sufficient good faith efforts to meet the Contract Specific Goal. If the Contractor will not meet the SBE goal, it shall nevertheless be eligible for award of the Contract if it can demonstrate to BDD that it has made good faith efforts to meet the goal. This good faith effort documentation must be submitted with the Contractor's bid or proposal.

c. For Contracts that are initially awarded under $50,000.00 with a zero Contract Specific Goal and later increases to greater than $50,000.00, BDD will evaluate whether to establish a Contract Specific Goal. If a Contract Specific Goal is established, the SBE commitment made to meet the Contract Specific Goal will be applicable to future contract value increases and change orders.

d. In evaluating a Contractor's good faith efforts submission, BDD will only consider those documented efforts that occurred prior to the good faith effort submission.

e. The submission of good faith efforts documentation is a matter of responsiveness and shall include a specific response to each of the following criteria with the bid or proposal. The following factors are taken into account when assessing whether a Contractor made good faith efforts to meet the Contract Specific Goal. These factors are minimally considered as good faith efforts and demonstrate specific initiatives made in attempting to achieve the Contract Specific Goal. These factors should not be considered as a template, checklist or some quantitative formula. A Contractor is required to meet all factors outlined below and provide support documentation in order for good faith efforts to be assessed. Mere pro forma efforts are not good faith efforts to meet the Contract Specific Goal. This means that a Contractor must show that it took all necessary and reasonable steps to achieve a Contract Specific Goal, which, by their scope, intensity, and appropriateness to the objective, could reasonably be expected to meet the Contract Specific Goal, even if they were not fully successful. Failure of the Contractor to demonstrate adequate good faith efforts as to any one of the following categories shall render the overall good faith showing insufficient and the bid/proposal non-responsive. BDD will evaluate the good faith efforts on quality, quantity, and intensity of the different kinds of efforts that the Contractor has made based on the regulations and the guidance in 49 C.F.R. part 26. **NOT SUBMITTING PROPER SUPPORT DOCUMENTATION IS NOT EVIDENCE OF A PROPER DEMONSTRATION OF GOOD FAITH EFFORT. SUBMITTAL OF THE CRITERIA, WITH NO ADDITIONAL DOCUMENTATION, WILL NOT BE CONSIDERED ADEQUATE DEMONSTRATION OF GOOD**

FAITH EFFORT. Contractors are not limited to these particular areas and may include other efforts deemed appropriate. Complete the **Commitment to SBE Participation** form and attach support documentation only if the Contract Specific Goal is not achieved. For additional guidance concerning good faith efforts, please refer to the Electronic Code of Federal Regulations (CFR 49 Part 26, Appendix A).

i. Conducting market research to identify small business contractors and suppliers and solicit through all reasonable and available means the interest of all certified SBEs that have the capability to perform the work of the contract. This may include attendance at any pre-bid or pre-proposal meetings to discuss subcontracting and supplier opportunities (acceptable documentation shall include copies of the meeting sign-in sheets with contractor name noted as signed-in) and business matchmaking meetings and events, advertising and/or written notices, posting of Notices of Sources Sought and/or Requests for Proposals, written notices or emails to all SBEs listed in the State and/or Local respective directories of firms that specialize in the areas of work desired (as noted in the SBE directory) and which are located in the area or surrounding areas of the project. *The Contractor should solicit this interest as early in the acquisition process as practicable to allow the SBEs to respond to the solicitation and submit a timely offer for the subcontract. The bidder should determine with certainty if the SBEs are interested in taking appropriate steps to follow up initial solicitations at least three (3) business days prior to bid opening*.

ii. Selecting portions of the work to be performed by SBEs in order to increase the likelihood that the SBE goals will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units (for example, smaller tasks or quantities) to facilitate SBE participation, even when the prime contractor might otherwise prefer to perform these work items with its own forces. This may include, where possible, establishing flexible timeframes for performance and delivery schedules in a manner that encourages and facilitates SBE participation.

iii. Providing interested SBEs with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation with their offer for the subcontract.

iv. Negotiating in good faith with interested SBEs. It is the bidder's responsibility to make a portion of the work available to SBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available SBE subcontractors and suppliers, so as to facilitate SBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of SBEs that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional Agreements could not be reached for SBEs to perform the work. A bidder

using good business judgment would consider a number of factors in negotiating with subcontractors, including SBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using SBEs is not in itself sufficient reason for a bidder's failure to meet the contract SBE goal, as long as such costs are reasonable. Also, the ability or desire of a prime contractor to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Prime contractors are not, however, required to accept higher quotes from SBEs if the price difference is excessive or unreasonable.

i. Not rejecting SBEs as being unqualified without sound reasons based on a thorough investigation of their capabilities. The contractor's standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. non-union status) are not legitimate causes for the rejection or non-solicitation of bids in the contractor's efforts to meet the project goal. Another practice considered an insufficient good faith effort is the rejection of the SBE because its quotation for the work was not the lowest received. However, nothing in this paragraph shall be construed to require the bidder or prime contractor to accept unreasonable quotes to satisfy contract goals*. A prime contractor's inability to find a replacement SBE at the original price is not sufficient to support a finding that good faith efforts have been made to replace the original SBE. The fact that the contractor has the ability and/or desire to perform the contract work with its own forces does not relieve the contractor of the obligation to make good faith efforts to find a replacement SBE, and it is not a sound basis for rejecting a prospective replacement SBE's reasonable quote.*

ii. Making efforts to assist interested SBEs in obtaining bonding, lines of credit, or insurance as required by the recipient or contractor.

iii. Making efforts to assist interested SBEs in obtaining necessary equipment, supplies, materials, or related assistance or services.

iv. Effectively using the services of available Small community organizations; Small contractors' groups; local, State, and Federal Small business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of SBEs.

v. At a minimum, DFW will review the performance of other bidders/proposers in meeting the contract goal. For example, when the apparent successful bidder/proposer fails to meet the contract goal, but others meet it, DFW may reasonably raise the question of whether, with additional efforts, the apparent successful bidder/proposer could have met the goal. As provided in §26.53(b)(2)((vi), the bidder must submit copies of each SBE and non-SBE subcontractor quote submitted to the bidder when a non-SBE subcontractor was selected over an SBE for work on

the contract to review whether SBE prices were substantially higher; and contact the SBEs listed on a contractor's solicitation to inquire as to whether they were contacted by the prime. Pro forma mailings to SBEs requesting bids are not sufficient to satisfy good faith efforts under the rule.

a. BDD will review not only the different kinds of efforts that the Contractor has made but also the quantity and quality of those efforts. Efforts that are merely pro-forma are not good faith efforts to meet the goal, even if they are sincerely motivated. The scope and intensity of the efforts will be considered in determining whether the bidder or proposer has achieved a good faith effort. Whether other Contractors attained a sufficient level of SBE participation to meet the Contract Specific Goal will also be taken into consideration when determining whether the Contractor in question has made a good faith effort. A promise to use SBEs after Contract award is not considered to be responsive to the Contract solicitation or to constitute good faith efforts. BDD will also consider if, given all relevant circumstances, the Contractor's efforts could reasonably be expected to produce a level of SBE participation sufficient to meet the goal.

b. Whether or not the Contract Specific Goal has been met and/or whether there were sufficient good faith efforts is considered a matter of the Contractor's responsiveness. The requirement to submit documentation that the Contract Specific Goal has been met or good faith efforts documentation has been submitted in the manner prescribed by BDD is considered a matter of the Contractor's responsiveness. The Airport Board will only award Contracts to Contractors determined to be responsive. If a Contractor fails to submit good faith efforts documentation with the bid or proposal, it waives the right to appeal the BDD's decision that sufficient good faith efforts were not made. The Vice President of BDD or designee shall determine whether the Contractor made the required good faith efforts and, if not, shall recommend that the Contractor be deemed non-responsive.

c. If a Contractor, that has submitted good faith efforts documentation, desires a review of BDD's decision, it must file a written request for an appeal within two (2) business days after receipt of the written decision to the following Reconsideration Official:

Executive Vice President
Chief Administrative Officer
DFW Airport, 2400 Aviation Drive
P.O. Box 619428
DFW Airport, TX 75261-9428

d. As part of the reconsideration, the Contractor will have the opportunity to meet in person with the Reconsideration Official to discuss the issue of whether it met the goal or made adequate good faith efforts to do so. The Contractor will also have the opportunity to provide written documentation or argument concerning the issue of good faith. Arguments, evidence, and documents supporting the basis for the appeal must be received no later than five (5) business days after the notice of appeal is filed. The Reconsideration Official's decision shall be made based solely on the entire administrative record presented with the original good faith efforts documentation. No new additional information or documentation can be

provided or allowed for review. The Reconsideration Official will issue a final written decision in response to the appeal.

a. Failure of the bidder or proposer to show good faith efforts as to anyone (1) of the criteria listed above shall render its overall good faith effort insufficient and its bid or proposal deemed non-responsive.

2. SBE Commitment Modification Due to Change in Scope of Work (Post Award)

a. The Contractor has a continuing obligation as a covenant of performance to meet the SBE utilization to which it committed at Contract award, inclusive of change orders, amendments, and modifications. If the Contractor during Contract performance cannot meet its original SBE commitment, due to changes to the scope of work made by the Airport Board, the Contractor and User Department must immediately notify BDD of the scope of work changes that impact SBEs for approval. The Contractor has a continuing obligation to meet its original SBE commitment.

b. Such good faith efforts during Contract performance must include, but are not limited to:

i. Solicitation of SBEs that are certified in the applicable area of work or specialty;

ii. Providing interested SBEs with adequate information about the plans, specifications, scope of work and requirements of the Contract;

iii. Fairly investigating and evaluating the interested SBEs' regarding their capabilities, not rejecting SBEs as unqualified without sound reasons based on a thorough investigation, and providing verification, including a statement giving the Contractor's reasons for its conclusion, that it rejected each non-utilized SBE because the SBE was not qualified;

iv. Negotiating in good faith with interested SBEs regarding price, using good business judgment and not rejecting reasonable quotes from interested SBEs and providing written documentation why the Contractor and any of the SBEs contacted failed in negotiating an agreement; and

v. Effectively using the services of available advocacy and business community organizations; chambers and Contractor groups; local, State, and Federal business assistance offices, and other organizations that provide assistance in the identification of SBEs

c. Modified good faith efforts must be demonstrated to be meaningful and not merely for formalistic compliance with this requirement. The scope and intensity of the efforts will be considered in determining whether the bidder or proposer has achieved a good faith effort.

d. A Contractor determined not to have made good faith efforts to meet its SBE contractual commitments may request administrative review and final reconsideration by the Vice President of BDD. The Contractor may elect to meet in person to discuss whether the Contractor made good faith

efforts in accordance with the SBE Program Policy and Administrative Procedures. BDD's determination shall be final.

A. COUNTING SBE PARTICIPATION

1. BDD will evaluate each bid or proposal to determine the responsiveness of the bid or proposal to the SBE Program Policy and Administrative Procedures and contractual requirements. In determining if a Contractor's committed levels of participation meet or exceed the solicitation's or the development agreement's Contract Specific Goal, BDD may base its determination solely on the information provided in the bid or proposal document.

2. If a joint venture is proposed to meet the Contract Specific Goal or any portion thereof, the total value of the distinct and clearly defined portions of the work of the Contract that the SBE will perform with its own workforce will be counted towards the Contract Specific Goal. In addition, the SBEs ownership interest percentage must be commensurate with its capital contribution, control, management, profits and risks.

3. When counting the SBE participation in bids with charged reimbursable expenses, deductive or add alternatives, the responsiveness determination shall be based on the base bid. Contractors, however, are strongly encouraged to include SBE participation on add alternates and charged reimbursable expenses when feasibly possible. Any participation achieved on add alternates and charged reimbursable expenses will be credited towards the SBE goal.

4. When calculating participation levels, percentages and dollar amounts for each SBE, the Contractor cannot round up in determining whether or not the total of these amounts meets or exceeds the Contract Specific Goal.

5. A Contractor cannot require an SBE subcontractor to enter an exclusive arrangement for purposes of submitting its bid or proposal or require the SBE subcontractor to enter into a non-compete arrangement post award

6. Post award, the Contractor may count towards its SBE contractual commitment an SBE in the relevant market area that is certified by an approved entity during the performance of the Contract, if the SBE is added to the Contract or substituted for an SBE pursuant to SBE SUBSTITUTIONS OR TERMINATIONS section herein.

7. The Contractor may not count toward its SBE contractual commitment the dollar value of work performed by an SBE after it has ceased to be certified as an SBE or ceased to satisfy the requirement that the SBE have a physical place of business in the relevant market area.

8. SBE prime Contractors can count their self-performance toward meeting the Contract Specific Goal, but only for the scope of work and at the percentage level they will self- perform.

9. SBE prime Contractors cannot count on their self-performance in lieu of meeting an SBE subcontracting commitment made at the time of contract award.

10. When an SBE participates in a Contract, the Contractor shall count only the value of the work performed by the SBE toward the Contract Specific Goal.

1. All SBE contractors, subcontractors, joint ventures, suppliers, manufacturers, manufacturer's representatives, or brokers listed in the bid or proposal must actually perform a commercially useful function in the work of a contract within the area(s) for which they are certified and must not act as a conduit. In no case, however, shall an SBE act as a conduit, nor shall the participation of an SBE count toward the goal to the extent it fails to perform a commercially useful function or knowingly agrees to pass the scope of work for which it is listed for participation and is scheduled to perform or supply on a contract, to a non-SBE or SBE firm and/or does not carry out the responsibilities required for SBE participation by actually performing, managing, controlling and supervising the work under a contract. In this type of relationship, the SBE has not performed a commercially useful function and the arranged agreement between the two (2) parties is not consistent with standard industry practice. This arrangement does not meet the commercially useful function requirement, and therefore the SBE's participation does not count toward the SBE goal on the contract. Conduit is also referred to as a passthrough.

    a. Conduit means an SBE that knowingly agrees to pass the scope of work for which it is listed for participation and is scheduled to perform or supply on a contract, to a non-SBE or SBE firm and/or does not carry out the responsibilities required for SBE participation by performing, managing, controlling and supervising the work under a contract. In this type of relationship, the SBE has not performed a commercially useful function and the arranged agreement between the two (2) parties is not consistent with standard industry practice. This arrangement does not meet the commercially useful function requirement, and therefore the SBE's participation does not count toward the SBE goal on the contract. Conduit is also referred to as a passthrough.

2. When a Contractor utilizes an SBE staffing service to perform work and the workers are independent contractors, subcontractors, or employees of the staffing firm who do not receive paid benefits (including, at a minimum, healthcare coverage and paid time off), the Contractor shall count only the amount of fees or commissions charged by the staffing service for providing labor force, consistent with normal industry practices.

3. A Contractor cannot count toward the Contract Specific Goal amounts paid to an affiliate, as defined in the SBE Program Policy and Administrative Procedures.

4. The Contractor shall count the entire amount of that portion of a Contract (or other Contract not covered by this section) that is performed by the SBEs own work forces. The Contractor may count the cost of supplies and materials obtained by the SBE for the work of the Contract, including supplies purchased or equipment leased by the SBE (except supplies and equipment the SBE subcontractor purchases or leases from the prime Contractor or its affiliate).

5. When an SBE subcontracts part of the work of its Contract to another firm at any tier, the value of the subcontracted work may be counted towards the SBE goal only if the SBE's subcontractor is itself an SBE. Work that an SBE subcontracts to a non-SBE does not count toward SBE goal.

6. The Contractor will count towards the SBE goal expenditures to an SBE subcontractor, only if the SBE subcontractor is performing a commercially useful function on the Contract.

a. AN SBE performs a commercially useful function when it is responsible for execution of the work of the Contract and is carrying out its responsibilities by performing, managing, and supervising the work involved. To perform a commercially useful function, the SBE must also be responsible, with respect to materials and supplies used on the Contract, for negotiating price, determining quality and quantity, ordering the materials, and installing (where applicable) and paying for the materials itself. To determine whether an SBE is performing a commercially useful function, the Contractor must evaluate the amount of the work subcontracted, industry practices, whether the amount the firm is to be paid under the Contract is commensurate with the work it is performing, the SBE credit claimed for its performance of the work, and other relevant factors.

b. An SBE does not perform a commercially useful function if its role is limited to that of an extra participant in a transaction, Contract, or project through which funds are passed in order to obtain the appearance of SBE participation. In determining whether an SBE is such an extra participant, the Contractor must examine, among other relevant factors, similar transaction, particularly those in which SBEs do not participate.

c. If an SBE does not perform or exercise responsibility for at least 30 percent of the total cost of its Contract with its own work forces, or the SBE subcontracts a greater portion of the work of a Contract than would be expected on the basis of normal industry practice for the type of work involved, the Airport must presume that it is not performing a commercially useful function.

d. When an SBE is presumed not to be performing a commercially useful function as provided in this section, the SBE may present evidence to rebut this presumption. BDD may determine that the firm is performing a commercially useful function given the type of work involved and normal industry practices. BDD in its sole discretion shall determine whether an SBE is performing a commercially useful function.

7. BDD shall use the following factors in determining whether an SBE trucking company is performing a commercially useful function:

a. The SBE must be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular Contract, and there cannot be a contrived arrangement for the purpose of appearing to meet the SBE goal.

b. The SBE must itself own and operate at least one fully licensed, insured and operational truck used on the Contract.

c. The SBE shall receive credit for the total value of the transportation services it provides on the Contract using trucks it owns, insures, and operates using drivers it employs.

d. The SBE may lease trucks from another SBE, including a owner-operator who is certified as an SBE. The SBE who leases trucks from another SBE shall receive credit for the total value of the transportation services the lessee SBE provides on the Contract.

a. The SBE may lease trucks from a non-SBE firm, including from an owner-operator. The SBE that leases trucks equipped with drivers from a non-SBE is entitled to credit for the total value of transportation services provided by non-SBE leased trucks equipped with drivers not to exceed the value of transportation services on the contract provided by SBE-owned trucks or leased trucks with SBE employee drivers. Additional participation by non-SBE owned trucks equipped with drivers receives credit only for the fee or commission it receives as a result of the lease arrangement. If a recipient chooses this approach, it must obtain written consent from BDD.

i. For example: SBE Firm X uses two of its own trucks on a contract. It leases two trucks from SBE Firm Y and six trucks equipped with drivers from non-SBE Firm Z. SBE credit would be awarded for the total value of transportation services provided by Firm X and Firm Y, any may also be awarded for the total value of transportation services provided by four of the six trucks provided by Firm Z. In all, full credit would be allowed for the participation of eight trucks. SBE credit could be awarded only for the fees or commissions pertaining to the remaining trucks Firm X receives as a result of the lease with Firm Z.

b. The SBE may lease trucks without drivers from a non-SBE truck leasing company. If the SBE leases trucks from a non-SBE truck leasing company and uses its own employees as drivers, it is entitled to credit for the total value of these hauling services.

i. For Example: SBE Firm X uses two of its own trucks on a contract. It leases two additional trucks from non-SBE Firm Z. Firm X uses its own employees to drive the trucks leased from Firm Z. SBE credit would be awarded for the total value of the transportation services provided by all four trucks.

c. For purposes of this paragraph, a lease must indicate that the SBE has exclusive use and control over the truck. This does not preclude the leased truck from working for others during the term of the lease with the consent of the SBE, so long as the lease gives the SBE absolute priority for use of the leased truck. Lease trucks must display the name and identification number of the SBE.

8. Suppliers: A supplier may be a regular dealer, manufacturer, manufacturer's representative or broker. The Contractor shall count expenditures to SBEs for materials or supplies towards the SBE goal as follows:

a. On Airport Board contracts of less than five million dollars ($5,000,000.00), at the time of bid openings or proposal selection, one hundred percent (100%) of the value of the commercially useful function performed by an SBE supplier on such contract shall be counted toward the SBE goal. If the materials or supplies are purchased from an SBE regular dealer, BDD will count 100% of the cost of the materials or supplies toward the SBE goal.

b. On Airport Board contracts of five million dollars ($5,000,000.00) or more, at the time of bid opening or proposal selection, sixty percent (60%) of the value of the commercially useful function performed by an SBE supplier on such contract shall be counted toward the SBE goal.

i. If the materials or supplies are obtained from an SBE manufacturer, BDD will count 100 percent of the cost of the materials or supplies toward the SBE goal.

ii. A manufacturer is a firm that operates or maintains a factory or establishment that produces, on the premises, the materials, supplies, articles, or equipment required under the contract and of the general character described by the specifications.

iii. If the materials or supplies are purchased from an SBE regular dealer, BDD will count 60% of the cost of the materials or supplies toward SBE goals.

iv. For purposes of this section, a regular dealer is a firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials, supplies, articles or equipment of the general character described by the specifications and required under the contract are bought and kept in stock in the usual course of business.

A. To be a regular dealer, the firm must be an established, regular business that engages, as its principal business and under its own name, in the purchase and sale or lease of the products in question.

B. A person may be a regular dealer in bulk items such as petroleum products, steel, cement, gravel, stone, or asphalt without owning, operating, or maintaining a place of business if the person both owns and operates distribution equipment for the products. Any supplementing of regular dealers' own distribution equipment shall be by a long-term lease agreement and not on an ad hoc or contract-by-contract basis.

v. Packagers, brokers, manufacturers' representatives, or other persons who arrange or expenditure transactions are not regular dealers.

vi. With respect to materials or supplies purchased from an SBE which is neither a manufacturer nor a regular dealer, BDD will count the entire amount of fees or commissions charged for assistance in the procurement of the materials and supplies, or fees or transportation charges for the delivery of materials or supplies required on a job site, toward SBE goals, provided it has been determined the fees to be reasonable and not excessive as compared with fees customarily allowed for similar services. BDD will not count any portion of the cost of the materials and supplies themselves toward SBE goals, however.

vii. BDD will determine the amount of credit awarded to a firm for the provisions of materials and supplies (e.g., whether a firm is acting as a regular dealer or a transaction expediter) on a contract-by-contract basis.

1. If an SBE subcontractor is not certified at the time of the execution of the Contract, supplemental agreement or subcontract, the Contractor may not count the firm's participation toward the SBE goal until the firm is certified. Counting of participation is not retroactive; only dollars paid to the SBE after certification count toward the SBE goal. Additionally, the Contractor shall not count the dollar value of work performed under a Contract with a firm after it has ceased to be SBE certified.

2. BDD reserves the right to reject the participation of a certified firm for credit towards meeting the Contract Specific Goal, in is sole discretion.

3. The Contractor shall not count the participation of an SBE subcontractor toward the goal until the amount has been actually paid to the SBE.

4. The following expenditures to SBEs may also count toward the SBE goal:

    a. The fees or commissions charged for providing a bona fide service, such as professional, technical, consultant or managerial services, and assistance in the procurement of essential personnel, facilities, equipment, materials or supplies required for performance of the Contract, provided that the fee or commission is determined by BDD to be reasonable and not excessive as compared with fees customarily allowed for similar services.

    b. The fees charged for delivery of material and supplies required on a job site (but not the cost of materials and supplies themselves) when the hauler, trucker or delivery service is not also the manufacturer of or a regular dealer in the materials and supplies, provided that the fee is determined by BDD to be reasonable and not excessive as compared with fees customarily allowed for similar services.

    c. The fees of commission charged for providing any bonds or insurance specifically required for the performance of the Contract, provided that the fee or commission is determined by BDD to be reasonable and not excessive as compared with fees customarily allowed for similar services.

5. Joint Ventures: The Airport Board shall encourage where economically feasible joint ventures to maximize prime contracting opportunities for SBEs on all eligible Contracts, including commercial development agreements.

    a. If a Contractor engages in a joint venture to satisfy its SBE commitment, BDD shall review all contractual agreements or other pertinent documents regarding:

        i. The initial capital investment of each venture partner;

        ii. The proportional allocation of profits, losses and risks to each venture partner;

        iii. The sharing of the right to control the ownership and management of the joint venture;

        iv. Actual participation of the venture partners in the performance of the Contract;

        v. The method of and responsibility for accounting;

i. The methods by which disputes are resolved; and

ii. Other pertinent joint venture factors.

b. A draft of the proposed joint venture agreement must be submitted with the bid or proposal to BDD for its approval in writing. BDD shall determine the degree of SBE participation resulting from the joint venture that may be credited towards the Contract Specific Goal.

c. BDD will count SBE participation where the SBE or joint venture partner performs a portion of work on the Contract and the percentage of ownership or equity of the SBE in a joint venture. BDD will allow the joint venture to count the portion of the total dollar value of the Contract equal to the distinct, clearly defined portion of the work of the Contract that the SBE joint venture partner performs with its own forces toward the SBE commitment and for which it is at risk.

d. If, after the award of a contract to a team, any member of the team believes that the terms and conditions of the agreement as approved by BDD have not been complied with, then such member may seek review and mediation of such agreement before the Vice President of BDD. The request for review must be made in writing.

e. In the event that the mediation with the Vice President, does not resolve all disputes, the Vice President of BDD shall have the option of referring mediation proceedings to a qualified outside mediator, the costs to be borne by the interested parties.

B. CERTIFICATION

1. In order to count the participation of SBEs towards the Contract Specific Goal or Annual Goal, the SBE must be certified by the North Central Texas Regional Certification Agency, DFW Business Council or the Women's Business Council Southwest. Other certifications are not acceptable. In addition to having a valid certification from one of the entities listed above, the SBE must be certified in the NAICS Code applicable to the scope of work it proposes to perform and have a place of business in the Airport Board's relevant market area at the time the bid or proposal is submitted for credit towards meeting the SBE goal. The Airport Board's relevant market area includes Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall, Somervell, Tarrant and Wise counties.

2. The SBE must provide any requested documentation to establish its place of business to the satisfaction of BDD. Using a post office box, private mailbox services, another person's or firm's office space (including Airport Board office space), virtual offices, shared or coworking office spaces, executive suites or staffing services does not satisfy the requirement that the SBE have a physical place of business in the relevant market area. Please reference the Definitions in the Appendix of the SBE Program Policy and Administrative Procedures.

3. An SBE owner or employee living in the relevant market area does not satisfy the requirement that the SBE have a place of business in the relevant market area. However, an SBE majority owner who operates his/her own business solely from his/her own residence in the relevant market area satisfies the requirement that the SBE have a physical place of business in the relevant market area. Please

reference the Definitions in the Appendix of the SBE Program Policy and Administrative Procedures.

1. Affiliate/Affiliation: Regardless of certification by a recognized agency, the SBE must be an independent business and not an affiliate of any other business including non-SBEs. Affiliate means any business entity that is affiliated with an SBE or with owners of such SBE or any other business enterprise. Business enterprises are affiliates of each other when:

    a. Affiliation exists when one business controls or has the power to control another or when a third party (or parties) controls or has the power to control both businesses. Control may arise through ownership, management, or other relationships or interactions between the parties. Control may be affirmative or negative. Negative control includes instances where a minority shareholder has the ability, under the concern's charter, by-laws, or shareholder's agreement, to prevent a quorum or otherwise block action by the board of directors or shareholders.

    b. Other relationships or identity of interests exist between or among parties such that affiliation may be found.

    c. *Affiliation based on identity of interest.* Affiliation may arise among two or more persons with an identity of interest. Individuals or firms that have identical or substantially identical business or economic interests (such as family members, individuals or firms with common investments, or firms that are economically dependent through contractual or other relationships) may be treated as one party with such interests aggregated.

    d. Firms owned or controlled by married couples, parties to a civil union, parents, children, and siblings are presumed to be affiliated with each other if they conduct business with each other, such as subcontracts or joint ventures or share or provide loans, resources, equipment, locations or employees with one another.

2. BDD in its sole discretion shall determine whether an applicant is an independent business.

3. The Contractor must submit to BDD a properly completed SBE Certification Certificate or letter, with all required attachments, for all SBEs proposed to be utilized as subcontractors or suppliers to meet the Contract Specific Goal at the time of bid/proposal submission. The Airport Board reserves the right to reject the participation of a certified firm for credit towards meeting the Contract goal, in its sole discretion. Such rejection shall be in writing and state the reason(s) for the rejection. BDD's decision on the request shall be final.

4. A firm must be certified as an SBE at the time of bid or proposal submission to be counted towards meeting the Contract Specific Goal for purposes of determining Contract award.

5. Dollars paid to a firm prior to obtaining an approved certification do not retroactively apply toward meeting the Contract Specific Goal or Annual Goal.

6. SBE certification does not constitute a representation or warranty as to the qualifications or capabilities of any certified firm.

1. BDD maintains a directory of certified firms that have expressed an interest in doing business with the Airport Board or are currently doing business with the Airport Board. The directory is not a certification database. Certifications listed are provided by third-party service providers. Bidders and proposers may use the directory to assist them in locating SBE firms for the work required on the Contract; however, the certifications should be verified through the approved certification agency. The directory is located at:

   - https://dfw.gob2gnow.com

C. PRE-AWARD COMPLIANCE PROCEDURES

1. SBE Utilization Forms and Related Documentation

   a. Each Contractor must submit for all solicitations, bids or proposals, qualifications completed and signed SBE utilization forms as outlined below to be considered responsive. If the Contract Specific Goal is 0% and no SBE participation is proposed, including no SBE self-performance, the required forms should be noted as "Not Applicable". Note that Requests for Proposals and/or Qualifications include Business Development Evaluation Criteria which must be responded to in the proposal even if the Contract Specific Goal is 0%.

2. Request for Bids (RFB) – Goods and Services

   Forms Required with Bid Submission

   a. ***Commitment to SBE Participation*** must be submitted at the time of bid submission.

   b. ***Final Schedule of Subcontractors*** must be submitted at the time of bid submission.

   c. ***Certification Certificates*** must be submitted at the time of proposal submission if a certified Prime is claiming credit for self-performance or for each certified subcontractor listed on the Final Schedule of Subcontractors.

   d. ***Intent to Perform as a Subcontractor*** must be submitted at the time of bid submission for each certified subcontractor identified on the Final Schedule of Subcontractors.

   e. ***Draft Joint Venture Agreement*** must be submitted at the time of RFP submission if proposing as a joint venture at the Prime level and seeking SBE credit in the Joint Venture.

   f. ***Good Faith Effort Documentation*** must be submitted at the time of bid submission if the Contractor fails to meet the Contract Specific Goal.

3. Request for Bids (RFB) – Construction

   Forms Required with Bid Submission

a. ***Commitment to SBE Participation*** must be submitted at the time of bid submission.

b. ***Final Schedule of Subcontractors*** must be submitted at the time of bid submission.

c. ***Certification Certificates*** must be submitted at the time of proposal submission if a certified Prime is claiming credit for self-performance or for each certified subcontractor listed on the Final Schedule of Subcontractors.

d. ***Intent to Perform as a Subcontractor*** must be submitted at the time of bid submission for each certified subcontractor identified on the Final Schedule of Subcontractors.

e. ***Draft Joint Venture Agreement*** must be submitted at the time of RFP submission if proposing as a joint venture at the Prime level and seeking SBE credit in the Joint Venture.

f. ***Good Faith Effort Documentation*** must be submitted at the time of bid submission if the Contractor fails to meet the Contract Specific Goal.

4. Request for Qualifications (RFQ) – Architectural/Engineering Services, Design & Design Management Services

Forms Required with Proposal Submission

a. ***Commitment to SBE Participation*** must be submitted at the time of proposal submission.

b. ***Final Schedule of Subcontractors*** must be submitted at the time of proposal submission. Contractors need to list only the anticipated percentage of participation of SBEs rather than specific dollar amounts. “To be determined” in lieu of a percentage is not acceptable.

c. ***Certification Certificates*** must be submitted at the time of proposal submission if a certified Prime is claiming credit for self-performance or for each certified subcontractor listed on the Final Schedule of Subcontractors.

d. ***Intent to Perform as a Subcontractor*** must be submitted at the time of proposal submission for each certified subcontractor identified on the Final Schedule of Subcontractors.

e. ***Draft Joint Venture Agreement*** must be submitted at the time of RFP submission if proposing as a joint venture at the Prime level and seeking SBE credit in the Joint Venture.

f. ***Good Faith Effort Documentation*** must be submitted at the time of proposal submission if the Contractor fails to meet the Contract Specific Goal.

5. Request for Proposal (RFP) – Goods and Services including Best Value

Forms Required with Proposal Submission

a. ***Commitment to SBE Participation*** must be submitted at the time of proposal submission.

b. ***Final Schedule of Subcontractors*** must be submitted at the time of proposal submission. Contractors need list only the anticipated percentage of participation of SBEs rather than specific dollar amounts. "To be determined" in lieu of a percentage is not acceptable.

c. ***Certification Certificates*** must be submitted at the time of proposal submission if a certified Prime is claiming credit for self-performance or for each certified subcontractor listed on the Final Schedule of Subcontractors.

d. ***Intent to Perform as a Subcontractor*** must be submitted at the time of proposal submission for each certified subcontractor identified on the Final Schedule of Subcontractors.

e. ***Draft Joint Venture Agreement*** must be submitted at the time of RFP submission if proposing as a joint venture at the Prime level and seeking SBE credit in the Joint Venture.

f. ***Good Faith Effort Documentation*** must be submitted at the time of proposal submission if the Contractor fails to meet the Contract Specific Goal.

6. Request for Proposal (RFP) for Construction-related Services procured through Indefinite Delivery: task/delivery order, Job Order Contracts, Program Management/Construction Management services:

Forms Required with Proposal Submission:

a. ***Commitment to SBE Participation*** must be submitted at the time of proposal submission.

b. ***Final Schedule of Subcontractors*** must be submitted at the time of proposal submission. Contractors need list only the anticipated percentage of participation of SBEs rather than specific dollar amounts. "To be determined" in lieu of a percentage is not acceptable.

c. ***Certification Certificates*** must be submitted at the time of proposal submission if a certified Prime is claiming credit for self-performance or for each certified subcontractor listed on the Final Schedule of Subcontractors.

d. ***Intent to Perform as a Subcontractor*** must be submitted at the time of proposal submission for each certified subcontractor identified on the Final Schedule of Subcontractors.

e. ***Draft Joint Venture Agreement*** must be submitted at the time of RFP submission if proposing as a joint venture at the Prime level and seeking SBE credit in the Joint Venture.

a. ***Good Faith Effort Documentation.*** must be submitted at the time of proposal submission if the Contractor fails to meet the Contract Specific Goal**.**

7. Third Party Commercial Development or Concession Tenant Finish Out

   a. **Commitment to SBE Participation (Design)** must be submitted prior to processing an Official Board Action.

   b. **Commitment to SBE Participation (Construction)** must be submitted prior to processing an Official Board Action.

   c. **Final Schedule of Subcontractors (Design)** must be submitted at the Airport's Initial Project Kick-Off Meeting.

   d. **Final Schedule of Subcontractors (Construction)** must be submitted at the Airport's Pre-Construction Meeting.

   e. **Accounting Reconciliation Statement** for the Contract must be submitted with the application for Certificate of Occupancy. A reconciliation statement shall include the total payments to the Prime Contractor and total payments made to each subcontractor listed on the Final Schedule of Subcontractors.

8. Any commitments to meet the Contract Specific Goal must be detailed on the Commitment ***to Small Business Enterprise (SBE) Participation*** form included with the bid/proposal. Submission of the form shall constitute a representation by the Contractor to the Airport Board that it commits to maintain the SBE participation level to which it committed to overall at the time of Contract award throughout the performance of the Contract. The percentage commitment must match the SBE percentage noted on the ***Final Schedule of Subcontractors*** form. For contracts where the scope of work is defined and SBE subcontractors have been selected to perform a portion of the work, the Contractor also commits to maintain and/or exceed the percentage commitment to each individual SBE subcontractor.

9. The ***Final Schedule of Subcontractors*** form must list the Contractor and all subcontractors and suppliers the Contractor intends to use in performing the work of the project, including non-SBEs, and detail the final percentage and dollar commitment of the Contractor to each subcontractor and supplier. Only certified SBEs identified and the levels of participation listed for each at the time of bid/proposal submission will be considered in determining whether the Contractor has met the Contract Specific Goal. All SBEs must be properly certified under the guidelines of the CERTIFICATION section. The final percentage and dollar commitment of the Contractor to SBE participation must match the percentage commitment on the ***Commitment to SBE Participation*** form. Modifications, substitutions or termination of the SBEs identified must follow the guidelines of the SBE SUBSTITUTIONS OR TERMINATIONS section.

10. Submission of the ***Intent to Perform as a Subcontractor*** form for each SBE shall constitute a representation by the Contractor to the Airport Board that it believes such SBE to be certified as an SBE to perform the work as designated, the SBE has a place of business in the Airport Board's relevant market area and the SBE is not affiliated with the Contractor as defined herein. It shall also represent a commitment by the Contractor that if it is awarded the Contract, it will enter a subcontract with such SBE for the work described at the approximate price and

percentage set forth in the ***Intent to Perform as a Subcontractor*** form. The aggregate SBE percentage of all ***Intent to Perform as a Subcontractor*** forms must match the SBE percentage commitment on the ***Commitment to SBE Participation*** form and the ***Final Schedule of Subcontractors*** form.

1. The Contractor shall enter into formal agreements with the SBE firms for work as indicated on the ***Final Schedule of Subcontractors*** and ***Intent to Perform*** forms within 10 (ten) business days after receipt of the Contract executed by the Airport Board or Notice to Proceed executed by the Airport Board. The Contractor, if requested, shall provide to BDD copies of those agreements within 5 (five) business days of execution. BDD reserves the right to review selected agreements at random.

2. If the information on the ***Final Schedule of Subcontractors*** form changes after all the forms have been submitted but prior to Board Approval, the Contractor must immediately notify BDD of the changes and a written explanation for the change by submitting a ***Request for Approval of Change to Final Schedule of Subcontractors*** form to BDD for approval. No change in SBE participation after bid submission, but prior to Contract award, may change, or be deemed to change, the Contractor's submitted bid amount.

3. Post award, any substitution or termination of SBEs that occur after Contract award, must be processed using the Airport Board's Compliance Management System and follow the SBE Program Policy and Administrative Procedures stated in the SBE SUBSTITUTIONS OR TERMINATIONS section.

4. Contractors must appoint and designate to BDD a high-level official to administer and coordinate its contractual SBE commitments.

5. Alternative **Compliance Plan**

    a. Contracts secured through a competitive selection process rather than a competitive bid process, the Vice President of BDD may require proposers to address the project goal by means of a compliance plan. Such a plan allows a contract to address the project goal by means of commitment to utilize SBEs for Project work or by the demonstration of a good faith effort at the point where the project is sufficiently defined and the process of procuring the subcontractors to perform the work is about to begin.

    b. The development, scope and utilization of such compliance plans will be governed by the following considerations and requirements.

    c. Basis for Determination

        i. Unless otherwise authorized in writing by the Vice President of BDD, a department may only require proposers to address a project goal by means of a compliance plan under the following conditions:

            A. The project solicitation must include the procurement of construction services.

            B. At the time of solicitation, the project design must not be complete or at a level of completeness allowing for final competitive pricing proposal; and

A. The project solicitation must not require a lump sum price proposal or the construction of the project upon which a contract award will be made.

6. Development of Compliance Plan

a. Upon determination that a compliance plan will be required for a project, the compliance plan shall be developed in accordance with the following requirements:

i. The Vice President of BDD will require separate goals for project professional services and project construction services.

ii. The construction goal established for each project shall be expressed as a percentage of either:

A. The total amount of any lump sum construction contract awarded to complete a project

B. Total estimated “cost of work,” as that term is defined in any guaranteed maximum price contract awarded to complete a project, or

C. On a task/work order

b. The contracting department shall provide a good faith estimate of the construction cost upon which a goal shall be set, and the compliance plan proposer shall provide a refined estimate at the time of the submission of a proposed compliance plan, if the amount is not reflected in an executed contract.

c. BDD shall establish a timetable for submittal and reviewing of any proposed compliance plan. During the solicitation process as solicitation submittal requirement; and after the conclusion of the solicitation process as a component of contract negotiations and award.

d. Failure to comply with any submittal timetable established by BDD may result in no further consideration of the proposed compliance plan.

7. Elements of a Compliance Plan. At a minimum, a proposed compliance plan shall address the following elements:

a. To the maximum extent applicable, the proposed compliance plan shall comply with the requirements of the SBE Program Policy and Administrative Procedures.

b. The proposed compliance plan shall set forth a detailed program for community outreach and support calculated to enhance participation opportunities.

c. The proposed compliance plan shall set forth a detailed program describing how the proposer will divide up the anticipated work into economically feasible units calculated to enhance participation opportunities.

a. The proposed compliance plan shall set forth a detailed methodology by which the Contractor shall meet the project goal.

b. The proposed compliance plan may be based upon a phased or packaged buy out of the project construction work and, if that is the case, will describe the process by which the proposer will address the project goal on a phased, package, or cumulative basis.

c. If appropriate, the proposed compliance plan shall address the subcontracting of normally self-performed work to meet the project goal.

d. The proposed compliance plan shall set forth how the proposer will comply with the requirements of the SBE Program Policy and Administrative Procedures, and Contract Provisions as part of the construction work, including use of Commitment forms, Intent to Perform, Schedule of Subcontractors forms or proposal pricing worksheet to adequately document committed participation attained.

e. The proposed compliance plan shall contain a specific acknowledgement of the proposer's continuing duty, pursuant to the SBE Program Policy and Administrative Procedures, and Contract Provisions to maintain, throughout the duration of any project contract, compliance with the level of participation committed to under any approved compliance plan, and such commitment will be the basis for award of any contract. The plan will also detail the methodology the proposer will employ for maintain participation commitments.

f. The proposed compliance plan shall set forth a detailed methodology for tabulation of participation performance and plan administration, as well as monitoring and reporting progress and participation performance to BDD. The plan shall provide for review and reconciliation milestones during the project and for review and audit opportunities for BDD.

g. The proposed compliance plan will recommend methods for supporting BDD administration and oversight of the plan, if approved.

h. The proposed compliance plan will affirm that BDD shall have prompt, full and complete access to all contractor and subcontractor personnel, books and records required to monitor and assure performance of the approved compliance plan. Additionally, the plan will acknowledge BDD's right to impose withholding payment in the event of noncompliance.

i. The proposed compliance plan shall set forth a detailed methodology for issuance of notice(s) of non-compliance with the plan and a reasonable opportunity to cure.

j. The proposed compliance plan shall set forth a detailed methodology for final reconciliation of participation performance, measured against the established goal and plan close out.

8. Approval of Compliance Plan

a. Upon receipt of a proposed compliance plan, BDD shall review and either approve or initially reject, with comments, the proposed plan. In the event of a rejection of the proposed plan, the BDD shall set a date for submission

and if warranted, schedule a meeting to discuss any deficiencies that must be addressed in the re-submittal.

a. In the event the Vice President of BDD formally rejects a proposed compliance plan, the Vice President of BDD shall notify the agency head in writing of its determination and such determination shall result in no further consideration of the contractor's proposal or in termination of the contract for cause, in the event a contract has been awarded. In no event shall a contract to construct a project be executed or continue without a compliance plan approved by the Vice President of BDD.

b. Upon approval, the compliance plan shall be incorporated and made a part of the contract with the plan proposer.

9. Compliance and Enforcement

a. The Contractor shall be subject to the COMPLIANCE AND ENFORCEMENT section of the SBE Program Policy and Administrative Procedures and Contract Provisions. If upon approval, the Contractor acknowledges and accepts any failure to comply with any material term or condition of an approved compliance plan or applicable provision of the SBE Program Policy and Administrative Procedures, and Contract Provisions, including failure to satisfactorily address the project goal, maintain participation commitments or otherwise comply with any applicable requirements.

D. PAYMENT

1. Monitoring Contractual Commitments and Payments to SBEs

a. It is Airport Board policy that all Contractor invoices in compliance with Contract payment terms and conditions be paid within 30 days of receipt.

b. All Contractors must comply with the Texas Prompt Pay Act (Chapter 2251; Texas Government Code) paying all sums, including retainage withheld from subcontractors, to subcontractors, subconsultants, vendors, materialmen, suppliers and similar persons or entities, including paying such persons or entities within seven (7) days of receiving payment from the Airport Board their appropriate share of such payment. No Contractor that has received payment of an undisputed amount from the Airport Board may withhold from any subcontractor its undisputed appropriate share of such payment.

c. Any joint check arrangement must be pre-approved by the Vice President of the Business Development Department (BDD) and follow the Department of Transportation joint check guidance before the arrangement or transaction takes place. By joint check, we mean a check issued by a prime Contractor to an SBE subcontractor and to a material supplier or another third party for items or services to be incorporated into a project.

d. No Contractor may withhold retainage from any subcontractor at a higher percentage rate than retainage is withheld by the Airport Board from Contractor. Except for the Texas Prompt Pay Act requirement that a Contractor release retainage to a subcontractor within seven (7) days of

that subcontractor's invoice for retainage, each Contractor must withhold/release retainage from/to each subcontractor in at least the same manner as retainage is withheld/released by the Airport Board from/to Contractor (and must include provisions in its subcontracts ensuring this), including, but not limited to mirroring the Airport Board's treatment of retainage withheld/released to Contractor concerning the following subjects:

i. the percentage amount of retainage withheld/released;

ii. the schedule for withholding/releasing retainage;

iii. the phased release of retainage according to any phased completion (substantial/final) of portions of the project;

iv. the optional cessation of withholding retainage prior to substantial/final completion of, or final payment for, the project (e.g. optional cessation when 50% of project is substantially complete, with an owner's right to resume withholding retainage upon the occurrence of certain events);

v. the release of retainage prior to final payment, less than an amount withheld to cover a percentage of the value of the punch-list work required before final completion is certified (e.g. retention of 200% of the value of punch-list work pending certification of final completion).

e. Each Contractor must address (and implement) in its subcontracts the retainage provisions so that each subcontractor is treated by the Contractor in the same manner as Airport Board treats the Contractor. Nothing in this provision precludes a Contractor from including in its subcontracts retainage provisions that are more favorable than those contained in the Contract between Airport Board and Contractor, including, but not limited to, provisions withholding retainage at a lesser percentage rate, releasing retainage in part/whole earlier than retainage released by Airport Board and/or withholding less retainage than Airport Board withholds to cover the value of punch-list work required to be completed before final completion certification.

f. DFW encourages all Contractors and their subcontractors, subconsultants, vendors, materialmen, suppliers and similar persons or entities to make payment of invoices submitted to them more expeditiously than required under the Texas Prompt Pay Act.

g. Payment by a Contractor in violation of the terms of the Contract or applicable law will constitute a material breach of this Contract.

h. BDD may withhold progress payments until the Contractor demonstrates compliance with the payment terms of this Contract or applicable law, including withholding progress payments solely relating to monies payable to Contractor for work it self-performs or associated retainage.

i. The Airport Board may also exercise any other rights or remedies available to it under this Contract or applicable law if Contractor fails to comply with the payment terms of this Contract or applicable law.

a. In an effort to remove the race- and gender-neutral barrier of the length of time for subcontractor payments on Airport Board procurements, the Airport Board has an Expedited Payment Policy for eligible Contractors that may elect to voluntarily participate in. This policy is applicable if a Contractor has been awarded a multi-year Contract for construction and/or maintenance services of at least $10,000,000 in Contract value. The Expedited Payment program requires those eligible Contractors that voluntarily participate in the program to pay their subcontractors within seven (7) calendar days after receipt of the subcontractor's invoice. The Airport Board would then pay interest and provide other incentives to the Contractor on eligible expedited payments according to the Expedited Payment Process and Policy. The terms for Expedited Payment will be negotiated prior to the issuance of the Notice to Proceed.

b. To ensure that the Contractor meets its SBE contractual commitment, BDD will review the Contractor's SBE utilization throughout the term of the Contract, including any term extensions from the original Contract period. The SBE commitment is determined by the total SBE utilization in relation to the total dollar value of contract as paid to the Prime Contractor. If a Contract includes an SBE contractual commitment, the Contractor must report all SBE payments using the Airport Board's Compliance Management System and submit verifying information as outlined below, concurrent with the Contractor's submission of each payment request. The information provided will be utilized to provide constant monitoring of the payments made to the SBE as well as non-SBE subcontractors in relation to the percentage of work performed. Failure to submit this information with the payment request will result in the invoice being returned to the Contractor. The Prime Contractor can be determined to be non-compliant, if utilization commitments to individual SBE subcontractors are not achieved, even if the total SBE contractual commitment is being met by disproportionate SBE subcontractor utilization not originally listed by the Prime Contractor's ***Final Schedule of Subcontractors*** and ***Intent to Perform as a Subcontractor*** forms without a sufficient modified Good Faith Effort justification.

    i. Contractors are required to report all payments online utilizing the Airport Board's Compliance Management System (B2Gnow) and submit a Compliance Audit List for the Invoice Period (or Pay Period Activity Report for the invoice period) with each payment application submitted to the Procurement & Materials Management (PMM) Department. The Compliance Audit List for the Invoice Period is a printout or copy of the subcontractor payments entered in the system for the invoice period.

    ii. Contracts prior to 2012 are required to submit the original Pay Period Activity Report form with the payment request, unless they choose to report online, when then defaults to Paragraph j.i.

2. Training for the Airport Board's Compliance Management System: The Contractor is responsible for ensuring its employees who are processing payment requests on its company's behalf are trained on the Airport Board's Compliance Management System (B2Gnow). This includes all subcontractors who the

Contractor will be utilizing on the contract and will be verifying reported sub payments online.

1. Contract Close Out: To ensure that the Contractor meets all its SBE contractual commitments, BDD will review the Contractor's SBE utilization throughout the term of the Contract, including any term extensions of the original Contract period, prior to receiving final payment.

    a. If a Contract includes an SBE contractual commitment, the Contractor must report all SBE payments using the Airport Board's Compliance Management System and submit a Final B2Gnow Compliance Audit List concurrent with the Contractor's submission of final payment request.

    b. Once all sub payments have been verified by the subcontractors in the Airport Board's Compliance Management System, the contract will be reviewed for compliance with the program requirements and the prime Contractor's SBE contractual commitment.

    c. The Contractor 's performance will be reviewed, and a satisfactory/unsatisfactory determination will be provided in writing to the Contractor by BDD.

    d. A Contractor's unsatisfactory determination may result in future bids or proposals being deemed non-responsive. In determining whether a future bid or proposal will be deemed non-responsive, BDD will take into consideration the following: circumstances for non-compliance, the length of the period of non-compliance and the history of previous unsatisfactory determinations.

2. Dispute Resolution: BDD encourages all Contractors that may have a dispute with any subcontractor to attempt to resolve such dispute through appropriate formal or informal alternative dispute resolution procedures, including, but not limited to, negotiation, mediation, collaborative law, arbitration and/or conciliation, prior to seeking BDD's assistance in resolving the dispute. If any Contractor or subcontractor does seek BDD's assistance, it may require them to first attempt to resolve their dispute through appropriate alternative dispute resolution procedures and to provide BDD with evidence of their good faith attempts to resolve the dispute as a condition of further assistance from BDD.

3. On-Site Inspections: Compliance monitoring may also include on-site inspections. The Contractor is responsible for providing BDD, if requested, a project work scheduler together with a list of all subcontractors for the scheduled work.

4. Contractors are required to maintain records and documents of payments to subcontractors, including SBEs for a minimum of three (3) years unless otherwise provided by applicable record retention requirements for the Airport financial assistance agreement whichever is longer. These records shall be made available for inspection upon request by any authorized representative of the Airport Board or Department of Transportation. This reporting requirement extends to all subcontractors, both SBE and non-SBE. All reports of noncompliance will be referred to the contract administrator, and if appropriate, to the Legal Department.

E. SBE SUBSTITUTIONS OR TERMINATIONS

1. If change orders, amendments or any other Contract modifications are issued under the Contract, the Contractor has a continuing obligation to immediately inform BDD in writing of any agreed upon increase or decrease in the scope of work of such Contract that impact the participation of SBEs on the contract.

2. If change orders or other Contract modifications are issued under the Contract that include an increase in the scope of work whether by amendment, change order, force account or otherwise which increases or decreases the dollar value of the Contract, whether or not such change is within the scope of work designated for performance by an SBE at the time of Contract award, then such amendment, change order or other modification must be contemporaneously submitted to BDD. The Contractor must make good faith efforts to meet its SBE contractual commitment with existing SBEs first. If the Contractor is unable to meet its SBE contractual commitment with existing SBEs, the Contractor shall satisfy its commitment, as it relates to changed scope of work, modifications, and or amendments, by soliciting new SBEs and must submit a ***Request for Approval of Change to Final Schedule of Subcontractors***, through the Airport Board's Compliance Management System and must be approved in writing by BDD.

3. The Contractor cannot terminate, substitute or otherwise change the terms of its Final Schedule of Subcontractors prior to or after Contract award without the prior written consent of BDD. This includes, but is not limited to, instances in which the Contractor seeks to perform work originally designated for an SBE subcontractor with its own forces or those of an affiliate, a non-SBE or another SBE.

    a. The Contractor shall utilize the specific SBEs listed in the ***Final Schedule of Subcontractors*** to perform the work and supply the materials for which each is listed unless the Contractor obtains BDD written consent as provided in this section; and

    b. The Contractor shall not be entitled to any payment for work or material unless it is performed or supplied by the listed SBE.

    c. The Contractor shall document good cause to terminate or substitute an SBE. For purposes of this paragraph, good cause includes the following circumstances:

        i. The listed SBE subcontractor fails or refuses to execute a written Contract.

        ii. The listed SBE subcontractor fails or refuses to perform the work of its subcontract in a way consistent with normal industry standards. Provided, however, that god cause does not exist if the failure or refusal of the SBE subcontractor to perform its work on the subcontract results from the bad faith or discriminatory action of the Contractor.

        iii. The listed SBE subcontractor fails or refuses to meet the Contractor's reasonable, nondiscriminatory bond requirements.

        iv. The listed SBE subcontractor becomes bankrupt, insolvent, or exhibits credit unworthiness.

        v. The listed SBE subcontractor is ineligible to work on public works projects because of suspension and applicable state law.

i. It has been determined that the listed SBE subcontractor is not a responsible Contractor.

ii. The listed SBE subcontractor voluntarily withdraws from the project and provides you written notice of its withdrawal.

iii. The listed SBE is ineligible to receive SBE credit for the type of work required.

iv. An SBE owner dies or becomes disabled with the result that the listed SBE contractor is unable to complete its work on the Contract.

v. Other documented good cause that BDD determines compels the termination of the SBE subcontractor. Provided, that good cause does not exist if the Contractor seeks to terminate an SBE it relied upon to obtain the Contract so that the Contractor can self-perform the work for which the SBE subcontractor was engaged or so that the Contractor can substitute another SBE or non-SBE subcontractor after Contract award.

d. Before transmitting to BDD its request to terminate and/or substitute an SBE subcontractor, the Contractor must give notice in writing to the SBE subcontractor, with a copy to BDD, of its intent to request to terminate and/or substitute, and the reason for the request.

e. The Contractor must give the SBE subcontractor five business days to respond to the Contractor's notice. The SBE subcontractor must advise BDD and the Contractor of the reasons, if any, why it objects to the proposed termination of its subcontract and why BDD should not approve the Contractor's action. If required in a particular case as a matter of public necessity (e.g. safety), BDD may provide a respond period shorter than five days.

4. In addition to post-award terminations, the provisions of this section apply to pre-award deletions of or substitutions for SBE firms put forward by bidders/proposals in bids/proposals.

a. When an SBE subcontractor is terminated as provided in this section or fails to complete its work on the contract for any reason, the Contractor shall make good faith efforts to find another SBE subcontractor to substitute for the original SBE. These good faith efforts shall be directed at finding another SBE to perform at least the same amount of work under the contract as the SBE that was terminated, to the extent needed to meet the SBE commitment established for the Contract. The good faith efforts shall be documented by the Contractor. The Contractor shall submit the documentation within 7 days, which may be extended for an additional 7 days if necessary, at the request of the Contractor, and BDD shall provide a written determination to the Contractor stating whether or not good faith efforts have been demonstrated.

5. The Contractor must submit an ***Intent to Perform as a Subcontractor*** form for each proposed new SBE subcontractor. BDD will approve or disapprove the substitution based on the Contractor's documented compliance with these provisions.

1. All changes to the ***Schedule of Subcontractors*** form must be submitted for review and approval through the Airport Board's Compliance Management System utilizing the ***Request for Approval of Change to Final Schedule of Subcontractors*** form when adding, changing, or deleting any subcontractor.

2. Failure by the Contractor to carry out the requirements of this section is a material breach of the Contract and may result in the termination of the Contract or such other remedies set forth in Compliance and Enforcement section.

F. COMPLIANCE AND ENFORCEMENT

1. These provisions address the additional contractual remedies available to the Airport Board as a result of the Contractor's failure to comply with the obligations set forth in the SBE Program Policy and Administrative Procedures. The contractual remedies set forth are also applicable to the Contractor's failure to comply with the Program requirements, as well as any remedies available at law or in equity. These remedies are not intended to apply to the Contractor's failure to comply with other obligations under the Contract unrelated to the Program requirements or preclude Airport Board's recovery of its actual damages for such unrelated breaches.

2. The Contractor must attend and participate in onboarding, progress, non-compliance meetings and site visits upon request. The Contractor must forward all necessary documents and information during performance and to close out the Contract and must cooperate with BDD in providing any information, including the final accounting for SBE participation on the Contract.

3. BDD is empowered to receive and investigate complaints and allegations by SBEs, third parties or Airport Board Staff, or to initiate its own investigations, regarding Contractor's compliance with the Program requirements. If BDD determines that an investigation is warranted, the Contractor must fully cooperate with the investigation and provide complete, truthful information to the Airport Board or its representatives concerning the investigation and Contractor's compliance with the Program requirements.

4. The failure of the Contractor to meet the SBE contractual commitment or comply with any other aspect of the Program requirements will constitute a material breach of the Contract entitling the Airport Board or its representatives to exercise any remedy available in this Contract, the Program requirements or applicable law. In addition, the failure of the Contractor to meet the SBE contractual commitment or comply with any other aspect of the Program requirements may be considered and have a bearing on future contract award considerations.

5. Any suspected false, fraudulent or dishonest conduct relating to the Contractor's performance of the Program requirements may be reported to the Airport Board's Department of Audit Services or to any applicable enforcement agency, including the State Attorney General's Office and appropriate federal law enforcement authorities.

6. If Contractor is in breach of any of the Program requirements, the Airport Board or its representatives may exercise any of following remedies, in addition to any other remedies available to it under this Contract or at law or in equity:

   a. withholding funds payable under this Contract, including, but not limited to, funds payable for work self-performed by the Contractor or applicable retainage;

a. temporarily suspending, at no cost to DFW, Contractor's performance under the Agreement/Contract;

b. termination of the Agreement/Contract;

c. suspension/debarment of Contractor for a period of time from participating in any solicitations issued by DFW for severity of breach of Contract.

7. With respect to a firm not meeting a goal on a previous contract or the underutilization of an SBE (or SBEs, if applicable) on a previous contract, BDD shall regard as non-responsive any bid, proposal or competitive selection process proposal received that includes the Contractor, consultant as a Contractor, consultant, subcontractor, subconsultant, joint venture, supplier, manufacturer's representative, or broker.

8. With respect to SBE firms, a finding of non-compliance could result in a denial of certification or removal of eligibility and/or suspension and debarment.

(End of SBE Special Contract Provisions)

DFW DALLAS FORT WORTH INTERNATIONAL AIRPORT

COMMITMENT TO SMALL BUSINESS ENTERPRISE (SBE) PARTICIPATION FORM

(This form is required as part of the bid/proposal submission.)

The SBE goal for Solicitation/Contract # _____is _____%.

***NOTE**: The BDD will only credit SBE participation that is certified by an approved certification entity at the time of bid/proposal submission. DBE,MBE OR WBE certificates are not accepted for SBE credit. Effective 11-07-2025, in addition to having a valid certification, SBEs must also have a place of business in the Airport's market area[1] at the time of bid/proposal submission for credit towards meeting a contract goal.*

The undersigned Contractor has satisfied the requirements of the bid/proposal specifications in the following manner (Please check (✔) the appropriate space):

☐ Self-Performance: The proposer, a certified SBE firm, is committed to meeting or exceeding the SBE goal through self-performance.

☐ Self-Performance & Percentage Participation: The proposer, a certified SBE firm, is committed to meeting or exceeding the SBE goal, with a minimum of _____% self-performance and a minimum of ____% SBE subcontracting participation on this contract.

☐ Percentage Participation: The proposer is committed to meeting or exceeding the SBE goal, with a minimum of _____% SBE subcontracting participation on this contract.

☐ The Contractor is unable to meet the SBE goal of _____% and is committed to a minimum of ___% SBE utilization on this contract and submits documentation demonstrating good faith efforts.

☐ The Contractor is unable to meet the SBE goal of _____% and submits documentation demonstrating good faith efforts.

Name of Prime Contractor:_____

_____

Signature Title

_____

Printed Name Date

[1] The Airport's market area is defined as Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall, Somervell, Tarrant, and Wise counties.

*I*nstructions for Commitment to Small Business Enterprise (SBE) Participation Form

(Note: this form requires the prime contractor to complete, sign, and date prior to bid/proposal submission.)

Contract Number: Enter the Ref.# or Solicitation No. from Bonfire Portal. **SBE Goal:** Enter the SBE percentage goal noted in the Project Description for the solicitation in the Bonfire Portal.

Select only one option which best describes the SBE commitment detailed in the submission:

- **Self-Performance:** Select this option if the Prime bidder/proposer is SBE certified and will meet the SBE goal through self-performance. Note that an SBE Prime who chooses to self-perform to meet the SBE goal must perform at least 30 percent of the total cost of its Contract with its own work force to satisfy the commercially useful function requirement.
- **Self-Performance & Percentage Participation:** Select this option if the Prime bidder/proposer is SBE certified and will meet the SBE goal through self-performance and a percentage of SBE subcontracting participation. Note that an SBE Prime who chooses to self-perform to meet the SBE goal must perform at least 30 percent of the total cost of its Contract with its own work force to satisfy the commercially useful function requirement. Enter participation percentage for both self-performance and SBE subcontracting participation. The percentages noted must match the percentages noted on the Final Schedule of Subcontractors for Work to be self-performed by the Prime and Work to be completed by SBE Subcontractors.
- **Percentage Participation:** Select this option if the SBE goal will be met through SBE subcontracting participation only. Enter the participation percentage proposed for SBE subcontracting participation. The percentage must match the percentage noted on the Final Schedule of Subcontractors for Work to be completed by SBE Subcontractors.

The following options require Good Faith Effort documentation be submitted at the time of bid/proposal submission. (*Reference to Section C. Goals and Good Faith Efforts in the SBE Special Contract Provisions.)* The submission of good faith efforts documentation is a matter of responsiveness and shall include a specific response to each of the criteria listed. Failure of the Contractor to demonstrate adequate good faith efforts as to any one of the criteria established shall render the overall good faith showing insufficient and the bid/proposal non-responsive.

- The Contractor is unable to meet the SBE goal of ___% and is committed to a minimum of ___ % SBE utilization on this contract and submits documentation demonstrating good faith efforts.
- The Contractor is unable to meet the SBE goal of ___% and submits documentation demonstrating good faith efforts.

Name of Prime Contractor: Enter name of Company bidding or proposing.

Signature: The Prime Contractor's authorized representative must sign this form.

Title: Enter title of Prime Contractor's authorized representative.

Printed Name: Enter the first and last name of the authorized representative. **Date:**

Enter date of executed Prime Contractor signature.

Exhibit B

DALLAS FORT WORTH INTERNATIONAL AIRPORT

SCHEDULE OF SUBCONTRACTORS (FINAL)

Prime Bidder/Contractor:_____

☐ SBE Plus ☐ NON-SBE

Contract Number: _____ **Contract Name**:_____

As part of the procedures for the submission of a completed bid/proposal, all bidders/proposers are required to identify ALL participating subcontractors applicable to the above project and include this completed form as part of the bid. Check all Certification Status categories that apply to each subcontractor. Verify that the proposed SBE subcontractor has a place of business in the Airport's Relevant Market Area[3] (not applicable to DBE goals). **NOTE: Certification certificate(s) MUST be attached to this form or bid/proposal will be deemed non-responsive.** The submission of this information is considered an issue of responsiveness, and the Airport Board will not award a contract to any Contractor who has not supplied this documentation. Use additional sheets if necessary.

Name of Subcontractor(s)	Certification Status[2] (check the applicable)		Relevant Market Area[3]	Description of Material or Service Being Provided or Performed	NAICS Commodity Code	Dollar Amount and Percentage of Work	
	SBE Plus	NON	COUNTY			$$$	%
	Dollar Amount & Percentage: Work to be completed by Non-SBE Plus Subcontractors						
	Dollar Amount & Percentage: Work to be completed by SBE Plus Subcontractors						
	Dollar Amount & Percentage: Work to be self-performed by the Prime						
	Total Dollar Amount & Percentage of Work (The Total Amount shall equal the amount proposed on summary of bid/proposal page).						100%

PRIME CONTRACTOR'S CERTIFICATION

The above information is true and complete to the best of my knowledge and belief. I further understand and agree that if awarded the contract, this certification shall be attached thereto and become a part thereof. Failure to provide accurate and complete information or exercise positive, good faith efforts (as defined by the Board's SBE Program) in support of the Board's small business intent and objective may result in being considered non-responsive to the Board's requirements. Furthermore, it is understood and agreed that, if awarded a contract by the Airport Board, the Contractor will not make additions, deletions or substitutions to this certified list of SBE subcontractors without the consent of the Board's Vice President of Business Development Department (BDD) or designee through the submittal of the *Form 102, Request for Approval of Change to Final Schedule of Subcontractors* if this is determined to be the final schedule. The BDD reserves the right to ensure compliance with the Board's SBE programs as deemed necessary including but not limited to audits of submitted SBE information applicable to the Contractor/subcontractors participating on the contract.

Name and Title of Authorized Representative_____ Date:_____

(Please print or type)

Signature:_____ E-mail Address:_____

Any named person, firm, partnership, corporation, association or joint venture as herein provided identified as providing work, labor, services, supplies, equipment, materials or any combination of the foregoing, under contract to a prime Contractor on an Airport contract at any tier.

[2] In order to credit the participation of small businesses, firms must be certified as SBE Plus by a certification agency approved by the Airport Board as defined in the SBE Policies and Administrative Procedures.

[3] In addition to having a valid certification, the SBE must have a place of business in the Airport's relevant market area at the time the bid/proposal is submitted for credit towards meeting an SBE goal.

Instructions for Schedule of Subcontractors

(Note: This form requires the prime contractor to sign and date prior to bid/proposal submission.)

Name of Prime Bidder/Contractor: Enter name of company bidding or proposing and certification status (SBE or Non-SBE).
Contract Number: Enter the reference number or solicitation number from the Bonfire portal.
Contract Name: Enter the Project name from the Bonfire portal.

List all subcontractors and suppliers the Prime Bidder/Contractor intends to use in performing the work of the project, including non-SBEs. Only certified SBEs identified, and the levels of participation listed for each at the time of bid/proposal submission will be considered in determining whether the Contractor has met the SBE goal.

Name of Subcontractor(s): Enter the name of the proposed subcontractor. This includes subconsultants and suppliers.
Certification status: Select the certification status of the proposed subcontractor. (SBE or NON-SBE)
Relevant Market Area: Enter the name of the county where the SBE subcontractor's physical place of business is located. The Airport's Relevant Market Area consists of Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall, Somervell, Tarrant, and Wise countiesonly.
Description of Material or Service Being Provided or Performed: Provide a brief description of the work that will be performed by the subcontractor.
NAICS Commodity Code: Enter the NAICS code(s) that correspond to the description of material or service being provided or performed by the subcontractor.
Dollar Amount and Percentage of Work:

- **Request for Bids (RFB)**: Enter the subcontractor/supplier dollar amount and associated percentage of work to be performed by the SBE subcontractor/supplier. The percentage should be calculated against the Prime Contractor's total dollar amount bid. The dollar amount and percentage must match the dollar amount and percentage noted on the Intent to Perform as an SBE Subcontractor form, if the Intent to Perform form is applicable).
- **Request for Proposals (RFP)**: Note the Price as Not Applicable or N/A. Enter the percentage of work to be performed by the SBE subcontractor/supplier. The percentage should be calculated against the Prime Contractor's total percentage proposed (100%). The percentage must match the percentage noted on the on the Intent to Perform as an SBE Subcontractor form, if the Intent to Perform form is applicable).

Dollar Amount & Percentage: Work to be completed by Non-SBE: If RFB, enter the subtotal dollar amount and percentage of work to be performed by Non-SBE subcontractors. If RFP, enter percentage only.
Dollar Amount & Percentage: Work to be completed by SBE Subcontractors: If RFB, enter the subtotal dollar amount and percentage of work to be performed by certified SBE subcontractors. If RFP, enter percentage only.
Dollar Amount & Percentage: Work to be self-performed by the Prime: If RFB, enter the subtotal dollar amount and percentage of work to be performed by the prime bidder/ contractor. If RFP, enter percentage only.

Total Dollar Amount & Percentage of Work: Enter the TOTAL dollar amount and percentage of work. The total dollar amount shall equal the amount proposed on the summary of bid/proposal page. The total percentage of work must equal to 100% (% Work to be performed by non-SBE subcontractors + % SBE subcontractors + % prime bidder/contractor self-performance)

Name and Title of the Authorized Representative: Enter the full name and title of the authorized representative signing on behalf of the company.
Date: Enter date of executed Authorized Representative signature.
Signature: The authorized representative must sign this form.
Email Address: Enter the email address for the authorized representative.

INTENT TO PERFORM CONTRACT AS A SBE SUBCONTRACTOR[1]

Submission of the **Intent to Perform as a SBE Subcontractor** form for each SBE firm shall constitute a representation by the Prime Contractor to the Airport Board that it believes such SBE to be certified as a SBE to perform the work as designated, the SBE has a place of business in the Airport Board's market area and the SBE is not affiliated with the Contractor as defined herein. It shall also represent a commitment by the Contractor that if it is awarded the Contract, it will enter in a subcontract with such SBE for the work described at the approximate price and percentage set forth.

PRIME CONTRACTOR / CONSULTANT			
Contract / Solicitation Number:			
Name of Prime Contractor:			
Address, City, State and Zip Code:			
The Prime Contractor designates the following person as their high-level official designated to administer and coordinate the efforts to carry out the SBE policy on behalf of the Prime Contractor.			
Name:		Title:	
E-Mail Address:		Phone Number:	

DECLARATION OF PRIME CONTRACTOR

I HEREBY DECLARE AND AFFIRM that as a duly authorized representative of the Prime Contractor stated above, I have personally reviewed the material and facts set forth in this form. To the best of my knowledge, information and belief, the facts and representations contained in this form are true and the owner or authorized agent of the SBE firm stated above signed this form in the place indicated, and no material facts have been omitted. The undersigned affirms that the Prime Contractor has no ownership or financial interest in the SBE subcontracting firm stated below. Except as authorized by the Vice President of Business Development Department or designee, the undersigned shall enter into a formal agreement (which shall include all audit and records provisions required by the Board) with the listed SBE firm for work as indicated by this form within ten (10) business days after receipt of the contract executed by the Airport. The undersigned will, if requested, provide said Vice President or the designee a copy of that agreement within five (5) business days of the written request. Pursuant to State Law, any person [entity] who makes a false or fraudulent statement in connection with the participation of a SBE in any locally funded project or otherwise violates applicable program requirements may be referred for prosecution.

Signature of Prime Contractor:		Date	

SBE SUBCONTRACTOR / SUBCONSULTANT / SUPPLIER AT ANY TIER			
The Airport requires that minority/women business enterprises be certified as SBEs by an approved certification agency as defined in the SBE Program Policy and Procedures. Effective 11-07-2025, in addition to having a valid certification, SBEs must have a place of business in the Airport's market area[1] at the time of bid/proposal submission for credit towards meeting a contract goal.			
Does the undersigned SBE subcontractor has a place of business in the Airport's market area?		☐ Yes ☐ No	
Is the undersigned SBE subcontractor affiliated with the Prime Contractor as defined in the SBE Program Policies and Procedures?		☐ Yes ☐ No	
Name of SBE Subcontractor:			
Address, City, State and Zip Code:			
Contact Person:			
E-Mail Address:		Phone Number:	
Scope of Work: (where applicable specify "supply" or "install" or both)			
Price and Percentage:	$ (%)		
SBE Certification #:		Certification Agency:	
If the SBE shown above is not a direct first tier subcontractor, subconsultant or supplier to the Prime Contractor shown above, please indicate the name of the subcontractor, subconsultant or supplier and tier level that will be utilizing your participation for SBE credit.			
Percentage (%) of the proposed subcontract described above will be sublet and/or awarded to a Non-SBE subcontractor. ***(Complete this box ONLY if subcontracting to a Non-SBE subcontractor.)***			_____%

DECLARATION OF SBE SUBCONTRACTOR

I HEREBY DECLARE AND AFFIRM that as a duly authorized representative of the Subcontractor stated above, the facts and representations contained in this form are true. The undersigned affirms that the Prime Contractor has no ownership or financial interest in the SBE subcontracting firm stated above. I also agree, for good and valuable consideration (including the opportunity to participate in this solicitation as a proposed subcontractor), the receipt and sufficiency of which is hereby acknowledged, that if the Subcontractor performs any work for the Prime Contractor as the result of a contract awarded to the Prime Contractor for this solicitation, the Subcontractor will maintain and the Board shall have the right to examine and make copies of all records, documents, books, statements, checks, invoices, and any other supporting evidence deemed necessary by the Board to substantiate compliance with the terms of this Contract, including any Change Orders. Such right of examinations shall include, but not be limited to, reasonable access to and cooperation by all Subcontractor personnel. Subcontractor agrees to provide the Board with retrievals of computer-based records or transactions that the Board determines to be necessary to conduct any audits. Subcontractor agrees that there shall be no charge to the Board for Subcontractor's costs of providing records, documents, and assistance for audits, and to provide to the Board within seven (7) calendar days all records, documents, retrievals, and other assistance requested.

Signature of SBE Subcontractor		Date	

1 Any named person, firm, partnership, corporation, association or joint venture as herein provided identified as providing work, labor, services, supplies, equipment, materials or any combination of the foregoing, under contract to a prime contractor on an Airport contract at any tier.

2 The Airport's market area is defined as Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall, Somervell, Tarrant, and Wise counties.

Instructions for Intent to Perform as a SBE Subcontractor Form

(Note: This form requires both the prime contractor and the SBE subcontractor to complete, sign and date prior to bid/proposal submission.)

PRIME CONTRACTOR/CONSULTANT

Contract/Solicitation Number: Enter the Ref. # or Solicitation No. from Bonfire Portal.
Name of Prime Contractor: Enter name of Company bidding or proposing.
Address, City, State and Zip Code: Enter physical address for company.
The Prime Contractor designates the following person as their high-level official designated to administer and coordinate the efforts to carry out the SBE policy on behalf of the Prime Contractor.
Name: Enter the first and last name of the Prime Contractor's designated representative as required above.
Title: Enter title of Prime Contractor's designated representative.
E-Mail Address: Enter the email address for the Prime Contractor's designated representative.
Phone Number: Enter a phone number for the Prime Contractor's designated representative.

DECLARATION OF PRIME CONTRACTOR

Signature of Prime Contractor: The Prime Contractor's designated person must sign this form.
Date: Enter date of executed Prime Contractor signature.

SBE SUBCONTRACTOR / SUBCONSULTANT / SUPPLIER AT ANY TIER

Does the undersigned SBE subcontractor have a physical place of business in the Airport's relevant market area? Select Yes or No
Is the undersigned SBE subcontractor affiliated with the Prime Contractor as defined in the SBE Program Policies and Procedures? Select Yes or No
Name of SBE Subcontractor: Enter the name of the SBE subcontractor or supplier.
Address, City, State and Zip Code: Enter the physical place of business address located in the Airport's relevant market area for the SBE subcontractor/supplier.
Contact Person: Enter the first and last name of the SBE subcontractor/supplier designated representative.
Email Address: Enter email address for the SBE subcontractor/supplier designated representative.
Phone Number: Enter the phone number for the SBE subcontractor/supplier designated representative.
Scope of Work: Provide a brief description of the scope of work or services to be performed by the SBE subcontractor. Where applicable, specify 'supply' or 'install' or both.
Price and Percentage:

- **Request for Bids**: Enter the subcontractor/supplier dollar amount and associated percentage of work to be performed by the SBE subcontractor/supplier. The percentage should be calculated against the Prime Contractor's total dollar amount bid and match the dollar amount and percentage noted on the Final Schedule of Subcontractors.
- **Request for Proposals**: Note the Price as Not Applicable or N/A. Enter the percentage of work to be performed by the SBE subcontractor/supplier. The percentage should be calculated against the Prime Contractor's total percentage proposed (100%) and match the percentage noted on the Final Schedule of Subcontractors.

SBE Certification #: Enter the certification number shown on the SBE subcontractor/supplier certificate.
Certification Agency: Enter the name or abbreviation of the certification agency shown on the SBE subcontractor/supplier certificate.
If the SBE subcontractor identified above is not the direct first tier subcontractor, subconsultant or supplier to the Prime Contractor shown above, please indicate the name of the subcontractor, subconsultant or supplier and tier level that will be utilizing your participation for SBE credit: Enter the subcontractor's name and tier level that will be utilizing the services of the SBE subcontractor.

The percentage (%) of the proposed subcontract described above will be sublet and/or awarded to a Non-SBE subcontractor. (Complete this box ONLY if subcontracting to a Non-SBE subcontractor.): Enter the percentage of work that will be subcontracted to a Non-SBE subcontractor only if applicable.

DECLARATION OF SBE SUBCONTRACTOR

Signature of SBE Subcontractor/Supplier: The SBE Subcontractor/Supplier's designated person must sign this form.
Date: Enter date of executed SBE Subcontractor/Supplier signature.

GOOD FAITH EFFORT (GFE) Criteria

NOTE: Include a response to GFE criteria and support documentation in bid/proposal only if the SBE goal is not achieved.

The following factors are taken into account when assessing a good faith effort response. These factors are minimally considered as good faith efforts and demonstrate specific initiatives made in attempting to achieve the applicable contract-specific Small Business Enterprise (SBE) goal. These factors should not be considered as a template, checklist or some quantitative formula. Proposers are required to meet all factors outlined below and provide support documentation in order for the good faith effort plan to be assessed. Mere pro forma efforts are not good faith efforts to meet the SBE contract requirements. This means that a bidder/proposer must show that it took all necessary and reasonable steps to achieve an SBE goal or other requirement of this GFE which, by their scope, intensity, and appropriateness to the objective, could reasonably be expected to obtain sufficient SBE participation, even if they were not fully successful. DFW will evaluate the GFE on quality, quantity, and intensity of the different kinds of efforts that the bidder/proposer has made, based on the regulations and the guidance in Code of Federal Regulations. **NOT SUBMITTING PROPER SUPPORT DOCUMENTATION IS NOT EVIDENCE OF A PROPER DEMONSTRATION OF GOOD FAITH EFFORT. SUBMITTAL OF THE CRITERIA, WITH NO ADDITIONAL DOCUMENTATION, WILL NOT BE CONSIDERED ADEQUATE DEMONSTRATION OF GOOD FAITH EFFORT.** Proposers are not limited to these particular areas and may include other efforts deemed appropriate. Complete form and attach support documentation only if the SBE goal is not achieved. For additional guidance concerning Good Faith Efforts, please refer to the Electronic Code of Federal Regulations (CFR 49 part 26 Appendix A).

GOOD FAITH EFFORT FACTORS
Conducting market research to identify small business contractors and suppliers and solicit through all reasonable and available means the interest of all certified SBEs that have the capability to perform the work of the contract. This may include attendance at any pre-bid or pre-proposal meetings to discuss subcontracting and supplier opportunities (acceptable documentation shall include copies of the meeting sign-in sheets with contractor name noted as signed-in) and business matchmaking meetings and events, advertising and/or written notices, posting of Notices of Sources Sought and/or Requests for Proposals, written notices or emails to all SBEs listed in the State and/or Local respective directories of firms that specialize in the areas of work desired (as noted in the SBE directory) and which are located in the area or surrounding areas of the project. *The Contractor should solicit this interest as early in the acquisition process as practicable to allow the SBEs to respond to the solicitation and submit a timely offer for the subcontract. The bidder should determine with certainty if the SBEs are interested in taking appropriate steps to follow up initial solicitations at least three (3) business days prior to bid opening.*
Selecting portions of the work to be performed by SBEs in order to increase the likelihood that the SBE goals will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units (for example, smaller tasks or quantities) to facilitate SBE participation, even when the prime contractor might otherwise prefer to perform these work items with its own forces. This may include, where possible, establishing flexible timeframes for performance and delivery schedules in a manner that encourages and facilitates SBE participation.
Providing interested SBEs with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation with their offer for the subcontract.
Negotiating in good faith with interested SBEs. It is the bidder's responsibility to make a portion of the work available to SBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available SBE subcontractors and suppliers, so as to facilitate SBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of SBEs that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional Agreements could not be reached for SBEs to perform the work.
A bidder using good business judgment would consider a number of factors in negotiating with subcontractors, including SBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using SBEs is not in itself sufficient reason for a bidder's failure to meet the contract SBE goal, as long as such costs are reasonable. Also, the ability or desire of a prime contractor to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Prime contractors are not, however, required to accept higher quotes from SBEs if the price difference is excessive or unreasonable.

Not rejecting SBEs as being unqualified without sound reasons based on a thorough investigation of their capabilities. The contractor's standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. non-union status) are not legitimate causes for the rejection or non-solicitation of bids in the contractor's efforts to meet the project goal. Another practice considered an insufficient good faith effort is the rejection of the SBE because its quotation for the work was not the lowest received. However, nothing in this paragraph shall be construed to require the bidder or prime contractor to accept unreasonable quotes in order to satisfy contract goals*. A prime contractor's inability to find a replacement SBE at the original price is not alone sufficient to support a finding that good faith efforts have been made to replace the original SBE. The fact that the contractor has the ability and/or desire to perform the contract work with its own forces does not relieve the contractor of the obligation to make good faith efforts to find a replacement SBE, and it is not a sound basis for rejecting a prospective replacement SBE's reasonable quote.*
Making efforts to assist interested SBEs in obtaining bonding, lines of credit, or insurance as required by the recipient or contractor.
Making efforts to assist interested SBEs in obtaining necessary equipment, supplies, materials, or related assistance or services.
Effectively using the services of available advocacy/business community organizations; contractor associations; local, State, and Federal business assistance centers; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of SBEs.
At a minimum, DFW will review the performance of other bidders/proposers in meeting the contract goal. For example, when the apparent successful bidder/proposer fails to meet the contract goal, but others meet it, DFW may reasonably raise the question of whether, with additional efforts, the apparent successful bidder/proposer could have met the goal. As provided in §26.53(b)(2)((vi), the bidder must submit copies of each SBE and non-SBE subcontractor quote submitted to the bidder when a non-SBE subcontractor was selected over a SBE for work on the contract to review whether SBE prices were substantially higher; and contact the SBEs listed on a contractor's solicitation to inquire as to whether they were contacted by the prime. Pro forma mailings to SBEs requesting bids are not alone sufficient to satisfy good faith efforts under the rule.
A promise to use SBEs after contract award is not considered to be responsive to the contract solicitation or to constitute good faith efforts.

FOR DFW BUSINESS DIVERSITY & DEVELOPMENT USE ONLY:

Plan Reviewed by:_____

Date:_____

Signature of Business Specialist/Manager:_____

Recommendation: Approval:_____Denial:_____

REQUEST FOR APPROVAL TO CHANGE ORIGINAL SCHEDULE OF SUBCONTRACTORS

Contract Number_____

Project Name_____

Contractor Name_____, requests approval of the following addition(s) and/or deletion(s) on the **SCHEDULE OF SUBCONTRACTORS (SBE Form No. 90)**, as originally submitted as part of the bid/proposal on the above-named project.

CHANGE

Check (X) block for each transaction.

ADD	DELETE	COMPANY NAME	TRADE	SBE STATUS	RELEVANT MARKET AREA COUNTY	DOLLAR AMOUNT

JUSTIFICATION

The Contractor must demonstrate good cause to terminate or substitute the SBE and seek BDD approval prior to taking any termination or substitution action. Good cause includes the following circumstances: 1. The listed SBE subcontractor fails or refuses to execute a written contract. 2. The listed SBE subcontractor fails or refuses to meet the Contractor's reasonable, nondiscriminatory bond requirements. 3. The listed SBE subcontractor becomes bankrupt, insolvent or exhibits credit unworthiness. 4. The listed SBE is ineligible to work on Airport projects because of suspension and debarment proceedings pursuant to federal or state law or other applicable laws or regulations. 5. BDD has determined that the listed SBE subcontractor is not a responsible contractor. 6. The listed SBE subcontractor voluntarily withdraws from the project and provides BDD written notice of its withdrawal. 7. The listed SBE subcontractor is ineligible to receive credit for the type of work required. 8. The SBE owner dies or becomes disabled with the result that the listed SBE subcontractor is unable to complete its work on the Contract. 9. Other good cause as determined in BDD's sole discretion. Attach additional sheets as necessary.

CERTIFICATION OF AFFIDAVIT

The above information is true and complete to the best of my knowledge and belief. I further understand and agree that this certification shall become a part of my contract with the Dallas/Fort Worth International Airport Board.

Name of Authorized Representative: _____ E-mail Address: _____

(Please print or type)

Signature_____ Date: _____

Routed To:

_____

(Check One)

_____Design, Code & Construction Dept.

_____Procurement & Materials Management Dept.

Approved by:

_____

Vice President or Designee
Business Development Dept.

DALLAS FORT WORTH

INTERNATIONAL AIRPORT

RENTAL CAR CENTER

BUS ROADS AND BRIDGE REHABILITATION

CONTRACT NUMBER: PA1689

PERMIT NUMBER: B24-0431

ISSUED FOR BID: 03/04/2026

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PART III - TECHNICAL SPECIFICATION BOOK

VERSION 4.3

PUBLISHED DATE: JUNE 2025

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SEALS PAGE

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License/Registration #: By Section
Firm Name / Registration #: By Section
Date: 03/04/2026

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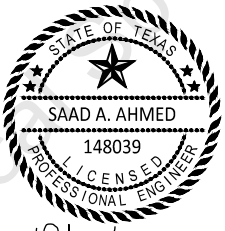
DIVISION 32 TXDOT	 03/04/2026	
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SECTION: 01 10 01

ABBREVIATIONS, ACRONYMS AND DEFINITIONS

PART 1 – GENERAL

1.01 SUMMARY

A. This Section defines common terms, abbreviations, acronyms, and definitions used in the Contract Documents. The terms provided below are presented in alphabetical order and do not imply order of hierarchy or importance in the Project:

1. Access Control Office (ACO) – A section of the Department of Public Safety (DPS) responsible for administering Airport Access/Identification Badges and Air Operations Area (AOA) Access Permits.
2. Access Permit – A permit issued to a motor vehicle required to enter the AOA.
3. Administrator of the Code of Rules and Regulations (Administrator) – The Vice President of Public Safety for the Airport, or their authorized agent.
4. Air Operations Area (AOA) – Refer to General Provisions, Section 10.
5. Air Traffic Control Tower (ATCT).
6. Aircraft Movement Area (AMA) – An area surrounding all taxiways and runways within which aircraft and vehicles operate at the direction of the Federal Aviation Administration (FAA) Air Traffic Control Tower, and all other areas within the AOA but outside the Ramp/Apron areas.
7. Aircraft Rescue and Fire Fighting (ARFF) Road – A designated road on the Airport that is under the operational control of the DPS and Airport Operations and is used for emergency purposes.
8. Airfield Construction – All work performed within the AOA.
9. Airfield Operations – The section of the Airport Operations Department responsible for all day-to-day operations on and surround the airfield.
10. Airport – Refer to General Provisions, Section 10.
11. Airport Board (or Board) – Refer to General Provisions, Section 10.
12. Airport Board Policy (ABP).
13. Airport Design Criteria Manual – The latest edition of the design criteria document to be used for all projects on the Airport property that may be located at the following:

    DFW Design Criteria Manual 2026
14. Airport Identification/Access Badge - A photo-identification badge issued by the Airport granting unescorted access to specific areas for the purpose of conducting business in accordance with the Rules and Regulations, Federal, State, and local laws and regulations, and Policies and Procedures of the Airport.
15. Airport Operations Department – Refer to “Operations Department.”
16. Allowance - As defined in Section 01 30 00.
17. Americans with Disabilities Act Accessibility Guidelines (ADAAG).
18. Approval Authority – The approval authority for ingress/egress issuance is the Airport’s Vice President of Airport Operations or Vice President of Design and Construction.
19. Apron (Ramp) – A paved surface usually around terminal buildings, cargo/air freight buildings, and aircraft hangars from which aircraft operate or are parked.

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20. Architect/Engineer (A/E) – The individual, partnership, firm or corporation duly authorized by the Owner to be responsible for professional services associated with architecture, engineering, or management for the Project.
21. Award - Refer to General Provisions, Section 10.
22. Baseline Schedule - The detailed schedule of coordinated construction activities prepared by the Contractor and approved by the Owner's Authorized Representative (OAR), to plan the Work of the Project. The Baseline Schedule shall not be modified after the approval of the OAR. Refer to Section 01 32 16 for additional information.
23. Basis of Design (BOD) – As defined in Section 01 91 00.
24. Best Management Practice (BMP)
25. Beneficial Occupancy- Stage of construction of a building or facility before final completion, at which its user can occupy for the purpose of construction.
26. Bidder - Refer to General Provisions, Section 10.
27. Building Information Model (BIM): BIM is a digital representation of the physical and functional characteristics of the Project and is referred as a Model(s), which term may be used to describe a Model Element, a single Model or technology used to create the Model.
28. Business Diversity and Development (BDD) - The Airport department responsible for business diversity and minority business opportunities and monitoring diversity participation in Airport projects.
29. Calendar Day - Refer to General Provisions, Section 10.
30. Certified Movement Area Escort (CMAE) – An Airport employee or otherwise authorized person responsible for guiding a non-Security Identification Display Area (SIDA) badged person and/or vehicle though the Transportation Security Administration (TSA) passenger screening checkpoint, manned AOA gate, or AOA un-manned access gate.
31. Central Terminal Area (CTA) – The ramp areas serving Terminals A, B, C, D, and E, and the 1E ramp.
32. Certificate of Occupancy (CO).
33. Change Order - Refer to General Provisions, Section 10.
34. Clean Air Act (CAA) – USC Title 42 §§ 7401 et seq.
35. Clean Water Act (CWA) - USC Title 33 §§ 1251, et seq.
36. Code of Federal Regulations (CFR).
37. Code of Rules and Regulations (Code) – The published Rules and Regulations of the Airport Board as ratified by local jurisdiction for the control of parking revenue boundary crossing by vehicles located at the following link: Code of Rules and Regulations Chapter 2.pdf
38. Commissioning – As defined in Section 01 91 00.
39. Commissioning Agent – As defined in Section 01 91 00.
40. Commissioning Coordinator – As defined in Section 01 91 00.
41. Commissioning Plan – As defined in Section 01 91 00.
42. Commissioning Team – As defined in Section 01 91 00.
43. Construction Site Notice (CSN).
44. Contaminated Media Management Plan (CMMP) – Refer to Section 01 33 29.06.01.

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45. Contract – Refer to General Provisions, Section 10.
46. Contract Administrator – The person assigned by the Owner to administer the Contract.
47. Contract Amount – The overall amount or cost included in the Contractor's Bid and shown on Page 1 of the Executed Contract.
48. Contract Documents – All documents that together form that basis of the Contract including the Contract Agreement, including all General Provisions and Special Provisions, Project Schedule, Plans, and Specifications, and any executed modifications thereto.
49. Construction General Permit (CGP).
50. Contract Item (or Pay item) - Refer to General Provisions, Section 10.
51. Contract Time - Refer to General Provisions, Section 10.
52. Construction Manager (CM) - Refer to General Provisions, Section 10.
53. Construction Schedule – The schedule prepared by the Contractor updated throughout the course of the Project based on the approved Baseline Schedule.
54. Contractor - Refer to General Provisions, Section 10.
55. Contractor's Authorized Representative (CAR) (Also Superintendent) - The Contractor's official representative for the Project who is regularly present on the Project site, is authorized to receive and fulfill instructions from the Owner and is responsible to supervise and direct the Contractor's personnel on the Project. The person shall be designated by the Contractor, in writing, as the primary point of contact for all Contract related matters. Refer to General Provisions, Section 10, Superintendent.
56. Control Plaza – The entrance and exit gates at the north and south ends of the Airport that provides a stop barrier on northbound and southbound International Parkway.
57. Corrective Action – The replacement, removal, repair, or modification proposed by the Contractor to address a deviation or non-conformance issue on the Project. The Corrective Action will be approved by the Owner prior to implementation.
58. Critical Path Method (CPM) - A detailed project management scheduling technique for planning and monitoring a project.
59. Cutting and Patching – Includes, but not limited to, the cutting and patching of existing work in order to accommodate the coordination of the Work, or the installation of new Work. Patching is also defined as the repair or filling of surfaces where existing items are removed depending on the context.
60. Department of Labor (DOL) – The United States Department of Labor which is responsible for the occupational safety, wage and hour standards, unemployment insurance benefits, and reemployment services.
61. Department of Public Safety (DPS) – The Airport department responsible for safety on the Airport property.
62. Design, Code, and Construction (DCC) – The Airport department responsible for, among other functions, the development of the Airport's various components. The Contractor is required to coordinate with DCC and obtain permits from DCC through use of certain forms as described in the Contract Documents.
63. Digital Facilities and Infrastructure (DFI) Standards Manual – Establishes specific content criteria for all public infrastructure, terminal buildings and other public facilities owned, operated, or maintained by the Dallas Fort Worth International Airport Board (hereinafter

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referred to as "Board"). It also serves as a guide for all other facilities designed and constructed within the boundaries of the DFW Airport.

64. Discharge Monitoring Report (DMR) – A regulatory term for a periodic water pollution report prepared for industry, municipalities, and other facilities discharging to the local surface waters.
65. Driver – An individual who drives or operates a commercial, governmental, institutional, and other type vehicle on the Airport.
66. Energy, Transportation and Asset Management (ETAM) – The Airport department including the Infrastructure Operations, Business Services and Energy & Utility Systems and responsible for operating and/or maintaining the Airport Infrastructure, Systems, and Equipment (Systems).
67. Engineer - Refer to General Provisions, Section 10. Refer to Architect/Engineer.
68. Environmental Affairs Department (EAD) – The Airport department responsible for environmental issues on the Airport.
69. Erosion Control Plans (ECP).
70. Estimated at Completion (EAC).
71. Estimate to Completion (ETC).
72. Extra Work - Refer to General Provisions, Section 10.
73. Final Stabilization: A construction site status where all soil disturbing activities at the site have been completed and a uniform (e.g., evenly distributed, without large bare areas) perennial vegetative cover with a density of 70% of the native background vegetative cover for the area has been established on all unpaved areas and areas not covered by permanent structures, or equivalent permanent stabilization measures (such as crushed stone, riprap, gabions, or geotextiles) have been employed.
74. Federal Aviation Administration (FAA) – Refer to General Provisions, Section 10.
75. Green Building Standards (GBS) – The latest edition of the Airport “Green Building Standards” document located at the following: DFW Green Building Standards
76. Haul Road – A specified roadway within the AOA serving authorized construction-related traffic.
77. Holder – A person, or his agent, who is granted operating authority to cross Parking Revenue Area (PRA) boundaries as specifically authorized in the Code.
78. Hot Work – Operations including cutting, welding, thermal welding, brazing, soldering, grinding, thermal straying, thawing pipe, or installation of roof systems requiring the use of a torch or any other open flame device or any other similar operation.
79. Hot Work Permit - A permit required of the Contractor from the Airport Fire Prevention and Planning Department necessary to perform any hot work operations on the Airport as part of the Project.
80. Infrastructure, Systems, and Equipment (Systems) - Consists of MEPS, Pavement, Signs & Markings, Grounds, Airfield Lighting and Utilities at the Airport. These systems are the responsibility of the Airport ETAM Department.
81. Ingress/Egress Device – A device that allows entry into the PRA by specified, unescorted vehicles.

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82. Inspector – A person selected by the Owner assigned to make all necessary inspections and/or tests of the Work being performed or of the materials furnished or being furnished by the Contractor.
83. Instrument Landing System (ILS).
84. International Building Code (IBC).
85. International Fire Code (IFC).
86. Knox Box - The rapid access security box by the Knox Company which provides first responders with immediate access into secure buildings, campuses, residences and commercial properties.
87. Land Use Committee (LUC) - The committee responsible for review of the land use at the Airport consisting of representatives from all relevant Airport Departments.
88. Limited Notice to Proceed (LNTP)- Written notice instructing the contractor to proceed with parts of the work.
89. Materials - Refer to General Provisions, Section 10.
90. Safety Data Sheet (SDS) – A formal document required by the Occupational Safety and Health Administration (OSHA) that contains information about the characteristics and actual or potential hazards of a substance. It identifies the material manufacturer along with the chemical identity, hazardous ingredients, physical and chemical properties, fire and explosion data, reactivity data, health hazards data, exposure limits data, precautions for safe storage and handling, need for protective gear, and spill control, cleanup, and disposal procedures.
91. Milestones - A special event or specific date that is established in a schedule to monitor the progress of the Project or a portion of the Project to assist the determination of whether the Project is on schedule.
92. Mobilization – The actions of the Contractor to establish offices, lay-down areas, plants, and other facilities in preparation of performing the Work of the Contract.
93. Multi-Sector General Permit (MSGP).
94. Municipal Separate Storm Sewer System (MS4).
95. National Environmental Laboratory Accreditation Certification (NELAC).
96. Navigational Aid (NAVAID) – An apparatus, generally located within the AOA, which serves as a guide to landing aircraft.
97. NAVAID Critical Area (NCA) – A three-dimensional area surrounding a NAVAID that, if penetrated by equipment or a stockpile, could cause interference with navigational equipment.
98. Non-Conformance Report (NCR) – A report prepared by the OAR personnel to document a deviation, deficiency, or other non-conformance item on the Project.
99. Non-Movement Area – An apron or other portion of the AOA where control and direction by the FAA Tower is not required.
100. Notice of Intent (NOI).
101. Not in Contract (NIC).
102. Notice of Change (NOC).
103. Notice of Termination (NOT).

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104. Notice to Proceed (NTP) - A written notice to the Contractor to begin the work under contract by a specified date. If applicable, the Notice to Proceed shall state the date on which the contract time begins.
105. Object Free Area (OFA) – As defined in Section 01 35 13.13.
106. Obstacle Free Zone (OFZ) – As defined in Section 01 35 13.13.
107. Operating Authority – Permission granted by the Administrator for a vehicle to enter the PRA in accordance with the Rules and Regulations.
108. Operations Department - The Airport department responsible for, among other functions, the Airfield Operations Section. Also, the Airport Operations Department.
109. Operator – The driver of a motor vehicle, the owner of a vehicle, or the Holder of a vehicle with Operating Authority.
110. Owner – Refer to General Provisions, Section 10. Refer to “Board.”
111. Owner’s Authorized Representative (OAR) – A person designated by the Owner, in writing, with specific limits of authority on the Project. The OAR may be an employee of the Owner or an employee of a firm under contract with the Owner to provide specific services.
112. Owner’s Project Requirements (OPR).
113. Parking Business Unit (PBU) - The Airport department is responsible for, among other functions, revenue control and operations of the PRA and issues and monitors use of parking privileges and Vehicle Access Tags (VATs).
114. Parking Revenue Area (PRA) – The area bounded by fences, gate control equipment and arms, from which the Owner produces revenue from parking spaces.
115. Pay Item – Refer to “Contract Item” and General Provisions, Section 10.
116. Payment Application – A formal request from the Contractor to the Owner for payment of the Work, or a portion of the Work, on the Project.
117. Person – An individual, a corporation, a government or governmental subdivision, or an agency, trust, partnership, or two or more persons having a joint or common economic interest.
118. Plans - Refer to General Provisions, Section 10.
119. Pre-conditioned Air Unit (PCA Unit) – Equipment that provides cooling to the jet bridge and the aircraft while the aircraft is parked at the gate.
120. Pre-Construction Conference – Refer to Section 01 31 19.
121. Progress Meeting – Refer to Section 01 31 19.
122. Progress Payment – A payment from the Owner to the Contractor in response to a Payment Application submitted by the Contractor on the Project.
123. Project – The Project is the total Work performed under the Contract Documents.
124. Project Manual – The package containing all the Specification Sections, General Provisions, Special Provisions, and all attachments included therein, (e.g., soils reports, environmental reports, safety documents, etc.).
125. Punch List - A list prepared by the Owner's personnel to document outstanding work items during the Project Closeout process.
126. Quality Assurance (QA) - Refer to General Provisions, Section 10.
127. Quality Control (QC) - Refer to General Provisions, Section 10.

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128. Quality Assurance Representative - The Airport employee or person designated by the Owner responsible for quality assurance tasks on the Project.
129. Recovery Schedule – As defined in Section 01 32 16.
130. Request for Information (RFI) - A formal request from the Contractor for additional information or clarification of information regarding an apparent inconsistency, error, or omission in the Contract Documents. The request may be based on unanticipated existing conditions on the Project site.
131. Rules and Regulations – The vehicle Rules and Regulations established under the AOA Rules and Regulations for Construction and Maintenance.
132. Ramp – Refer to "Apron."
133. Runway – Refer to General Provisions, Section 10.
134. Runway Incursion – An incorrect presence of an aircraft, vehicle, or person on the protected area of a Runway.
135. Runway Safety Area (RSA).
136. Safety Area – A specific area surrounding Runways and Taxiways, which requires special authorization to enter.
137. Schedule of Charges – The rates and fees charged by and as approved by the Owner.
138. Security Identification Display Area (SIDA) – All areas of the Airport identified in the security program as requiring each person to continuously display on their outermost garment above the waist and below the neck, an Airport approved identification medium unless under an escort by a CMAE. For purposes of construction and maintenance, it also includes the entire area of the AOA.
139. Schedule of Values (SOV) – A detailed schedule provided by the Contractor which breaks down the Contract Amount, including Supplemental Agreements and Change Orders to date, into the Project approved cost codes divisions and/or sections of the Work. Refer to Section 01 29 73.
140. Security Threat Assessment (STA).
141. Site Mobilization Conference – Refer to Section 01 31 19.
142. Unifier – Database software system used by the Owner for construction projects. All project submittals, meeting minutes, correspondence, etc. should be completed through this system unless otherwise noted in the Specification Sections or directed by the OAR.
143. Skylink Automated People Mover System – Guideway, stations, and vehicles to provide timely inter-terminal connections in the CTA.
144. Small/Disadvantaged/Minority/Women Business Enterprise (S/D/M/WBE).
145. Spill Prevention Control and Countermeasure (SPCC) – Refer to Section 01 57 19.
146. Spill Response Plan (SRP) – Refer to Section 01 57 19.13.
147. Specifications – Defines the qualitative requirements for material, and workmanship required for the Work. The Specifications for this Project consist of the Standard Specifications and any additional Specification Sections included in the Project Manual. Any Specification Sections included in the Project Manual will supersede a Standard Specification where a conflict may occur. The Specifications are part of the Contract Documents. Refer to General Provisions, Section 10.
148. Standby Time – As defined in Section 01 21 00.
149. State – The State of Texas.

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150. Stockpiles – Quantities of materials, debris or spoils, which remain on the work site after work has finished for the day, etc.
151. Stormwater Pollution Prevention Plans (SWPPP).
152. Subcontractor – Any independent firm, corporation, or partnership that enters into a subcontract with the Contractor to perform a portion of the Work of the Contract.
153. Substantial Completion - The stage of the Project, or a portion of the Project, where the Owner determines the Project to be sufficiently complete. In accordance with the Contract Documents so the Owner may use or occupy the Project site, or a portion of the Project site, to be used for the intended purpose.
154. Substitution - As defined in Section 01 25 13.
155. Surface Movement Guidance & Control System (SMGCS).
156. Systems – Infrastructure, equipment, and systems which are identified in the Contract Documents to be commissioned on the Project.
157. Systems Performance Group (SPG) - A group within the Airport ETAM Department which consists of the following teams:
    a. Facility Systems
    b. Watershed Management
    c. Computer Maintenance Management Systems
    d. Commissioning
        1) The SPG Manager is the designated Commissioning Authority (CxAuD)
    e. Geospatial Analytics
158. Taxilane – A portion of an aircraft parking area used for access between Taxiways and aircraft parking positions.
159. Taxiway – Refer to General Provisions, Section 10.
160. Temporary Structure - A portable building, Conex container, or shade structure that will be on the Project site less than ninety-one (91) Calendar Days from the date of the letter of authorization.
161. Texas Administrative Code (TAC).
162. Texas Accessibility Standards (TAS).
163. Texas Pollutant Discharge Elimination System (TPDES).
164. Texas Risk Reduction Program (TRRP).
165. Texas Manual of Uniform Traffic Control Devices (TMUTCD).
166. Time Impact Analysis (TIA)- Refer to Schedules, Section 1.32.16.
167. United States Code (USC).
168. Utility - A private, publicly or cooperatively owned line, facility and/or system for producing, transmitting or distributing communications, power or electricity, cable television, light, heat, gas, gas, oil, crude products, water, wastewater, and other products that directly or indirectly serve the Airport or public.
169. Utility Coordinator - An employee of the Owner or other person designated by the Owner responsible to monitor and coordinate Utilities on the Project.
170. Utility Owner - A privately, publicly, or cooperatively owned company which owns, leases, and/or operates a Utility on the Airport.

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171. Vehicle - Private, commercial, governmental, institutional and any other type vehicles that operate in a way that requires crossing of the PRA boundary and have been licensed by proper authority.
172. Vehicle Access Tag (VAT).
173. Voluntary Cleanup Program (VCP).
174. Work - Refer to General Provisions, Section 10.
175. Work Breakdown Structure (WBS).
176. Working Day - Refer to General Provisions, Section 10.

B. Additional definitions and acronyms are included in the individual Specification Sections. Any such definitions and acronyms are meant to be cooperative with this Section.

C. Additional professional association and public agency names, abbreviations, and acronyms are included in Section 00 10 02.

D. The Contractor shall coordinate with the OAR to promptly resolve any conflicts in terminology or definitions between individual Specification Sections and this Section. Any unresolved disagreement between the Contractor and the OAR regarding interpretation shall be resolved by the Owner.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

- END OF SECTION -

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SECTION: 01 10 02

REFERENCE STANDARDS

PART 1 – GENERAL

1.01 REQUIREMENTS INCLUDED

A. This Section includes the language definitions and standard references. Agency/association acronyms are included in the Contract Documents. Additional term definitions are included in the individual Specification Sections.

1.02 QUALITY ASSURANCE

A. Application: When a standard is specified by reference, the Contractor shall comply with the requirements and recommendations stated in that standard. Except when requirements are modified by the Contract Documents or other applicable codes which establish more stringent standards.

B. Publication Date: The publication is in effect on the Bid Date, except when a specific version date or publication date is specified in the Contract Documents.

1.03 LANGUAGE DEFINITIONS

A. “Directed,” “Designated,” “Selected,” “Requested,” “Authorized,” “Permitted,” or words of similar import: Direction, designation, selection, or similar action of the Owner is intended.

B. “Require” and words of similar import: As required to complete Work and as required by the Owner.

C. “Shall” or “Must”: A mandatory requirement or activity of the Contractor or his associated Subcontractor.

D. “Perform”: Contractor shall perform operations necessary to complete Work. Including furnishing of necessary labor, tools, and equipment. Further including and installing of materials indicated, shall be specified or required to complete performance within the Contract Price.

E. “Provide”: Contractor shall furnish and install Work.

F. “Other acceptable manufacturer," "equal," "acceptable equal," "equivalent," or words of similar import: Refer to products or work proven to the satisfaction of the Owner, Architect/Engineer, or any specific department of the Airport to comply with the intent of the Contract Documents.

G. "Acceptance," "acceptable,” or words of similar import: Acceptance, acceptable or similar words shall be as approved by the Owner. "Accepted" or “Acceptance,” where used in conjunction with an action on the Contractor's submittals, and or requests, is limited to responsibilities and duties of the Owner’s Authorized Representative (OAR), Architect/Engineer, or any department of the Owner as stated in General and Supplementary Conditions. Approval does not release the Contractor from responsibility to fulfill the requirements of the Contract Documents, unless specifically stated otherwise in the Approval or Acceptance provided by the Owner.

H. "At no extra cost to Owner", "With no extra compensation to Contractor", "At Contractor's sole expense", or words of similar import: Terms shall be understood to mean that Contractor shall perform or provide specified operation of Work at no increase to Contract Amount stated in executed Contract.

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I. "NIC": Work identified on the Contract Documents, which is not being performed or provided as part of the Contract; the term shall mean "Not in This Contract" or "Not Part of Work to be performed or provided by Contractor." "NIC" work is indicated as an aid to Contractor in scheduling amount of time and materials necessary for completion of Contract.

J. "Indicated" refers to graphic representations, notes or schedules on the Plans, in other Specification Sections, or schedules, and similar requirements in the Contract Documents. Where the term "shown", "noted", "scheduled", and "specified" are used, it is to help locate the reference.

K. "Regulation" includes laws, statutes, ordinances, and lawful orders issued by authorities having jurisdiction. As well as rules, conventions, and agreements within the construction industry that control performance of Work, whether they are lawfully imposed by authorities having jurisdiction or not.

L. "Furnish" means supply and delivery to Project site ready for unloading, unpacking, assembly, installation, and placing into operation in accordance with the Contract Documents.

M. “Incidental” means materials or efforts required for the completion of the Work or a work item but will not be itemized for payment individually and will be considered as part of the overall Work or construction or installation of another work item.

N. "Install" means unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations.

O. "Installer" is a person or firm engaged by Contractors either an employee or Subcontractor, regardless of tier, for performance of a particular construction activity. Including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged in to perform. The term "experienced", when used with "installer", means having a minimum of five (5) years previous experience in projects of similar size and scope to this Project. Be familiar with precautions required and have complied with requirements of authority having jurisdiction.

P. "Project site" is space available to Contractor for performance of Work, either exclusively or in conjunction with others performing construction as part of Project. The limits of the Project site is shown on the Plans, or described in the Contract Documents, and may or may not be identical with description of land upon which Project is to be constructed.

Q. “Specification Section” (Section), “Project Specification,” “Technical Specification,” shall refer to the specifications identified or included in the Project Manual or refer to the requirements of a Reference Standard depending on context.

R. "Testing Laboratory" is an independent entity engaged by the Owner to perform specific inspections or tests, to report on, and if required, to interpret results of those inspections or tests, either at Project site or elsewhere.

1.04 SPECIFICATION SENTENCE STRUCTURE

A. Simple imperative mood of sentence structure may be used in the Specification Sections which place a verb as first word in sentence. Where "perform", "provide", "install", "erect", "furnish", "connect", "test", or words of similar import are used, it shall be understood that words include meanings of the phrase "The Contractor shall" is included before such words for interpretation.

B. Subsection titles and other identifications of subject matter in Specification Sections are intended as aid in locating and recognizing various requirements in Specification Sections. Titles do not define, limit, or otherwise restrict the Specification Sections text. Capitalizing of words in text does not signify or mean that words convey special or unique meanings having

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precedence over other parts of Contract Documents. Specification text shall govern over titling and shall be understood to be interpreted as a whole.

1.05 DOCUMENT ORGANIZATION

A. The organization of the Project Manual and Plans are not intended to control or to lessen responsibility of the Contractor, by dividing Work among its Subcontractors, or in establishing extent of the Work to be performed by any trade.

1.06 SYMBOLS

A. Graphic symbols used in the Contract Documents are those symbols recognized in the construction industry for indicated purposes. Where otherwise not noted symbols are those defined in "Architectural Graphics Standards", published by John Wiley & Sons, Inc., Current Edition.

B. Graphic symbols used on mechanical and electrical drawings are generally aligned with symbols recommended by American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE). Where appropriate, mechanical and electrical symbols are supplemented by more specific symbols recommended by the technical associations including American Society of Mechanical Engineers (ASME), American Society of Plumbing Engineers (ASPE), Institute of Electrical and Electronics Engineers (IEEE), and similar organizations. The Contractor shall request clarification from the OAR if the symbols are unfamiliar.

1.07 REFERENCE STANDARDS

A. Reference Standard-Abbreviations:

1. Reference standards are referred to in Specification Sections by basic designation only.
2. Where acronyms or abbreviations are used in the Contract Documents, they shall mean recognized name of trade association, standards generating organization, authority having jurisdiction, or other organization applicable to context of requirement.
3. Acronyms for governmental agencies and private associations are provided in this Section as aid to the Contractor and are not all inclusive.
4. Refer to "Encyclopedia of Associations", published by Gale Research Company, available in most public libraries, to reference unfamiliar organization acronyms or abbreviations.

B. Publications of organizations and societies listed in individual Specification Sections shall be considered an integral part of Contract Documents to the extent referenced. Work shall be executed on the Project in accordance with the requirements of the Reference Standards listed, to the extent such requirements do not supersede or conflict with the requirements within the Contract Documents.

C. Where a conflict may exist between requirements of two or more Reference Standards, and the Contract Documents do not clearly supersede the conflict, the Contractor shall request clarification from the OAR. Prior to proceeding with activities which are affected by such conflict. If work activities impacted by such conflict are on-going, the Contractor shall stop work and request clarification from the OAR.

D. If the Contractor does not request conflict clarification prior to proceeding or continuing, with activities impacted or controlled by such information. The Contractor will be proceeding at their own responsibility and will not be compensated for any re-work or removal of work, labor, material, or any other costs associated with the impacted work.

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E. Publications may be referenced in text by basic designation only with organizations and societies referenced by abbreviations indicated.

F. When a Reference Standard is referred to in an individual Specification Section, but is not listed by title and date, it shall be considered to be the latest edition of such reference including the appropriate supplements, amendments, revisions, or errata at the date of the issuance of the Project Manual.

G. The Contractor shall provide at the Project site, copies of the Reference Standards per required, or as the OAR may request. Maintain those copies at the Project site throughout the construction period to ensure proper performance of the Work.

1.08 ABBREVIATIONS AND NAMES OF ORGANIZATIONS

A. Obtain copies of Reference Standards direct from publication source. All Airport codes and reference documents may be obtained online, as noted in various Sections, or from the Design, Code, and Construction Department (DCC).

AA	Aluminum Association
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AAES	American Association of Engineering Societies
AAN	American Association of Nurserymen
AASHTO	American Association of State Highway Transportation Officials
ACEI	Air Conditioning Engineers, Inc.
ACG	AABC Commissioning Group
ACI	American Concrete Institute
AGA	American Gas Association
AGC	Associated General Contractors of America
AHA	American Hardboard Association
AI	Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ALSC	American Lumber Standards Committee
AMCA	Air Movement and Control Association
ANSI	American National Standards Institute
APA	American Plywood Association
APFA	American Pipe Fittings Association
ARI	Air-Conditioning and Refrigeration Institute

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ASA	American Subcontractors Association
ASCA	American Spray Coaters Association
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASLA	American Society of Landscape Architects
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASSE	American Society of Sanitary Engineering
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AWI	Architectural Woodwork Institute
AWPA	American Wood-Preservers' Association
AWS	American Welding Society
BCA	Building Commissioning Association
BIA	Brick Institute of America
BHMA	Builders Hardware Manufacturers Association
BOCA	Building Officials and Code Administrators
CBM	Certified Ballast Manufacturers
CDA	Copper Development Association
CISCA	Ceiling & Interior Systems Construction Association
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CPSC	Consumer Product Safety Commission
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standard
CSI	Construction Specifications Institute
CTI	Ceramic Tile Institute
DHI	Door & Hardware Institute
EPA	Environmental Protection Agency
FM	Factory Mutual System
FAA	Federal Aviation Administration
FARs	Federal Aviation Regulations
FGMA	Flat Glass Marketing Association

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FS	Federal Specification
FSCSI	Food Service Consultants Society International
GA	Gypsum Association
HPMA	Hardwood Plywood Manufacturers Association
IAPMO	International Institute of Plumbing and Mechanical Officials
ICBO	International Conference of Building Officials
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
IETA	International Electrical Testing Association, Inc.
IILP	International Institute for Lath & Plaster
ILI	Indiana Limestone Institute of America
IPCEA	Industrial Power Cable Engineers Association
ISA	Instrument Society of America
IWA	International Waterproofing Association
MCAA	Mechanical Contractors Association of America
MLSFA	Metal Lath/Steel Framing Association
MIA	Marble Institute of America
MIL	Military Specifications
MSHA	Mine Safety and Health Administration
MSSVFI	Manufacturer’s Standardization Society of the Valve & Fitting Industry
NAAMM	National Association of Architectural Metal Manufacturers
NAFM	National Association of Fan Manufacturers
NAPA	National Asphalt Pavement Association
NBS	National Bureau of Standards
NCPWB	National Certified Pipe Welders Bureau
NCTCOG	North Central Texas Council of Governments
NEBB	National Environmental Balancing Bureau
NEC	National Electric Code
NEMA	National Electrical Manufacturer's Association
NFC	National Fire Code
NFPA	National Fire Protection Association

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NFPA	National Forest Products Association
NIOSH	National Institute for Occupational Safety and Health
NRC	National Response Center
NRCA	National Roofing Contractors Association
NSF	National Sanitation Foundation
NSWMA	National Solid Wastes Management Association
NTMA	National Terrazzo & Mosaic Association
NWWDA	National Wood Window and Door Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Precast/Prestressed Concrete Institute
PDI	Plumbing & Drainage Institute
PEI	Porcelain Enamel Institute
PS	Product Standard
SBCCI	Southern Building Code Congress International
SDI	Steel Deck Institute
SDI	Steel Door Institute
SIGMA	Sealed Insulating Glass Manufacturing Association
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SPIB	Southern Pine Inspection Bureau
SPRI	Single Ply Roofing Institute
SSPC	Steel Structures Painting Council
TAS	Technical Air Series
TCA	Tile Council of America, Inc.
TCEQ	Texas Commission on Environmental Quality
TDSHS	Texas Department of State Health Services
TxDOT	Texas Department of Transportation
UBC	Uniform Building Code
UL	Underwriters Laboratories, Inc.
UPC	Uniform Plumbing Code
USDA	United States Department of Agriculture

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USDC	United States Department of Commerce
USPS	United States Postal Service
WRI	Wire Reinforcement Institute
WWPA	Woven Wire Products Association

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

- END OF SECTION -

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SECTION: 01 11 00

SUMMARY OF WORK

PART 1 – GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

A. The project seeks to rehabilitate and reconstruct roadway pavements and associated bridge rehabilitation tasks at the Rental Car Center (RCC) located at 2424 E. 38th Street. This project will impact various roadway entrances and exits on International Parkway, Service Roads, East 39th Street, East 37th Street, Passport Avenue, South 26th Avenue, South 24th Avenue, and the bus maintenance yard. The pavements associated with this project will be rehabilitated and reconstructed within the existing footprint. In addition to the pavement work, this project will:

1. Rehabilitation of RCC bridge expansion joints.
2. Rehabilitation of RCC bridge deck spall repairs.
3. Repair of existing retaining wall.
4. Optimization of Traffic Signal.
5. Unclog and clean bridge retaining wall weepholes.
6. Rehabilitate two (2) stormwater inlets and pipe laterals.
7. Rehabilitate storm drains (Cured in Place).
8. Rehabilitate vertical spall on bridge retaining wall.
9. Install riprap along the bridge retaining wall.
10. Install new traffic guardrails with end treatments.
11. Construct new non-revenue-controlled bus access gate on South 24th Avenue near Global Drive.
12. Install new DPS-Fire access gate at the bus maintenance yard (at South 24th Avenue & Innovation Drive) & reconstruct sidewalk with ADA ramps.
13. Install sidewalk from Connection Avenue to Global Drive.
14. Install pavement sensors in select RCC Bridges.
15. Remove and replace roadway pavement markings.

This project will also upgrade non-LED lighting fixtures to LED at the Rental Car Center campus. This includes the non-LED single and dual canister fixtures located along Rental Car Center campus roadways and on the upper level of the Rental Car Center parking garage structure.

This project is not expected to increase capacity in this area and is limited to the Roads and Bridges within the RCC leased area (does not include the building or parking areas).

Construction will be outside the Airport's Air Operations Area (AOA). The Contractor shall be responsible for reviewing all existing conditions associated with the Work prior to commencement of work activities.

1.02 BADGING, AOA ACCESS AND REVENUE AREA ACCESS

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A. Identification/Access badge required for Contractor to work on the project: NO

B. Access to Revenue Area (RA) for Contractor to work on the project.

1. Default access through the North and South Control plazas is required. NO
2. Vehicle access through Crossover gate(s) IS NOT required.
3. Vehicle permit and AOA gate access is required. NO
4. AOA Non-movement Area Driving Credentials required. NO

C. The Contractor and all Subcontractors must obtain and pay for all Airport Identification Badges, Vehicle Permits and access to Revenue Area as required by the Airport.

D. Refer to Section 01 55 20 for detailed information on obtaining Identification Badges, Vehicle Permits and access to Revenue Area as required by the Airport.

E. The project WILL NOT require an off-duty DPS officer while working on-site.

1.03 CONTRACT TIME & SCHEDULE MILESTONES

A. The Contractor shall sequence and stage the Work in accordance with the requirements of the Contract Documents to meet the following interim requirements and Final Completion date.

1. Three-hundred and ninety-five (395)] consecutive Calendar Days for Substantial Completion, from the date set forth in the Notice to Proceed (NTP).
2. Sixty (60) consecutive Calendar Days for Final Completion, from the date set forth for Substantial Completion.
3. Total Contract Time = Four-hundred and fifty-five (455)] consecutive Calendar Days from NTP.

B. The Owner reserves the right to request the completion of work based on critical Milestones established in the Contract Documents.

C. The Owner reserves the right to apply Liquidated Damages associated with the completion of work based on critical Milestones.

D. Complete material submittals, shop drawings, and RFI's and submit for review. Particular attention should be paid to critical submittals, including but not limited to safety plan(s), quality control plan(s), concrete mix designs, and other long lead time items.

E. Begin mobilization, including set up of the Contractor's staging area, procurement and stockpiling of project materials, and furnishment and set up temporary facilities.

F. Notify utility companies to have underground utilities located.

G. Perform necessary exploratory excavations for underground utilities, as necessary, in airport-approved locations.

H. Complete initial survey checks and verification of control monuments along with establishment of temporary benchmarks.

I. Procure temporary SWPPP controls and verify sufficient quantity for each phase once work is authorized to begin.

J. Procure barricades and other safety items and verify sufficient quantity to close the required areas of each phase once work is authorized to begin.

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1.04 HOURS OF WORK

A. Work can generally be performed 24 hours a day. Work schedules must be strictly coordinated with the Owner's Authorized Representative (OAR), the DFW Transportation Business Unit (TBU), and the DFW Airport Traffic Engineer before each phase of work.

B. Exceptions to the above work hours:

1. Any Work within an aircraft parking apron and Object Free Area (OFA) of an active Taxiways or Taxilane will be restricted to the following:
   a. From 23:00 to 04:00 hours.
   b. Work activities within these areas may be canceled and the area reopened in the event of airfield emergencies, late airline complexes, and unforeseen conditions that could create significant delays to the Airport.

2. Work schedules are restricted during the periods noted below. No runway closures or removal of any NAVAIDS from service will be allowed during these periods. No new airfield pavement closures will be allowed during these periods, though work may continue on pavements that have already been closed prior to the periods noted below. No shifts of phasing will be permitted during these periods, though work may continue on phases that have already commenced prior to the periods noted below. The Contractor should anticipate increased aircraft traffic during these periods that may impact access routes and active pavement crossing points. During the noted Holiday blackout dates any work that impacts ramp level operations, roadways, guests inside the terminals and non-emergency utility outage requests, will not be approved. Work and utility outages that do not impact stakeholder operations or have limited impact will be evaluated on a case-by-case basis during the blackout periods. The Contractor must coordinate requirements with the OAR. The following construction blackout dates are recognized for the Project:

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a. 2026
   1) Spring Break: Saturday, March 07, 2026, 00:01 – Monday, March 23, 2026, 23:59
   2) Memorial Day: Thursday, May 21, 2026, 00:01 – Tuesday, May 26, 2026, 23:59
   3) World Cup: Thursday, June 11, 2026, 00:01 – Tuesday, July 15, 2026, 23:59
   4) US Independence Day: Thursday, June 25, 2026, 00:01 – Tuesday, July 7, 2026, 23:59
   5) Labor Day: Thursday, September 3, 2026, 00:01 – Tuesday, September 8, 2026, 23:59
   6) Thanksgiving: Thursday, November 19, 2026, 00:01 – Tuesday, December 1, 2026, 23:59
   7) Christmas/New Year's: Friday, December 18, 2026, 00:01 – Tuesday, January 5, 2027, 23:59

b. 2027 *SUBJECT TO CHANGE, PENDING OFFICIAL MORATORIUM RELEASE.*
   1) Spring Break: Wednesday, March 3, 2027, at 0001 until Tuesday, March 23, 2027, at 2359.
   2) Memorial Day: Thursday, May 27, 2027, at 0001 until Tuesday, June 1, 2027, at 2359.
   3) Independence Day: Thursday, July 1, 2027, at 0001 until Tuesday, July 13, 2027, at 2359.
   4) Labor Day: Thursday, September 2, 2027, at 0001 until Tuesday, September 7, 2027, at 2359.
   5) Thanksgiving Break: Thursday, November 18, 2027 at 0001 until Tuesday, November 30, 2027, at 2359.
   6) Christmas/New Years Break: Thursday, December 16, 2027, at 0001 until Tuesday, January 4, 202, at 2359.

3. For all utility outages, a Utility Impairment Request Form must be submitted seven (7) days in advance to Poweroutage@dfwairport.com. For power outage requests, all impacted panel schedules must be submitted with the request. Operations will review and if needed, coordinate a stakeholder meeting to discuss mitigation plans. One hour prior to all utility outages, the requestor must call the Integrated Operations Center at 972-973-3112 one hour prior to the scheduled outage for a final go/no-go. The Utility Impairment Request Form may be found on DFW Utility Impairment Form or you may request a form from PowerOutage@dfwairport.com.

1.05 VEHICLE RELOCATION PROCEDURES

A. Post a "30 Day Closure Notice" sign at the entrance to the parking facility. Sign specifications are available from the DFW Sign Shop.

1. If the closure involves only a section of the parking facility, the signs should be posted in the affected area to delineate closure of the specific section. Cones, barrels, tape, barricades or any combination thereof may be used to secure vacant spaces.
2. If vehicles have been removed after 30 days, the DFW Project Manager will ensure that the Contractor:
3. Contact the Board's contract wrecker service 48 hours in advance to ensure the company has adequate staffing.
4. Barricade the entrance to prevent additional vehicles from parking if the entire lot is involved.
5. Ensure that before and after photographs are taken of vehicles that will be relocated.
6. Create a vehicle log that includes the color, make, model, license plate number and document any existing damage.

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7. Note the location where the vehicle was parked and to where it has been relocated. Relocation should be as close as practical to the original location.
8. If relocating vehicles at Remote Parking, notify Guest Services at (972) 574-6004.
9. If relocating vehicles parked at Express Parking, notify Parking Contract Bussing at (972) 574-7500 and AMPCO at (972) 574-7414.

B. If relocating vehicles parking at the Employee Parking Lots, notify Parking Contract Bussing at (972) 574-1700.

C. Fax a copy of the vehicle log to DPS Communications at (972) 973-3210, DFW Customer Service at (972) 973-3112, All DFW Airport Parking Guest Relations at (972) 973-3900, and the Airport Integrated Operations Center (IOC) at (972) 973-3112.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

- END OF SECTION -

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SECTION: 01 18 16

PROTECTION OF EXISTING UNDERGROUND UTILITIES AND CABLES

PART 1 – GENERAL

1.01 SUMMARY

A. This Section shall govern the field location of all underground existing Utilities and sub-drains in construction areas of the Project. It shall include, but not be limited to, the location of electrical and communication ducts, airfield lighting and control cables, fiber optic and Federal Aviation Administration (FAA) Navigational Aid (NAVAID) cables. It is the intent of this Section to provide for the location of existing Utilities by hand digging, particularly underground cables and NAVAIDs.

NOTE: The significance of protecting and maintaining all Utilities cannot be overstated. Direct-buried fuel, gas and water pipes, and electric, fiber-optic, navigational aid, security and telephone cables are found both inside and outside the Air Operations Area (AOA) and are very susceptible to damage during trenching and earthmoving operations. Any cut NAVAID cable could have disastrous consequences.

1.02 RELATED REQUIREMENTS

A. Section 01 18 16.13, Utility Location Sign-Off Sheet

B. Section 01 18 16.14, Underground Utilities Damage Report

1.03 CONSTRUCTION METHODS

A. It is the sole responsibility of the Contractor to locate all Utilities on the construction site, except for FAA lines. It is the Contractor's responsibility to coordinate with the FAA regarding the location of the FAA lines.

B. Utilities, utility appurtenances, and cables encountered by the Contractor during the construction of this Project shall be protected by the Contractor, as needed for construction and to conform to the finished grades on the Project. Use of mechanical equipment of any kind to verify Utility locations are expressly prohibited. The Contractor shall immediately repair any damaged Utilities at his own expense, to the satisfaction of the respective Airport department and/or the FAA.

C. The Contractor shall coordinate with all Utility Owners maintaining facilities at the Airport, as well as Utilities owned by the Owner, through the Owner's Authorized Representative (OAR). Ensure all available record information has been provided, prior to any excavation/ digging, and provide the OAR with written documentation of how the Utility location was verified.

D. The Contractor shall continuously maintain Utilities for facilities and/or systems, which are or may be affected by the Work of the Project. Refer to the Utility Location Sign-Off Sheet included in Section 01 18 16.13. The Contractor shall prepare and maintain a contingency plan, approved by the OAR, to restore to service all Utilities and/or control/signal cables which may be placed out of service or damaged during performance of the Work. The Contractor shall provide immediate notification to the Airfield Operations Department and Airport Maintenance through the OAR on all damage to underground Utilities and follow up with written reports. Refer to the Underground Utilities Damage Report included in Section 01 18 16.14.

E. Accurately locate all the routing of underground cable and Utilities within the Project areas to be excavated, trenched, or drilled. The location shall be accomplished by hand digging and once located, placing highly visible and durable markers along all such cable and Utility routes

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at intervals of not greater than twenty-five (25) feet. Obtain the OAR approval of proposed marking devices. Use semi-permanent markers that are low profile, frangible and non-metallic within the Runway and Taxiway Safety Areas, and navigational and restricted zones. The Contractor shall maintain these markers in their original locations throughout the Project and shall also be responsible for providing and maintaining a field survey and plan of the marker locations replacing any disturbed markers at Contractors own expense.

F. Do not use power equipment with teeth when excavating within five (5) feet from an area of marked cables unless the cables or other Utilities are completely visible, the Contractor shall avoid nicking, severing, or damaging in any way.

G. The Contractor will be responsible for the completion of all forms required by the Owner and the assemblage of all the executed forms into a meeting binder (commonly called a “Dig Book”) which will require signatures and formal approval by the Owner. The Dig Book must also be kept onsite by the Contractor until the Work is complete. Is it suggested that the Contractor allow at least one (1) month for the assemblage and approval of all requirements.

H. Contents of the Dig Book:

1. Develop an overall utility and cable chart/map that shall be maintained throughout the construction. This chart/map shall have all underground utilities and cables shown, including the field survey information and other Utility information provided by the FAA, telephone, electrical and other Utility Owners, and shall reside in the Contractor's office. This chart/map shall be furnished to the Owner at the completion of the Project.
2. At the beginning of each work period check the utility and cable chart/map for cables and utilities in the areas of work. If any of the Contractor's personnel removes the chart/map from the office, then that person will initial a sign-out sheet for the chart/map.
3. Develop and provide a comprehensive plan and procedures for controlling vehicle travel to and/or within AOA work areas that avoids underground cables to the extent possible. Obtain the OAR approval of the plan prior to commencing work operations within the AOA. Strictly adhere to the approved plan and procedures throughout the duration of the Project.
4. The cable or Utility shall be exposed by hand (pot-holed) after the Contractor performs a circuit lock out. The cable or Utility must be visibly exposed. The Contractor shall verify adjacent width of five (5) feet parallel to each side of the exposed cable for any other existing cables.
5. Both the OAR and the Contractor's Authorized Representative (CAR) must sign off that the cable or Utility has been located before any work is started. Coordinates of the cable or Utility shall be recorded at this time and placed on the Record Drawings and the cable chart/map.
6. Operators or any other Contractor's personnel who observe sand or bedding material in trenches or excavations shall cease operations and notify their supervisor immediately.

I. If the Contractor does damage a NAVAID cable that has been previously located, the Contractor shall be required to repair the cable and install either a pull box or manhole and/or complete cable replacement depending on the type and or size of the NAVAID cable. Whether a pull box, manhole, or complete cable replacement is required, it shall be totally the decision of the FAA. All cost related to the said damaged NAVAID shall be the sole responsibility of the Contractor.

J. Any irrigation lines that are damaged must be repaired by a licensed irrigation company.

K. Protection of new and Existing Electrical Equipment:

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1. All new and existing transformers, Oncor switch gear and switches, and DFW Switch gear and electrical service equipment within the work zone, haul route or staging area as shown on the construction documents shall be protected from physical damage during construction by installing orange safety fences around the equipment. Orange safety fence shall be installed no closer than ten (10'- 0") from the equipment and shall encircle the entire equipment. A safety fence shall be installed before any work is performed in the work zone. Engineer of record to include this information on all drawings for DFW Airport Electrical Infrastructure.

1.04 PROCEDURES

A. Always Assume All Utilities are Active & Live.

B. If sand or bedding materials are encountered during excavations, operations shall immediately cease and notification to the Contractor's management team is required.

C. Always refer to the project specifications concerning Protection of Utilities & Cables prior to excavations being performed. Contractors are required to develop & maintain a project Dig Book (Utility Locate Document). This document should provide the location & elevation for each individual utility. At the beginning of each work shift, verify the location of each proposed excavation area and then verify the previously located utilities within the area. Both the OAR & Contractor must complete the "Utility Location Sign-Off Sheet" prior to excavations being performed to confirm that the existing cables/ utilities have been previously located.

D. It is the sole responsibility of the Contractor to locate all utilities on the construction site, except for FAA lines. All utilities discovered during the construction process shall be protected by the Contractor. The Contractor shall immediately repair any damaged utilities encountered

E. The Contractor will provide immediate notification to the OAR and provide a written report of the incident.

F. If a utility is discovered, but not damaged, the OAR shall contact the DFW Airfield Operations Officer (Port 102) and inform them of the assumed utility found.

G. If a utility is damaged, immediately inform:

1. DFW Airfield Integrated Operations Officer via AOA Radio or call (682) 298-1133
2. Airport Integrated Operations Center (IOC) (972) 973-3192
3. Call the Quality Assurance Manager for notification.
4. Email the project CM and Quality Assurance Manager to notify them of the damage.
5. Inform both of assumed utility damage and provide area location of the damage.
6. An "Underground Utilities Damage Report" should be completed by the OAR and upon completion be emailed to: DFW Airfield Integrated Operations Officer & DFW Operations Compliance Officer AirfieldOfficers@dfwairport.com. Also, copy the Project CM, and Quality Assurance Manager.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

- END OF SECTION -

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SECTION: 01 18 16.13

UTILITY LOCATION SIGN-OFF SHEET

EXCAVATION SHALL NOT PROCEED IN THE AREA DESCRIBED BELOW UNTIL THIS FORM IS PROPERLY COMPLETED.

DATE:_____

LOCATION OF UTILITY:_____

*DFW MAPSCO#:_____

TYPE OF UTILITY:_____

UTILITY FIELD LOCATION CONFIRMATION#:_____DATE:_____

DATE FIELD LOCATION OCCURRED:_____N/A:_____

DATE UTILITY UNCOVERED FOR OBSERVATION:_____N/A:_____

LOCATION UTILITY WILL IMPACT PROPOSED WORK: YES ____ NO ____

COMMENTS:

_____

_____

_____

DATE AS-BUILT INFORMATION FOR UNCOVERED UTILITY OBTAINED: _____

_____

The Contractor verifies, by signature below, that a thorough examination of all available as-built information has been completed and that field investigation(s) to locate any Utilities in the Work area, where the proposed excavation will occur, has been Completed.

Contractor's Authorized Representative: _____ Date: _____

Concurrence by

Owner's Authorized Representative: _____ Date: _____

cc: Utility Coordinator
Construction Manager
Quality Assurance Representative
AOPS (6/91)
Dallas-Fort Worth International Airport

*Note: MAPSCO refers to the latest edition of the Fort Worth Street Guide published by the Kappa Map Group.

- END OF SECTION -

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SECTION: 01 18 16.14

UNDERGROUND UTILITIES DAMAGE REPORT

DATE: _____ TIME: _____ CONTRACT No.: _____

PROJECT: _____ CONTRACTOR: _____

UTILITY: _____

LOCATION (Attach sketch, including location, depth, etc.): _____

_____

_____

TIME/DATE RETURNED TO SERVICE: _____ WAS UTILITY MARKED? _____

WAS EXCAVATION EQUIPMENT USED? WHAT KIND? _____

_____

DESCRIBE HOW DAMAGE OCCURRED: _____

_____

_____

_____

WHAT PRECAUTIONS WERE TAKEN? _____

_____

_____

_____

COMMENTS/RECOMMENDATIONS: _____

_____

_____

_____

ATTACHMENTS: _____

_____

SIGNED _____

cc: Airfield Operations Projects and Standards Administrator
Construction Manager

- END OF SECTION -

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SECTION: 01 21 00

STANDBY TIME ALLOWANCE

PART 1 – GENERAL

1.01 SUMMARY

A. Some of the Work of this Contract must be constructed at locations that are critical to the overall operation of the airfield. The Contractor shall coordinate the scheduling and sequencing of the Work with the Owner's Authorized Representative (OAR) in a manner that avoids unacceptable construction impacts on airfield operations. However, aircraft arrivals and departures are subject to weather conditions and cannot always be accurately predicted. Portions of the Work will require the Contractor to work within allotted time frames that could be subject to changing Airfield conditions. On occasion, the OAR, on short notice, may direct the Contractor to temporarily stop work for departing and/or arriving aircraft. The purpose of this Section is to establish a means to compensate the Contractor for temporary disruptions to his work resulting from airfield operations. Any compensable disruptions, further identified as Standby Time, must be approved by the OAR.

B. Work under this Section is subject to the requirements of the Contract Documents.

1.02 SUBMITTALS

A. During the Mobilization phase of the Contract, the Contractor shall submit a listing of hourly billing rates (Standby rate and Operating rate) for each type of equipment that will be used on the Project. The OAR will review these rates and negotiate any differences with the Contractor. The agreed upon equipment rates will be used to pay for any approved Standby Time.

B. Only standard or regular equipment scheduled for actual use and operation shall be subject to Standby Time compensation. Any equipment provided as a replacement for any regular equipment will not be subject to Standby payment.

PART 2 – PRODUCTS

2.01 STORAGE OF MATERIALS

A. The Contractor will not be allowed to stockpile materials in any location that could interfere with airfield operations unless the Contractor can demonstrate to the OAR that: (1) the materials must be staged in critical areas to facilitate construction, and (2) the Contractor will be able to remove the materials within thirty (30) minutes of notification. The final determination of timely removal of such materials will be the responsibility of the OAR.

2.02 PAYMENT FOR IMPACTS TO MATERIALS

A. If a Standby Time period results in impacts on materials that renders the materials unusable, the Contractor will submit invoices to the OAR documenting the costs for such materials. For example, if the Contractor has concrete on site that cannot be used due to a Standby Time period, resulting in the concrete being discarded, the costs for this material may be submitted for reimbursement. No Contractor or Subcontractor mark-up will be allowed for this type of material reimbursement.

PART 3 – EXECUTION

3.01 PROJECT WORK SCHEDULE

A. Prior to beginning construction, the Contractor shall prepare and submit a Project Schedule to the OAR for review and approval. In preparing the Project Schedule, the Contractor will incorporate phasing details and construction restraints set forth in the Contract Documents.

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During the review of the Project Schedule, the OAR will conduct a meeting with the Contractor and Airfield Operations to review potential Airfield Operational Impacts on the Project Schedule. The Contractor, as necessary, will modify the Project Schedule to minimize any potential impacts.

3.02 DAILY WORK SCHEDULES

A. Prior to the end of each Working Day (by 1800 local time), the Contractor shall attend a schedule meeting with the OAR to review the next day's schedule for work in proximity to an active Taxiway or Runway. Prior to the meeting, the OAR will check with the Airfield Operations Department to determine which Taxiway and Runway configurations are planned for the next 24 hours. During the daily schedule meeting, the Contractor and OAR will determine which construction activities can be scheduled for the following 24 hours, and those construction activities that will be significantly impacted by planned airfield operations and will not be approved for the following day/night. For any work activity the OAR determines could be impacted by an airfield operation, the Contractor will provide a plan for removing equipment, materials, and manpower from that area within thirty (30) minutes of notification.

3.03 AUTHORIZATION AND CANCELLATION OF WORK

A. During the daily schedule meeting, the OAR will authorize the Contract's work for the following 24-hour period. If airfield conditions change in a way that significantly impacts the Contractor's scheduled work, and the OAR provides at least four (4) hours' notice before the scheduled shift start time that the work is canceled, the Contractor will not be eligible to any additional compensation as a result to the cancellation.

3.04 ADDITIONAL COMPENSATION

A. If a Contractor is authorized to perform work and the work is not cancelled at least four (4) hours prior to the scheduled shift start time, and airfield operations require the OAR to temporarily stop the work or terminate the work for the day, the Contractor will be eligible for compensation as follows.

1. Work is Terminated for the Day Prior to Starting:

   If the Contractor's crew for the cancelled work arrives at the site and is sent home, the Contractor will be compensated for two (2) crew hours based on the hourly rates provided in certified payrolls. If the Contractor diverts the crew to other Project work, no additional compensation will be approved. The Contractor will also be compensated for two (2) hours of standby equipment time for any equipment that was scheduled for the cancelled work. If the Contractor diverts the equipment to other Project work, no additional compensation for lost equipment time will be approved. If the Contractor has rented specialized equipment for a portion of the work that was cancelled, and the Contractor incurs additional rental time as a result of the cancellation, the OAR may approve additional payment for more than two (2) hours of the shift. Before the OAR considers this additional payment, the Contractor must provide information (actual invoices) quantifying the Contractor's costs.

2. Work is Temporarily Stopped and Restarted:

   If the Contractor is directed to temporarily stop any portion of work as a result of airfield operations, the Contractor will be compensated for the labor impacted by the temporary stoppage. The OAR will document the crew members and the duration of the temporary stoppage. Additional compensation will be calculated using hourly rates provided in certified payroll. If the Contractor's production is not impacted by the temporary stoppage, no Standby Time compensation will be approved. Additional compensation for equipment Standby Time will only be authorized for impacted equipment that directly reduced the

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Contractor's production during the temporary stoppage. This compensation will be calculated using approved standby time rates.

3. Work is Started and Terminated for the Day:

   If the Contractor is directed to stop an element of work for the remainder of the day, additional compensation will be authorized for two (2) hours of impacted labor if, at the time of the stoppage, the impacted labor has worked six (6) hours or less for the day/night. For any stoppage after six (6) hours of work, additional compensation will be made for the difference between eight (8) hours and the actual time worked. Compensation for labor will be calculated based on hourly rates provided in certified payrolls. Additional compensation for equipment will be calculated in the same manner provided the OAR agrees that the lost equipment time reduced the Contractor's production for the shift. Compensation will be calculated using approved standby time rates.

4. Standby Time Documentation:

   For any component of authorized work temporarily stopped by the OAR due to the airfield operations, the Contractor shall complete the "Standby Time Work Report" form included in Section 01 21 00.01. At the end of the work shift the Contractor and OAR will verify the labor and equipment impacted, the duration of the temporary stoppage, and any materials determined to be discarded as a result of the temporary stoppage event.

3.05 COMPENSATION FOR STANDBY TIME

A. Compensation will be limited to the Contractor's labor and equipment costs and materials determined to be discarded or lost due to the event. Materials discarded due to delays or a work stoppage event which qualify as Standby Time based on the criteria herein, will be compensated at the discretion of the Owner based on the determination of the OAR. All compensation requests must be documented on the "Standby Time Work Report" form in Section 01 21 00.01. In calculating compensation for Standby Time, the OAR will not authorize any Contractor or Subcontractor mark up on materials, labor, or equipment.

3.06 ADDITIONAL CONTRACT TIME

A. Additional Contract Time will be allowed for any Working Day during which all the following criteria are met:

   1. The impacted work was scheduled by the Contractor and authorized by the OAR.
   2. The Contractor can demonstrate that the impacted work is critical to meeting one or more of the Contract Milestones in the Project Schedule or construction phase durations.
   3. The temporary work stoppage impacts more than four (4) hours of scheduled work.
   4. The Contractor submits a written request in accordance with Part 1 - General Provisions 80-9 "DETERMINATION AND EXTENSION OF CONTRACT TIME", requesting that additional Calendar Days be added to the Contract Time.

3.07 BASIS OF PAYMENT

A. Payment will be made on a time and material basis as specified above and supported by a completed "Standby Time Work Report."

- END OF SECTION -

Part III - Technical Specification Book V4.3

SECTION: 01 21 00.01
STANDBY TIME WORK REPORT

☐ CONSTRUCTION INSPECTOR
☐ CONSTRUCTION MANAGER
☐ CONTRACTOR

Dallas-Fort Worth International Airport

DATE OF WORK _____

Work Report #_____

STANDBY TIME WORK REPORT

WORK REPORTS TO BE COMPLETED DAILY WHEN EXTRA WORK (AUTHORIZED OR UNAUTHORIZED) IS IN PROGRESS.
FORM SHALL BE SUBMITTED TO THE CONSTRUCTION MANAGER FOR SIGNATURE DURING THE DAY FOLLOWING SUCH WORK.

CONTRACT NO _____

CONTRACT NAME _____

GENERAL CONTRACTOR

WORK DESCRIPTION, LOCATION

SUBCONTRACTOR

LABOR / PERSONNEL			EQUIPMENT USED	
NAME	**CLASSIFICATION**	**HRS**	**TYPE - MANUFACTURER - CAPACITY**	**HRS**
			MATERIAL USED	
			FULL DESCRIPTION	**QTY**
TOTAL LABOR / PERSONNEL				

CORRECT AS TO TIME, MATERIALS AND EQUIPMENT

Contractor DATE

SUBMITTED

Construction Manager DATE

- END OF SECTION -

Part III - Technical Specification Book V4.3

SECTION: 01 22 00

MEASUREMENT AND PAYMENT

PART 1 – GENERAL

1.01 SUMMARY

A. Measurement and payment shall conform to the provisions of Contract Documents, including Special Provisions, Project Requirements, and Technical Specifications.

B. This Section includes Administrative, measurement and procedural requirements for unit prices and lump sum.

1.02 RELATED REQUIREMENTS

A. General Provisions

B. Special Provisions

C. 01 11 00 Summary of Work

D. 01 29 73 Schedule of Values

E. 01 30 00 Allowances

F. 01 32 16 Schedules

G. 01 71 13 Mobilization

H. 01 77 00 Closeout Procedures

I. 32 92 19 Seeding and Sodding

1.03 DEFINITIONS

A. Contract Unit Price is an amount the Contractor included on the Bid Form, as the price per unit of measurement for an item of Work required by and pursuant to the Contract Documents.

B. Lump Sum Price is an amount the Contractor included on the Bid Form, for the Work pursuant to the Contract Documents.

C. The Owner's Authorized Representative (OAR) will be responsible for the approval of measurement and payment for all items.

1.04 PROCEDURES

A. All Contract Unit Prices will be full compensation for furnishing all materials, for preparing and placing these materials, and for all labor, supervision, equipment, tools and incidentals necessary to complete the item of work. All Contract Unit prices will include delivery, installation, insurance, applicable taxes, fees, overhead and profit.

B. Payment for Unit Price: Refer to paragraph 3.02 and description herein for Scope of Work for the various unit price items. The quantities indicated in the Schedule of Work and Prices are approximate only and not guaranteed to be correct. The Contractor will only be compensated for actual constructed quantities pursuant to the Contract Documents.

C. Payment for Lump Sum: Contractor shall submit an itemized cost breakdown into major components of work of all Lump Sum Values and total amount to the OAR for review within fourteen (14) calendar days after award of Notice to Proceed (NTP). The OAR will review and approve the itemized cost breakdown. The approved cost breakdown schedule (Schedule of Values) will be the basis for determining the value of the monthly progress payment, unless otherwise stated herein. The Schedule of Values must be approved prior to the first application for payment.

Part III - Technical Specification Book V4.3

D. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured by its own surveyor, at Owner's expense.

E. Measurement of Quantities for Unit Pricing: Unless otherwise specified, all units shall be "accepted, in-place quantities."

1. General: Unless otherwise specified, quantities of work shall be determined from measurements or dimensions in horizontal planes. However, linear quantities of pipe, piling and fencing shall be considered as being the true length measured along the longitudinal axis.
2. Unless otherwise provided in the Contract, volumetric quantities shall be the product of the mean area of vertical or horizontal sections and the intervening horizontal or vertical dimension.
3. Methods of Measurement: Materials and items of work which are to be paid for on the basis of measurement shall be measured in accordance with methods stipulated in the particular sections involved.
4. Certified Weights: When payment is to be made on the basis of weight, the weighing shall be done on certified platform scales or, when approved by the OAR, on a completely automated weighing and recording system. The Contractor shall furnish the OAR with duplicate licensed weigh master's certificate showing actual net weights. The OAR will accept the certificates as evidence of delivered weights.
5. List of Contract Unit Price items: A list of unit price items is included below. Specifications referenced in the schedule contain requirements for materials described under each unit price.
6. No adjustments will be made to the established contract unit prices for work performed at night or work requiring multiple mobilizations to facilitate the suggested construction phasing.
7. Removal of any material not accepted by the OAR or any excess materials not used by the Contractor must be measured prior to removal and disposal off-site. Material may not be discarded on the Airport site without OAR approval. This is subsidiary to the various bid items of the project, unless otherwise noted.
8. For any work required by the Contract Documents for which no specific Contract Unit Price item is listed herein or in the Schedule of Work and Prices, shall be considered subsidiary or incidental to the work of other listed Contract Unit Price items and no separate payment will be made to the Contractor for compensation of this required work.
9. Lump Sum Items in Unit Price Contracts: Items, for which quantities are indicated "Lump Sum," or "LS," shall be paid for at the price indicated in the Contract. Such payment shall be full compensation for the items of work and all work appurtenant thereto.

PART 2 – PRODUCTS

Not Used.

PART 3 – MEASUREMENT AND PROCEDURES

Item – Mobilization

Spec Ref.: 01 71 13

Description: Mobilization of equipment, personnel, material, supplies, tools, and all other resources necessary prior to beginning the Work.

Part III – Technical Specification Book V4.3

Measurement : LS

Item - Skidata System
Spec Ref.: 11 12 00
Description: Furnish and install electrical and low voltage components, devices, and accessories for fully functional Skidata system. System to be installed and configured by certified Skidata installer.
Measurement : EA

Item - #8 AWG Copper Conductors
Spec Ref.: 26 05 19
Description: Furnish and install electrical conductors, except conductors specifically covered by other Items.
Measurement : LF

Item - #6 AWG Copper Conductors
Spec Ref.: 26 05 19
Description: Furnish and install electrical conductors, except conductors specifically covered by other Items.
Measurement : LF

Item - #4 AWG Copper Conductors
Spec Ref.: 26 05 19
Description: Furnish and install electrical conductors, except conductors specifically covered by other Items.
Measurement : LF

Item - 2" PVC Schedule 40
Spec Ref.: 26 05 33
Description: Furnish and install conduit.
Measurement : LF

Item - 1" PVC Schedule 40
Spec Ref.: 26 05 33
Description: Furnish and install conduit.
Measurement : LF
Item - Precast Concrete Handholes and boxes
Spec Ref.: 26 05 43
Description: Furnish and install factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.
Measurement : EA

Item - Lighting Fixture (NV-2-T3-128L-7-35K-UNV-MOUNTING-COLOR-CONTROLS-OPTIONS) (TYPES: A1,A1-G,A2,A2-G)
Spec Ref.: 26 56 19

Part III - Technical Specification Book V4.3

Description: Furnish and install electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by qualified testing agency, and marked for intended location and application.
Measurement : EA

Item - Lighting Fixture (NV-2-T2-128L-7-35K-UNV-MOUNTING-COLOR-CONTROLS-OPTIONS) (TYPE:B1)
Spec Ref.: 26 56 19
Description: Furnish and install electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by qualified testing agency, and marked for intended location and application.
Measurement : EA

Item - Lighting Fixture NV-2-T4-128L-7-35K-UNV-MOUNTING-COLOR-CONTROLS-OPTIONS) (TYPE:C1-G)
Spec Ref.: 26 56 19
Description: Furnish and install electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by qualified testing agency, and marked for intended location and application.
Measurement : EA

Item - Opticom System
Spec Ref.: 27 00 00
Description: Furnish and install electrical and low voltage components, devices, and accessories for fully functional Opticon system. System to be installed and configured by certified opticon installer.
Measurement : EA

Item - Outdoor Telecommunications Cabinet
Spec Ref.: 27 05 28
Description: Construct, furnish, and install conduits, fittings, cables, wireways, pathways, boxes, enclosures, cabinets, handholes and boxes.
Measurement : EA

Item - Cabinet Ground Cabling (#6)
Spec Ref.: 27 05 28
Description: Construct, furnish, and install conduits, fittings, cables, wireways, pathways, boxes, enclosures, cabinets, handholes and boxes.
Measurement : LF

Item – Gantry
Spec Ref.: 27 05 28
Description: Construct, furnish, and install conduits, fittings, cables, wireways, pathways, boxes, enclosures, cabinets, handholes and boxes.
Measurement : EA

Part III - Technical Specification Book V4.3

Item - 3/4" Conduit
Spec Ref.: 27 05 28
Description: Construct, furnish, and install conduits, fittings, cables, wireways, pathways, boxes, enclosures, cabinets, handholes and boxes.
Measurement : LF

Item - 1" Conduit
Spec Ref.: 27 05 28
Description: Construct, furnish, and install conduits, fittings, cables, wireways, pathways, boxes, enclosures, cabinets, handholes and boxes.
Measurement : LF

Item - 1-1/2" Conduit
Spec Ref.: 27 05 28
Description: Construct, furnish, and install conduits, fittings, cables, wireways, pathways, boxes, enclosures, cabinets, handholes and boxes.
Measurement : LF

Item - 2" Conduit
Spec Ref.: 27 05 28
Description: Construct, furnish, and install conduits, fittings, cables, wireways, pathways, boxes, enclosures, cabinets, handholes and boxes.
Measurement : LF

Item - Cat6 Data Cabling
Spec Ref.: 27 13 13
Description: Furnish and install twisted cabling.
Measurement : LF

Item - Single Mode Indoor/Outdoor Rated Fiber
Spec Ref.: 27 13 23
Description: Furnish and install communication optical fiber cabling.
Measurement : LF

Item - Preparing ROW
Spec Ref.: Item 100 Preparing Right of Way *(TxDOT)*
Description: Prepare the right of way and designated easements for construction operations by removing and disposing of all obstructions when removal of such obstructions is not specifically shown on the plans to be paid by other Items.
Measurement : STA

Part III - Technical Specification Book V4.3

Item - Preparing ROW (Tree) (36" to 48" Diameter)
Spec Ref.: Item 100 Preparing Right of Way *(TxDOT)*
Description: Prepare the right of way and designated easements for construction operations by removing and disposing of all obstructions when removal of such obstructions is not specifically shown on the plans to be paid by other Items.
Measurement : EA

Item - Remove Concrete (Pavement) (Bridge)
Spec Ref.: Item 104 Removing Concrete *(TxDOT)*
Description: Break, remove, and salvage or dispose of existing hydraulic cement concrete.
Measurement : SY

Item - Remove Concrete (Sidewalk, ramp or sup)
Spec Ref.: Item 104 Removing Concrete *(TxDOT)*
Description: Break, remove, and salvage or dispose of existing hydraulic cement concrete.
Measurement : SY

Item - Remove Concrete (Curb)
Spec Ref.: Item 104 Removing Concrete *(TxDOT)*
Description: Break, remove, and salvage or dispose of existing hydraulic cement concrete.
Measurement : LF

Item - Removing Concrete (Pavement)
Spec Ref.: Item 104 Removing Concrete *(TxDOT)*
Description: Break, remove, and salvage or dispose of existing hydraulic cement concrete.
Measurement : SY

Item - Removing Concrete (Curb and Gutter)
Spec Ref.: Item 104 Removing Concrete *(TxDOT)*
Description: Break, remove, and salvage or dispose of existing hydraulic cement concrete.
Measurement : LF

Item - Remove (6"-10") Treated/Untreated Base and Asphalt Pavement
Spec Ref.: Item 105 Removing Treated and Untreated Base and Asphalt Pavement *(TxDOT)*
Description: Break, remove, and store or dispose of existing asphalt pavement, including surface treatments, and treated or untreated base materials.
Measurement : SY

Item – Embank (FNL)(DC)(TY C)
Item – Embank (FNL)(DC)(TY C1)
Spec Ref.: Item 132 Embankment *(TxDOT)*

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Description: Furnish, place, and compact materials for construction of roadways, embankments, levees, dikes, or any designated section of the roadway where additional material is required.
Measurement : CY

Item - Compost Manufactured TopSoil (4")
Spec Ref.: Item 161 Compost *(TxDOT)*
Description: Furnish and place compost as shown on the plans.
Measurement : SY

Item – Block sodding
Spec Ref.: Item 162 Sodding for Erosion Control *(TxDOT)*
Description: Provide and install grass sod as shown on the plans or as directed.
Measurement : SY

Item - Vegetative Watering
Spec Ref.: Item 168 Vegetative Watering *(TxDOT)*
Description: Provide and distribute water to promote growth of vegetation as directed.
Measurement : TGL

Item - Irrigation System
Spec Ref.: Item 170 Irrigation System *(TxDOT)*
Description: Furnish and install an irrigation system as shown on the plans.
Measurement : LS

Item - Irrigation System Operation and Maintenance
Spec Ref.: Item 193 Landscape Establishment *(TxDOT)*
Description: Establish landscape plantings and maintain landscaped areas at designated locations.
Measurement : MO

Item - Proof Rolling
Spec Ref.: Item 216 Proof Rolling *(TxDOT)*
Description: Proof-roll earthwork, base, or both to locate unstable areas.
Measurement : HR

Item - Flexible Base (CIP) (Type A Grade 1-2) (8”)
Item - Flexible Base (CIP) (Type A Grade 1-2) (Final Position)
Spec Ref.: Item 247 Flexible Base *(TxDOT)*
Description: Construct a foundation course composed of flexible base.
Measurement : CY

Item - Flexible Base (CIP) (Type A Grade 1-2) (8”)
Spec Ref.: Item 247 Flexible Base *(TxDOT)*

Part III - Technical Specification Book V4.3

Description: Construct a foundation course composed of flexible base.
Measurement : SY

Item - Prime Coat (AE-P)
Spec Ref.: Item 310 Prime Coat *(TxDOT)*
Description: Prepare and treat existing or newly constructed surface with an asphalt binder or other specialty prime coat binder material. Apply blotter material as required.
Measurement : GAL

Item - D-GR HMA TY-B PG64-22
Spec Ref.: Item 341 Dense-Graded Hot-Mix Asphalt *(TxDOT)*
Description: Construct a hot-mix asphalt (HMA) pavement layer composed of a compacted, dense-graded mixture of aggregate, asphalt binder, and additives mixed hot in a mixing plant.
Measurement : TON

Item - Concrete Pavement (CRCP) (12")
Item - Concrete Pavement (CRCP) (HES)(12")
Spec Ref.: Item 360 Concrete Pavement *(TxDOT)*
Description: Construct hydraulic cement concrete pavement with or without curbs on the concrete pavement.
Measurement : SY

Item – Full depth repair CRCP (6”)
Spec Ref.: Item 361 Repair of Concrete Pavement *(TxDOT)*
Description Repair concrete pavement to half-depth or full-depth in accordance with the details shown on the plans and the requirements of this Item.
Measurement : CY

Item - Structure Excavation
Spec Ref.: Item 400 Excavation and Backfill for Structures *(TxDOT)*
Description: Excavate for placement and construction of structures and backfill structures. Cut and restore pavement.
Measurement : CY

Item - Flowable Backfill
Spec Ref.: Item 401 Flowable Backfill *(TxDOT)*
Description: Furnish and place flowable backfill for trench, hole, or other void.
Measurement : CY

Item - CIPP (Drainage Structures) (ID=18")
Item - CIPP (Drainage Structures) (ID=21")
Item - CIPP (Drainage Structures) (ID=24")
Spec Ref.: Item 4023 Cured-in-Place Pipe (CIPP) (Drainage Structures) *(TxDOT)*

Part III - Technical Specification Book V4.3

Description: Reconstruct existing cross-drainage structures by forming a new pipe within an existing deteriorated structure, which has generally maintained its original shape.
Reconstruct the pipes by installing thermosetting resin-impregnated flexible felt fiber tube, coated on one side with an elastomeric coating, installed within the existing line pipe, using a water column or other approved method. Cure by circulating hot water, applying steam, or other approved methods throughout the length of the installed tube to cure the thermosetting resin into a hard, impermeable pipe with the elastomeric coating on the inside surface of the new pipe. Provide a cured-in-place pipe (CIPP) extending the full length of the original pipe, which is structurally sound, jointless, and close-fitting.
Measurement : LF

Item – Temporary special shoring
Spec Ref.: Item 403 Temporary Special Shoring *(TxDOT)*
Description: Furnish and install temporary shoring to hold the surrounding earth, water, or both out of the work area.
Measurement : CY

Item – Drilled shaft (18in)
Item – Drilled shaft (30in)
Spec Ref.: Item 416 Drilled Shaft Foundations *(TxDOT)*
Description: Construct foundations consisting of reinforced or non-reinforced concrete drilled shafts.
Measurement : LF

Item – Cl A Conc (flume)
Spec Ref.: Item 420 Concrete Substructures *(TxDOT)*
Description: Construct concrete substructures including footings, columns, caps, abutments, piers, culverts, other bridge substructure elements, and other concrete structures as indicated.
Measurement : CY

Item – Approach slab
Spec Ref.: Item 422 Concrete Superstructures *(TxDOT)*
Description: Construct reinforced concrete bridge slabs, decks, flat slabs, slab and girder units (pan formed), approach slabs, or other bridge superstructure elements as indicated.
Measurement : CY

Item – Retaining Wall (Cast-in-Place)
Spec Ref.: Item 423 Retaining Walls *(TxDOT)*
Description: Furnish, construct, and install retaining walls.
Measurement : SF

Item - Concrete Paint Finish
Spec Ref.: Item 427 Surface Finishes for Concrete *(TxDOT)*
Description: Finish concrete surface as specified.

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Measurement : SF

Item - Concrete Structure Repair (Epoxy Mortar)
Item - Concrete Structure Repair (Part Depth)
Item - Concrete Structure Repair (Vertical & Overhead)
Spec Ref.: Item 429 Concrete Structure Repair *(TxDOT)*
Description: Remove and repair unsound, delaminated, or spalled concrete.
Measurement : SF

Item - Riprap (Conc) (4 in)
Item - Riprap (Mow Strip) (4 in)
Item - Riprap (Stone protection)(12")
Spec Ref.: Item 432 Riprap *(TxDOT)*
Description: Furnish and place concrete, stone, cement-stabilized, or special riprap.

Item - Cleaning and Sealing Existing Joints
Item - Cleaning Existing Joints
Spec Ref.: Item 438 Cleaning and Sealing Joints *(TxDOT)*
Description: Clean and seal joints in new or existing rigid concrete pavements and bridge decks. Resize joints in rigid concrete pavements and approach slabs as shown on the plans.
Measurement : LF

Item - Structural Steel (Misc Non-Bridge)
Spec Ref.: Item 442 Metal for Structures *(TxDOT)*
Description: Provide structural steel, high-strength bolts, forgings, steel castings, iron castings, wrought iron, steel pipe and tubing, aluminum castings and tubing, or other metals used in structures, except reinforcing steel and metal culvert pipe.
Measurement : LB

Item - Clean & Paint Existing Structure (System I)
Spec Ref.: Item 446 Field Cleaning and Painting Steel *(TxDOT)*
Description: Prepare steel surfaces for painting and apply paint.
Measurement : LS

Item - Anchor Bolts
Spec Ref.: Item 449 Anchor Bolts *(TxDOT)*
Description: Fabricate and install anchor bolts to be embedded in or attached to concrete. Anchor bolts are also referred to as anchor rods.
Measurement : EA

Part III - Technical Specification Book V4.3

Item - Rail (TY T551)(HPC)
Spec Ref.: Item 450 Railing *(TxDOT)*
Description: Construct railing of concrete, steel, aluminum, or a combination of these materials, including necessary anchorage for the railing on bridges, culverts, walls, or other structures as shown on the plans.
Measurement : LF

Item - Reinforced Concrete Pipe (CL III) (18"")
Spec Ref.: Item 464 Reinforced Concrete Pipe *(TxDOT)*
Description: Furnish and install reinforced concrete pipe, materials for precast concrete pipe culverts, or precast concrete storm drain mains, laterals, stubs, and inlet leads.
Measurement : LF

Item - Manh (Complete) (PRM)(48”)
Item - Inlet (Complete) (PCO) (5') (None)
Item - Inlet (Complete) (AD-2) (FTW)
Spec Ref.: Item 465 Junction Boxes, Manholes, and Inlets *(TxDOT)*
Description: Construct junction boxes, manholes, and inlets, complete in place or to the stage detailed, including furnishing and installing frames, grates, rings, and covers.
Measurement : EA

Item - Remove Structure (Retaining Wall)
Spec Ref.: Item 496 Removing Structures *(TxDOT)*
Description: Remove and either dispose of or salvage structures.
Measurement : LF

Item - Barricades, Signs and Traffic Handling
Spec Ref.: Item 502 Barricades, Signs, and Traffic Handling *(TxDOT)*
Description: Provide, install, move, replace, maintain, clean, and remove all traffic control devices shown on the plans and as directed.
Temporary work zone (TWZ) traffic control devices manufactured after December 31, 2019, must have been successfully tested to the crashworthiness requirements of the 2016 edition of the AASHTO Manual for Assessing Safety Hardware (MASH). An exception to the manufacture date applies when, based on the project’s date of letting, a category of MASH-2016 compliant TWZ traffic control devices was not approved, or was not self-certified. In such case, devices that meet NCHRP-350 or MASH-2009 may be used. Temporary work zone (TWZ) traffic control devices manufactured on or before December 31, 2019, must at a minimum have been successfully tested to the crashworthiness requirements of NCHRP-350 or MASH-2009. These devices may continue to be used throughout their normal service lives.
Measurement : MO

Item - Temporary Sediment Control Fence (Install)
Item - Temporary Sediment Control Fence (Remove)
Item - Biodegradable Erosion Control Logs (Install) (12")

Part III - Technical Specification Book V4.3

Item - Biodegradable Erosion Control Logs (Remove)
Spec Ref.: Item 506 Temporary Erosion, Sedimentation,
and Environmental Controls *(TxDOT)*
Description: Install, maintain, and remove erosion, sedimentation, and environmental control measures to prevent or reduce the discharge of pollutants and protect environmental resources in accordance with the Stormwater Pollution Prevention Plan (SWP3) and environmental layout shown on the plans. Comply with Texas Pollutant Discharge Elimination System (TPDES) Construction General Permit (CGP) TXR150000 requirements. Control measures are defined as Best Management Practices (BMPs) used to prevent or reduce the discharge of pollutants and measures to protect environmental resources. Control measures include, but are not limited to, rock filter dams, temporary pipe slope drains, temporary paved flumes, construction exits, earthwork for erosion control, pipe, construction perimeter fence, sandbags, temporary sediment control fence, biodegradable erosion control logs, vertical tracking, temporary or permanent seeding, and other measures. Erosion and sediment control devices must be selected from the Erosion
Control Approved Products List. Perform work in a manner to prevent degradation of receiving waters, protect environmental resources, facilitate project construction, and comply with applicable federal, state, and local regulations. Ensure the installation and maintenance of control measures are performed in conformance with the manufacturers or designer's specifications.
Measurement : LF

Item - Concrete Curb (Type II)
Item - Concrete Curb (Type IIA)
Item - Concrete Curb (Monolithic) (Type II)
Spec Ref.: Item 529 Concrete Curb, Gutter, and Combined Curb and Gutter *(TxDOT)*
Description: Construct hydraulic cement concrete curb, gutter, and combined curb and gutter.
Measurement : LF
Item - Driveways (Concrete)
Spec Ref.: Item 530 Intersections, Driveways, and Turnouts *(TxDOT)*
Description: Construct and pave intersections, driveways, and turnouts. Pave existing intersections, driveways, and turnouts.
Intersections are considered areas off the travel lanes and shoulders of the Contract highway on the intersecting highway on the state system. The intersecting on-system highway work will be paid for under this Item only when shown on the plans.
Driveways are defined as private (residential or commercial) and public (county road and city street) access areas off the travel lanes and shoulders.
Turnouts include, but are not limited to, mailbox and litter barrel widenings.
Measurement : SY

Item - Concrete Sidewalks (5")
Spec Ref.: Item 531 Sidewalks *(TxDOT)*
Description: Construct hydraulic cement concrete sidewalks, Americans with Disabilities Act ramps, and steps.
Measurement : SY

Part III - Technical Specification Book V4.3

Item - Concrete Median
Spec Ref.: Item 536 Concrete Medians and Directional Islands *(TxDOT)*
Description: Construct cast-in-place concrete medians and directional islands.
Measurement : SY

Item - Metal W-Beam Guard Fence (Steel Post) (Median Barrier)
Item - Metal Beam Guard Fence Transition (Thrie-Beam)
Item - Metal Beam Guard Fence (W-Beam) (Median Barrier)
Spec Ref.: Item 540 Metal Beam Guard Fence *(TxDOT)*
Description: Furnish, install, replace, or adjust metal beam guard fence consisting of metal beam rail elements, hardware,
blocks, and support posts.
Measurement : LF

Item - Remove Metal Beam Guard Fence
Item - Remove Metal Beam Guard Fence Transition (Thrie-Beam)
Spec Ref.: Item 542 Removing Metal Beam Guard Fence *(TxDOT)*
Description: Remove existing metal beam guard fence and store at locations shown on the plans or as directed.
Measurement : LF

Item - Guardrail End Treatment (Install)
Item - Guardrail End Treatment (Remove)
Spec Ref.: Item 544 Guardrail End Treatments *(TxDOT)*
Description: Furnish and install, move, or remove guardrail end treatments.
Measurement : EA

Item – Chain Link fence (Repair)(6')
Item - Chain Link fence (Remove)
Spec Ref.: Item 550 Chain Link Fence *(TxDOT)*
Description: Furnish, install, remove, repair, or replace chain link fence and gates.
Measurement : LF

Item - Gate (Remove)
Spec Ref.: Item 550 Chain Link Fence *(TxDOT)*
Description: Furnish, install, remove, repair, or replace chain link fence and gates.
Measurement : EA

Item - Gate (Special)
Spec Ref.: Item 552 Wire Fence *(TxDOT)*
Description: Furnish and construct fence of barbed wire or a combination of woven fence fabric and barbed wire, supported on metal or wood posts.
Measurement : EA

Part III - Technical Specification Book V4.3

Item - Pipe Underdrains (Type 6) (6")
Spec Ref.: Item 556 Pipe Underdrains *(TxDOT)*
Description: Install pipe underdrains.
Measurement : LF

Item - Portable Changeable Message Sign
Spec Ref.: Item 6033 Portable Changeable Message Sign *(TxDOT)*
Description: Furnish, operate, and maintain portable trailer mounted changeable message sign (PCMS) units.
Measurement : EA

Item - Non-Intrusive Pave Condition & Temperature Sensor
Spec Ref.: Item 6058 Roadway Weather Information System *(TxDOT)*
Description: Furnish and install a Roadway Weather Information System (RWIS) to monitor weather conditions at the locations as shown on the project plans. The RWIS must include bridge deck pavement sensors; pavement sensors with integrated pavement temperature probes; and complete weather station to monitor wind information, air temperature humidity, and other items defined in this Item. The system must be specifically designed for monitoring and displaying pavement surface conditions, pavement temperature, freeze point temperature, pavement friction coefficient, and subsurface temperature. Nonintrusive sensors must be installed at the RWIS sites to monitor roadway surface status conditions, including dry, wet, chemical wet, ice watch, ice warning roadway temperature, and roadway grip or friction coefficient.
Measurement : EA

Item - Retroreflectorized Pavement Marking Type I (White) 4" (BRK) (060 MIL)
Item - Retroreflectorized Pavement Marking Type I (White) 8" (Solid) (100 MIL)
Item - Retroreflectorized Pavement Marking Type I (White) 12" (Solid) (100 MIL)
Item - Retroreflectorized Pavement Marking Type I (White) 24" (Solid) (100 MIL)
Item - Retroreflectorized Profile Pavement Marking Type I (White) 4" (Solid) (100 MIL)
Item - Retroreflectorized Profile Pavement Marking Type I (Yellow) 4" (Solid) (100 MIL)
Item - Pavement Sealer 4"
Item - Pavement Sealer 8"
Item - Pavement Sealer 12"
Item - Pavement Sealer 24"
Spec Ref.: Item 666 Retroreflectorized Pavement Markings *(TxDOT)*
Description: Furnish and place retroreflectorized or non-retroreflectorized (shadow) pavement markings.
Measurement : LF

Item - Retroreflectorized Pavement Marker Type II-C-R
Spec Ref.: Item 672 Raised Pavement Markers *(TxDOT)*
Description: Furnish and install raised pavement markers (RPMs).
Measurement : EA

Part III - Technical Specification Book V4.3

Item - Curb Inlet Sediment Protection
Spec Ref.: Item 7014 Curb Inlet Sediment Control Device *(TxDOT)*
Description: Install, maintain, and remove sediment control devices placed at the openings of curb inlets.
Measurement : LF

Item - Joint Cleaning and Sealing (LNGT CNSTR JTS)
Spec Ref.: Item 713 Cleaning and Sealing Joints and Cracks (Concrete Pavement) *(TxDOT)*
Description: Clean and seal joints and cracks in concrete pavement.
Measurement : LF

Item - Tree Removal (4" - 12" Dia)
Item - Tree Removal (30" - 36" Dia)
Spec Ref.: Item 752 Tree and Brush Removal *(TxDOT)*
Description: Remove and dispose of trees, brush, shrubs, and vines. Trim trees and shrubs. Remove stumps.
Measurement : EA

Item - Concrete Rail Repair (In-Kind)
Spec Ref.: Item 778 Concrete Rail Repair *(TxDOT)*
Description: Repair or replace damaged concrete railing on bridges, culverts, parapet walls, retaining walls, or other structures as shown on the plans and as directed.
Measurement : LF

Item - Concrete Crack Repair (Discrete) (Inject)
Spec Ref.: Item 780 Concrete Crack Repair *(TxDOT)*
Description: Repair cracks in concrete members by epoxy injection, gravity filling, routing and sealing, or surface sealing.
Measurement : LF

Item - Clean Wall Weepholes
Spec Ref.: Item (TxDOT)
Description: Clean weepholes as specified in the plan.
Measurement : LS

PART 4 – EXECUTION

4.01 PROJECT SPECIFIC UPDATES

A. The specifications provided herein are examples listed in paragraph 3.02 and are intended to serve as a foundation for project-specific requirements. It is imperative that for each project, the entire specification document is meticulously reviewed and updated to align with the unique demands and intricacies of the given undertaking.

B. Project Team and stakeholders involved are hereby directed to consider the examples presented as illustrative, not prescriptive. The objective is to tailor the specifications

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comprehensively for each project, taking into account specific objectives, standards, and regulatory requirements.

C. Pay Items Inclusion: The responsibility lies with the project team to ensure that all pertinent Pay Items are identified and incorporated into the specification for comprehensive coverage. This includes a thorough examination of project nuances that might necessitate the addition of specific items not covered in the exemplar.

4.02 PROJECT PAY ITEMS ALIGNED WITH SCHEDULE OF VALUES

[ITEM NO 01 30 00, ALLOWANCES

A. Spec. Ref.: 01 30 00, Allowances

B. Description: This item is for completion of elements of the work that are within the general scope of work, but not shown in the plans or specified in the specification, as approved by the OAR through a Change Order

C. Measurement: Price quote and scope of work requested by the OAR for each Allowance item shall be provided to and approved by the OAR prior to the Contractor proceeding with such work.

D. Payment: Payment for this item will be made at the contract unit price per Allowance. which constitutes full compensation for furnishing all materials, for preparing and placing these materials, and for all labor, supervision, equipment, tools and incidentals necessary to complete this item.

E. Unit of Measurement: ..... Allowance Amount (AL)]

[ITEM NO 01 71 13. MOBILIZATION

A. Spec. Ref.: 01 71 13, Mobilization

B. Description: See reference specification 01 71 13.

C. Measurement:

1. Measurement of the item "Mobilization" will be by the "Lump Sum," as the Work progresses as specified in the Contract.

D. Payment:

1. When one percent (1%) of the Contract Amount has been earned by the Contractor, fifty percent (50%) of the Mobilization Pay Item or five percent (5%) of the total Contract Amount, whichever is less, will be paid. Previous payments under this item will be deducted from this amount.
2. When five percent (5%) of the Contract Amount has been earned, seventy five percent (75%) of the Mobilization Pay Item, or ten percent (10%) of the total Contract Amount, whichever is less will be paid. Previous payments under this item will be deducted from this amount.
3. When ten percent (10%) of the Contract Amount is earned, ninety percent (90%) of the Mobilization Pay Item or fifteen percent (15%) of the total Contract Amount, whichever is less, will be paid. Previous payments under this item will be deducted from this amount.
4. Upon completion of all Work under this Contract, payment for remainder of the Mobilization Pay Item will be paid.

E. Unit of Measurement: ..... Lump Sum (LS)]

[ITEM NO 32 92 19. SEEDING AND SODDING

A. Spec. Ref.: 32 92 19, Seeding and Sodding

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B. Description: See reference specification 32 92 19.

C. Measurement:

1. The area to be seeded/sodded is measured by the square yard/acre as indicated by the limits of disturbance on the design plans. Any additional area of disturbance will be seeded/sodded by the Contractor at no additional cost to the Owner.
2. Seed is measured by the square yard or by the acre.
3. Sod is measured by the square yard in its final position.
4. Fertilizer is measured by the acre of surface area covered or by the ton (2,000 lb.) Measurement by ton will use guaranteed weight of bags or containers as shown by the manufacturer.
5. Hydro mulch or straw mulch is measured by the square yard or by the acre.
6. Tackifier is measured by the acre.
7. Soil retention blanket is measured by the square yard of surface area covered.

D. Payment:

1. Unit Price Contracts
   a. The Contractor will be paid for 90% of the sod installed during the monthly estimate period based on the actual quantities installed using the unit price amount for the pay item. The remaining 10% will be paid once the owner has made final acceptance of the sodded areas. The unit price bid is full compensation for securing a source, excavation, loading, hauling, rolling, finishing, furnishing materials, equipment, labor, tools, supplies, and incidentals. Sod is under warranty for one year after final stabilization is achieved.
   b. The contractor will be paid for 75% of the seeding installed during the monthly period based on the actual quantities installed using the unit price amount for the pay item. The remaining 25% will be paid once the owner had made final acceptance of the seeded areas.
   c. Fertilizer is considered subsidiary to the seed and sod bid items of the contract. Work performed, materials furnished, equipment, labor, tools, and incidentals will not be paid for directly unless otherwise specified in the contract.
   d. The contractor will be paid for 100% of Hydro mulch or straw mulch installed during the monthly estimate period based on the actual quantities installed using the unit price amount for the pay item.
   e. Tackifier is considered subsidiary to the Hydro mulch or straw mulch bid items of the contract. Work performed, materials furnished, equipment, labor, tools, and incidentals will not be paid unless otherwise specified in the contract.
   f. The Contractor will be paid for 100% of the erosion blanket installed during the monthly estimate period based on the actual quantities installed using the unit price amount for the pay item.
   g. Protective barriers, mowing and other maintenance activities are considered subsidiary to the seed or sod unit price. Work performed, materials furnished, equipment, labor, tools, and incidentals will not be paid for directly unless otherwise specified in the contract.
   h. 100% payment will be made for Seeding and Sod if transfer to DFW as accepted per terms in 32 92 19, 3.05.
2. Lump Sum Contracts
   a. The Contractor will be paid for 90%, less applicable retainage, of the sod installed during the monthly pay application period based on the approved Schedule of

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Values. The remaining 10% will be paid once Final Stabilization of the sodded areas is achieved. Sod that is placed during the cool season will require an inspection in the warm season to confirm viability for final stabilization. Areas where sod has failed to thrive shall be replaced with living green sod at the contractor's expense.

b. The Contractor will be paid for 75%, less applicable retainage, of the seeding installed during the monthly pay period based on the percentage of work installed assessed against the approved Schedule of Values pay item. The remaining 25% will be paid once final stabilization of the seeded areas is achieved.

c. 100% payment will be made for Seeding and Sod if transfer to DFW as accepted per terms in 32 92 19, 3.05.

E. Unit of Measurement: ..... To be Defined]

- END OF SECTION -

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SECTION: 01 25 13

PRODUCT SUBSTITUTION PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

A. This Section covers the requirements for Contractor requests for a product Substitution on the Project.

1.02 DEFINITIONS

A. Substitution: A request for a change in a product, material, equipment and/or method of construction required by Contract Documents after Contract Award are considered a Substitution. The following do not qualify as a Substitution:

1. A Substitution requested by Bidders during the bidding period, and accepted prior to Award, is considered as included in the Contract Documents, and is not subject to requirements specified in this Section.
2. Specified options of products and construction methods included in the Contract Documents.
3. Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.03 CONTRACTOR'S REPRESENTATION

A. A request for Substitution is a representation that the Contractor:

1. Has investigated proposed product and has determined that it is equal to or superior in all respects to that specified in the Contract Documents.
2. Will provide the same or better warranties or bonds for substitution as for product specified in the Contract Documents.
3. Will coordinate the installation of the accepted substitution into the Work and will make such changes as may be required for the Work to be complete in all respects.
4. Waives claims for any additional costs caused by the Substitution, which may subsequently become apparent.
5. Has provided complete cost data which includes related costs under this Contract but not costs under separate contracts.

1.04 OWNER’S DUTIES

A. The Owner, either directly or through an Owner’s Authorized Representative (OAR), will determine the acceptability of proposed substitutions.

B. The Owner and/or OAR will review the Contractor's request for a Substitution with reasonable promptness.

C. The OAR will notify the Contractor, in writing, of the decision to accept or reject the request for a Substitution.

D. The Owner or the Architect/Engineer review, acceptance, or failure to take exceptions to a Substitution or other review document, shall not relieve the Contractor of the responsibility for the Substitution meeting performance or other requirements of Contract Documents.

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PART 2 – PRODUCTS

2.01 SUBSTITUTIONS

A. Contractor's Options:

1. For products specified only by reference or performance standards, select any approved product and manufacturer meeting that standard.
2. For products specified by naming several products or manufacturers, select any approved product and named manufacturer which complies with the Specifications.
3. For products specified by naming one or more products and manufacturers, there is no option, unless a Substitution is approved.

B. The OAR will consider a request from the Contractor for a Substitution of a product in place of the one specified only on the Product Substitution Form included in Section 01 25 13.01.

C. Within a period of 30 Calendar Days after Award of the Contract or respective subcontract, the OAR will consider formal requests from Contractor for Substitutions in place of the products specified in the Contract Documents. After the end of that period, Substitution requests will be considered only if specified product is no longer manufactured.

D. Substitutions will only be considered when the Contractor can demonstrate to the satisfaction of the OAR that the request for a substituted product is reasonable for the Project.

E. The Contractor shall submit separate request for each Substitution, supported with complete data, drawings and appropriate samples substantiating compliance of proposed substitution with Contract Documents, including:

1. Complete data substantiating compliance of the proposed Substitution meeting or exceeding the requirements in Contract Documents:
   a. Product identification, including manufacturer's name and address.
   b. Manufacturer's Literature: Identify with product description, reference standards, and performance and test data.
   c. Drawings, samples, as applicable.
   d. Name and address of similar projects on which product has been used, and date of each installation.
2. Itemized comparison of the proposed Substitution including its quantities with product specified and list significant variations.
3. Data relating to changes in Construction Schedule and indicating any impact of proposed Substitution on overall Contract Time.
4. Adjustment in Contract Amount for each Substitution.
5. Changes required in other elements of Work and to any construction performed by Owner or separate Contractors, if any, to accommodate the proposed Substitution.
6. Availability of maintenance service and source of replacement parts and materials, as applicable.
7. Provide test data from an independent testing laboratory to show compliance with performance characteristics specified in the Contract Documents as compared to the product to be replaced with the Substitution.
8. Designation of required license fees or royalties.

F. Properties including, but not limited to the following, will be considered as applicable:

1. Physical dimension requirements to satisfy space limitations.
2. Static and dynamic weight limitations, structural properties.

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3. Audible noise levels.
4. Vibration generation.
5. Interchangeability of parts or components.
6. Accessibility for maintenance, possible removal, or replacement.
7. Colors, textures, and compatibility with other materials, products, assemblies, and components.
8. Equipment capacities and performance characteristics.

G. A Substitution will not be considered for acceptance when:

1. Indicated or implied on shop drawings, or any product data submittal without a formal request from Contractor for a Substitution.
2. Requested directly by Subcontractor or supplier.
3. Acceptance will require substantial revision of Contract Documents or increase in the Contract Time.
4. Any increase in the Contract Amount.

H. The Contractor or any Subcontractor shall not order or install any substitute product without the written acceptance of the OAR.

I. The Contractor assumes full responsibility for justifying each Substitution And the decision of acceptance or rejection of proposed Substitution by the Owner will be final.

J. If a proposed Substitution is not accepted, the Contractor shall provide a specified product or material meeting the requirements of the Contract Documents.

K. The Contractor shall reimburse the Owner for any expenses incurred by Owner or the Architect/Engineer for modifications to the Contract Documents required by any Contractor requested Substitution accepted by the Owner.

PART 3 – EXECUTION

3.01 SUBSTITUTION REQUEST

A. The Contractor shall complete and submit a Product Substitution Form included in Section 01 25 13.01 for each proposed Substitution.

- END OF SECTION -

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SECTION: 01 25 13.01

PRODUCT SUBSTITUTION FORM

SUBSTITUTION REQUEST

CONTRACT NO.		**DATE:**	
CONTRACTOR:		**TECHNICAL SUBMITTAL NO.**	

Complete SPECIFIED and PROPOSED sections for each item as applicable.

PRODUCT DESCRIPTION

PROPERTY	SPECIFIED	PROPOSED
1. Manufacturer and model number		
2. Governing quality standards		
3. Appearance/finish		
4. Ease of operations		
5. Maintenance/useful life		
6. Source of maintenance service and replacement materials		
7. Suitability for climate and/or operating conditions		
8. Effect on schedule		
9. Other significant differences		
10. Changes required to other elements of work due to substitution		
11. Explanation of how substitution is beneficial		

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To: Construction Manager:								
Project Name:								
SPECIFIED ITEM:								
	Section	Page		Paragraph	Description			
The undersigned Contractor's Authorized Representative (CAR) requests consideration of the following:								
PROPOSED SUBSTITUTION:								
1.	Attached data include product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified, both on the proposed substitution and the original specified product.							
2.	Attached data also includes description of changes to Contract Documents, which the Substitution will require for its proper installation.							
The undersigned CAR states that the following paragraphs are correct, unless as are modified on the attachments.								
1.	The proposed Substitution does not affect dimensions in the Contract Documents.							
2.	The undersigned CAR agrees to pay for changes to the building design, including engineering design, detailing and construction costs caused by the Substitution.							
3.	The proposed Substitution will have no adverse effect other trades, the Construction Schedule, or specified warranty requirements.							
4.	Maintenance and service parts will be locally available for the proposed Substitution.							
The undersigned CAR further states that the function, appearance, and quality of the proposed Substitution are equivalent or superior to the specified item in the Contract Documents.								
5.	Cost Reduction to the Owner:	$						

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ACCEPTANCES:

1.	Contractor's Authorized Representative (CAR) Acceptance:					Representing:	
		Date:					
2.	Owner's Authorized Representative (OAR) Acceptance:					Representing:	
		Date:					
3.	Architect/Engineer Acceptance:					Representing:	
		Date:					

		Accepted as Noted	
		Not Accepted	
		Received too late	
		Resubmit with complete information	

- END OF SECTION -

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SECTION: 01 26 13

REQUEST FOR INFORMATION

PART 1 – GENERAL

1.01 SUMMARY

A. This Section covers the process for the Contractor to request clarification on the Project Documents through a Request for Information (RFI) during the Project.

1.02 GENERAL

A. An RFI is intended for the Contractor to request a clarification and/or interpretation of the Contract Documents due to an apparent inconsistency, error, or omission, or due to unanticipated existing conditions.

B. An RFI is not intended for by the Contractor to request substitutions, proposed changes to the Contract Documents, the resolution of any non-conforming work, or for general questions not related to the Contract Documents.

C. The RFI process is intended to be a cooperative effort between the Contractor, the Owner, and the Architect/Engineer to clarify ambiguities in the Contract Documents while maintaining the progress of the Work.

1.03 RFI NUMBERING

A. The Contractor shall number each RFI sequentially utilizing a three-digit code starting with “001” and continuing “002”, “003”, etc.

B. A resubmittal or revised RFI on the same subject shall be numbered utilizing the same three-digit code and including a letter suffix beginning with “A” and continuing sequentially. (e.g., The second revision to the second RFI would be numbered “002B”.) In such case, the previous edition of the RFI shall be acknowledged to be superseded and thereby closed in the description of revised RFI.

C. A three-digit alphanumeric prefix designation may be utilized on a large project, or a project involving numerous buildings or structures. (e.g., The second RFI on “Building A” could be “BDA-002”).

D. The Contractor shall consult with the Owner’s Authorized Representative (OAR), whether such prefix designation is required for the Project and shall maintain the prefix chosen unique designation for each building or structure consistent throughout the Project.

1.04 DOCUMENTATION

A. All notifications, documentation, and transmittals between the Contractor and the Owner’s personnel for the RFI process shall utilize the Unifier software application, unless the Owner for the Project directs an alternate form of transmission.

B. If an alternate form of transmission is directed for the Project, all notifications, documentation, and transmittals shall utilize that form of transmission.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 SUBMISSION

A. The Contractor shall submit an RFI to the OAR identifying the subject and providing all necessary reference information.

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B. The Contractor shall submit only a complete RFI including all attachments necessary to adequately explain the subject of the RFI.

C. The Contractor shall limit the RFI to only one (1) Contract Item or only one (1) Specification Section reference.

3.02 RESPONSE

A. The OAR will review the RFI to respond or forward to the Architect/Engineer or other Owner personnel for input or reject the RFI if it is determined to be incomplete.

B. The Architect/Engineer or other Owner personnel will review the RFI and provide a response to the OAR or request additional information to adequately review and respond to the RFI.

C. The OAR will forward the response or request additional information from the Contractor.

D. If the OAR requests additional information, the Contractor shall provide such information within [two (2) Calendar Days] unless otherwise allowed by the OAR.

E. If the Contractor does not provide the requested information within [two (2) Calendar Days], the OAR will close the RFI. In such a case, the Contractor may submit a new RFI concerning the subject matter when the requested information can be provided.

F. If the Contractor submits a new RFI concerning a previously rejected or closed RFI without the previously requested information, the RFI will be rejected by the OAR.

G. When the OAR returns the response to the Contractor, the RFI will be closed.

3.03 BUILDING INFORMATION MODELING RESPONSE

A. The CM will review the RFI to respond or forward to the Architect/Engineer or DFW BIM Group for input or reject the RFI if it is determined to be incomplete.

B. The Architect/Engineer or DFW BIM Group will review the RFI and provide a response to the CM or request additional information to adequately review and respond to the RFI.

C. The CM will forward the response or request additional information from the Contractor.

D. If the CM requests additional information, the Contractor shall provide such information within [two (2) Working Days] unless otherwise allowed by the CM.

E. If the Contractor does not provide the requested information within [two (2) Working Days], the CM will close the RFI. In such a case, the Contractor may submit a new RFI concerning the subject matter when the requested information can be provided.

F. If the Contractor submits a new RFI concerning a previously rejected or closed RFI without the previously requested information, the RFI will be rejected by the CM.

G. When the CM returns the response to the Contractor, the RFI will be closed.

- END OF SECTION -

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SECTION: 01 29 00

PAYMENT PROCEDURES

PART 1 – GENERAL

1.01 GENERAL

A. This Section covers the requirements for the Contractor to prepare and submit a Payment Application.

1.02 FORMAT

A. The Contractor shall use the pay request forms provided by Contract Administrator at the Project Pre-Construction Conference.

1. Part I – General Provisions
2. Part II – Special Provisions
3. 01 11 00 Summary of Work
4. 01 22 00 Measurement and Payment
5. 01 29 73 Schedule of Values
6. 01 30 00 Allowances
7. 01 32 16 Schedules
8. Airport Form E-184 – Construction Contract Pay Request
9. PPAR Form – Pay Period Activity Report
10. AIA Form 702
11. AIA Form 703

B. Adequate copies of the pay request forms may be obtained from the Owner's Authorized Representative (OAR).

1.03 PREPARATION OF PAY APPLICATIONS

A. The Contractor shall complete the required information on the appropriate pay request forms.

B. The forms shall be certified by signature of Contractor's Authorized Representative (CAR).

C. Prepare an application for final payment as specified in Part I – General Provisions.

1.04 SUBMITTAL PROCEDURES

A. Submit the signed copy of the pay request form electronically according to DFW's current submission procedure, and as documented during the Project Pre-Construction Conference.

1.05 SUBSTANTIATING DATA

A. When the Owner requires substantiating information, the Contractor shall submit data justifying line-item amounts in question.

B. The Contractor shall electronically provide one (1) copy of data with cover letter for each copy of the submittal. Show application number and date, and line item by number and description.

C. The current approved Cost Loaded Project Schedule, updated per specification section 01 32 16 Schedules, must be received and approved prior to the submittal of the Payment Application otherwise payment may be denied by the OAR.

D. The updated and approved BIM, per specification section 01 31 01 Building Information Modeling (BIM), as applicable on a project specific basis, must be approved prior to the submittal of the Payment Application otherwise payment may be denied by the OAR.

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E. Certified Payrolls and other documentation as required by Part I – General Provisions.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

- END OF SECTION -

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SECTION: 01 29 73

SCHEDULE OF VALUES

PART 1 – GENERAL

1.01 SUMMARY

A. This Section covers the procedures for the Contractor to prepare and submit a Schedule of Values (SOV) for all types of Contracts.

1.02 FORMAT

A. The SOV for review by the Owner's Authorized Representative (OAR).

B. The SOV shall be submitted in DFW's required format which will be provided by the Owner's Authorized Representative (OAR).

1.03 CONTENT

A. The Contractor shall:

1. Assign each major item a singular value as a separate line item to serve as a basis for computing values for Progress Payments. Assigned major items of work shall use the most current of either Uniformat 2010, MasterFormat, FAA or TxDOT coding structure as appropriate for identification.
2. Include any Allowances as a separate line item and coordinate the items with the Construction Schedule general activities.
3. List values for the cost of stored products including any taxes paid for items on which payments will be requested for stored products.
4. Ensure the sum of values listed equals the total Contract Amount.

1.04 SUBMITTAL

A. The Contractor shall submit digital copies of Schedule of Values (SOV) at the Pre-Construction Conference.

B. The SOV shall identify the Project by Title and Contract Number.

1.05 SUBSTANTIATING DATA

A. When the OAR requires substantiating information to support the SOV, the Contractor shall submit data justifying line-item amounts in question.

B. The Contractor shall provide one copy of data for each copy of the application. Show application number and date, and line item by number, specification number and description.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

- END OF SECTION -

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SECTION: 01 29 85

WAGE RATE REQUIREMENTS

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes the required forms and schedules necessary to meet the wage rate requirements for the Project.

1.02 FORMS

A. Labor Standards Interview – Standard Form 1445

B. Request for Authorization of Additional Classification and Rate - Standard Form 1444

C. General Wage Decision Rates for Tarrant and Dallas County, Texas

Building: https://sam.gov/wage-determination/TX20260270/0 and/or

Highway: https://sam.gov/wage-determination/TX20260294/0

1.03 WAGE RATES

A. United States Department of Labor (DOL) provides the required minimum wages and fringe benefits to be paid to all laborers and mechanics employed to work on this Contract, either directly under this Contract or under a related Subcontract. The Contractor and all Subcontractors are required to report the actual wages paid to laborers and mechanics performing work under this Contract. The reported wages will be verified by review of the weekly payroll reports and by periodic on-site interviews conducted by the Owner's Authorized Representative (OAR) using Labor Standards Interview - Standard Form 1445. The latest version of Standard Form 1445 may be obtained at: Labor Standards Interview | GSA

B. The Wage Determination establishes the minimum wages and fringe benefits to be paid to laborers and mechanics throughout the duration of this Contract. In no event shall these minimum wages be modified.

C. If the work specified in this Contract requires work performed by laborers or mechanics whose job classification is not listed in the Wage Determination, the Contractor is responsible for preparing the Request for Authorization of Additional Classification and Rate Standard (Form 1444) the latest version of Standard Form 1444 may be obtained at: Request for Authorization of Additional Classification and Rate | GSA

D. Additional copies of the latest Standard Form 1444 may also be obtained from the Owner's Authorized Representative (OAR). The Contractor must complete Items 3 through 15 on the form and submit the request to the OAR prior to issuance of the Notice to Proceed (NTP) or as soon as the need for the additional classification or rate is identified, if the work has been authorized to begin.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

- END OF SECTION -

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"General Decision Number: TX20260294 01/02/2026

Superseded General Decision Number: TX20250294

State: Texas

Construction Type: Highway

Counties: Collin, Dallas, Delta, Denton, Ellis, Grayson, Hunt, Johnson, Kaufman, Parker, Rockwall, Tarrant and Wise Counties in Texas.

HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

SATX2025-007 11/15/2023

	Rates	Fringes
Asphalt Distributor Operator	$ 24.40	0.00
Asphalt Paving Machine Operator	$ 22.52	0.00
Asphalt Raker	$ 19.87	0.00
Broom or Sweeper Operator	$ 18.01	0.00
Concrete Finisher, Paving and Structures	$ 22.48	0.00
Concrete Pavement Finishing Machine Operator	$ 24.07	0.00
Concrete Saw Operator	$ 20.34	0.00
Crane Operator, Hydraulic 80 tons or less	$ 31.32	0.00
Crane Operator, Lattice Boom 80 Tons or Less	$ 29.90	0.00
Crane Operator, Lattice Boom Over 80 Tons	$ 33.55	0.00
Crawler Tractor Operator	$ 24.06	0.00
Electrician	$ 36.10	0.00
Excavator Operator, 50,000 pounds or less	$ 25.08	0.00
Excavator Operator, Over 50,000 pounds	$ 25.34	0.00
Flagger	$ 14.80	0.00
Form Builder/Setter, Structures	$ 22.50	0.00
Form Setter, Paving & Curb	$ 20.89	0.00

Foundation Drill Operator, Crawler Mounted	$ 29.25	0.00
Foundation Drill Operator, Truck Mounted	$ 29.86	0.00
Front End Loader Operator, 3 CY or Less	$ 20.93	0.00
Front End Loader Operator, Over 3 CY	$ 22.56	0.00
Laborer, Common	$ 18.01	0.00
Laborer, Utility	$ 19.32	0.00
Loader/Backhoe Operator	$ 23.22	0.00
Mechanic	$ 27.44	0.00
Milling Machine Operator	$ 20.94	0.00
Motor Grader Operator, Fine Grade	$ 27.09	0.00
Motor Grader Operator, Rough	$ 24.90	0.00
Off Road Hauler	$ 23.70	0.00
Pavement Marking Machine Operator	$ 22.35	0.00
Pipelayer	$ 22.46	0.00
Reclaimer/Pulverizer Operator	$ 22.17	0.00
Reinforcing Steel Worker	$ 23.50	0.00
Roller Operator, Asphalt	$ 20.35	0.00
Roller Operator, Other	$ 18.60	0.00
Scraper Operator	$ 21.54	0.00
Servicer	$ 24.86	0.00
Sign Erector	$ 18.01	0.00
Small Slipform Machine Operator	$ 25.09	0.00
Spreader Box Operator	$ 23.59	0.00
Telecommunication Technician	$ 23.14	0.00
Truck Driver Lowboy Float	$ 25.57	0.00
Truck Driver, Single Axle	$ 20.60	0.00
Truck Driver, Single or Tandem Axle Dump Truck	$ 22.64	0.00
Truck Driver, Tandem Axle Tractor with Semi Trailer	$ 23.22	0.00

Truck Driver, Transit-Mix.....$ 21.97 0.00

Welder.....$ 23.72 0.00

Work Zone Barricade Servicer.....$ 18.01 0.00

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Note: Executive Order 13658 generally applies to contracts subject to the Davis-Bacon Act that were awarded on or between January 1, 2015 and January 29, 2022, and that have not been renewed or extended on or after January 30, 2022. Executive Order 13658 does not apply to contracts subject only to the Davis-Bacon Related Acts regardless of when they were awarded. If a contract is subject to Executive Order 13658, the contractor must pay all covered workers at least $13.30 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2025. The applicable Executive Order minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under Executive Order 13658 is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the

state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION
"

SECTION: 01 30 00

ALLOWANCES

PART 1 – GENERAL

1.01 SUMMARY

A. This Section covers the requirements and procedures if Allowances are included in the Contract.

B. Allowances are not included in the Lump Sum Base Bid for a Lump Sum Contract.

C. Allowances have been set aside to complete elements of the Work that are within the general scope of work but are not shown on the Plans or specified in the Specifications. Any and all unused portions of the stipulated Allowances will not be paid to the Contractor and shall be deducted from the Contract Amount at the Final Completion of the Project.

D. Use of any funds allotted to Allowances is only for the Work of the Project. while Allowances are considered to be within the original Scope of Work, such items could not have been reasonably anticipated based upon the information available at the time the cost estimate was established. Use of such funds is not to be construed as including upgrading or enlarging the Scope of Work of the Project and its use is at the sole discretion of the Owner.

E. All price quotes and scopes of work requested by the Owner through the Owner's Authorized Representative (OAR) for each Allowance item of work, shall be provided to and approved by the OAR prior to the Contractor proceeding with any such work. The Contractor shall provide a price quote within seven (7) Calendar Days of receipt of request by the OAR.

F. The OAR will approve an Allowance item of work by issuance of a Change Order prior to the Contractor proceeding with such work. The Change Order will clearly define the Allowance item scope and agreed to pay amount.

G. Contract Time extensions may not be executed under this process, but within the Change Order process. Any adjustment to the Contract Time shall be in accordance with Section 01 32 16, Schedules.

1.02 RELATED SECTIONS

A. 01 22 00, Measurement and Payment

B. 01 32 16, Schedules

1.03 ALLOWANCE SCOPE

A. Standby Time: This Allowance establishes means to compensate the Contractor for temporary disruptions to his work resulting from airfield operations. Any compensable disruptions, further identified as Standby Time, must be approved by the Owner through the OAR.

B. Differing Site Conditions: This Allowance establishes means to compensate the Contractor for changes in the various work areas/phases or Scope of Work as directed by the OAR to mitigate differing or unforeseen field conditions. The scope and associated compensation under this Allowance includes, but is not limited to:

1. Additional demolition, relocation, or construction of necessary infrastructure to mitigate miscellaneous unforeseen conditions.

2. Discovery of abandoned utilities from prior permanent or temporary Federal Aviation Administration (FAA) facilities, drainage structures abandoned in place, direct buried cabling, and similar items.

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3. Additional compensation to maintain and remove existing erosion control devices from previous projects and not included in the Contract Documents.

C. Utility Investigation/Relocation: This Allowance establishes means to compensate the Contractor for Level A Potholing and modification in various work areas of the Project as directed by the OAR. The scope of this Allowance includes, but is not limited to:

1. Additional exploratory investigation and relocation of utilities.
2. Other additional miscellaneous utilities requirements not included in the Scope of Work.
3. Investigation of utilities shown on the Plans to confirm location and depth will not be considered part of this Allowance but is included within the Contract Amount.

D. Supplemental Safety Measures: This Allowance establishes means to compensate the Contractor for all labor, equipment and material as may be required to procure, place, remove, and/or modify the airfield construction safety plan as deemed necessary by the OAR to make traffic flow and protect aircraft that include, but are not limited to:

1. Barricades
2. Haul Road signage and construction
3. Sweepers

E. Part 139 Measures: When the Work of the Project includes airfield work, this Allowance also includes labor, equipment, and materials as may be required to address FAA Part 139 inspection items, not already included in the Contract Documents.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 MEASUREMENT

A. Price quote and scope of work requested by the OAR for each Allowance item shall be provided to and approved by the OAR prior to the Contractor proceeding with such work. See reference specification 01 22 00.

3.02 PAYMENT

A. Payment will be made under:

1. Pay Item 01 30 00-1, Standby Time
2. Pay Item 01 30 00-2, Unforeseen Field Conditions
3. Pay Item 01 30 00-3, Utility Investigation/Relocation
4. Pay Item 01 30 00-4, Supplemental Safety Measures
5. Pay Item 01 30 00-5, Part 139 Measures

- END OF SECTION -

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SECTION: 01 31 01

BUILDING INFORMATION MODELING (BIM)

PART 1 – GENERAL

1.01 SUMMARY

A. This Section covers the requirements and procedures for projects using Building Information Modeling (BIM) at DFW Airport.

1.02 RELATED REQUIREMENTS

A. Part I – General Provisions
B. Part II - Special Provisions
C. DFW Digital Facilities and Infrastructure (DFI) Standards Manual
D. DFI Project Execution Plan (PXP)
E. Drawings
F. Section 01 11 00, Summary of Work
G. Section 01 26 13, Requests for Information
H. Section 01 33 23, Shop Drawings, Product Data, and Samples
I. Section 01 78 23, Operation and Maintenance Data
J. Section 01 78 39, Project Record Documents
K. Section 01 45 16.13, Contractor Quality Control

1.03 DEFINITIONS

A. Building Information Modeling (BIM) aka Digital Facilities and Infrastructure Model (DFI): BIM is a digital representation of the physical and functional characteristics of the Project and is referred as a Model(s), which term may be used to describe a Model Element, a single Model or technology used to create the Model. For DFW Projects it is accepted that Building Information Modeling (BIM) and DFI are interchangeable. DFW's DFI Moniker is understood to define more than just facilities BIM, it is inclusive of all content required to develop Facilities, Infrastructure, Landside, and Airside projects and data for integration into the DFW Digital Twin.

B. DFI Project Execution Plan (PXP): Provides a framework that allows for project communication and efficient collaboration. The plan describes roles and responsibilities for all stakeholders and the details of the information to be shared and relevant processes. The PXP shall be further developed jointly with DFW Airport, Designer of Record, and the Contractor to specifically address the administrative steps necessary to provide a comprehensive BIM system before, during and after construction.

C. DFI Standards Manual: Establishes specific content criteria for all public infrastructure, terminal buildings and other public facilities owned, operated, or maintained by the Dallas Fort Worth International Airport Board (hereinafter referred to as "Board"). It also serves as a guide for all other facilities designed and constructed within the boundaries of the DFW Airport.

D. BIM Models represent many different phases of a project and are authored by different parties with different inherent uses. The following models are defined within the DFI Standards and are common to most projects at DFW:

1. Existing Conditions BIM Model
2. Design BIM Model

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3. Construction BIM Model
4. Federated BIM Model (Coordination Models)
5. As-Built BIM Model
6. Reconciled Design BIM Model.

1.04 CONTRACTORS MODELS

A. Models, General: Prepare coordination models and requisite drawings according to requirements in individual Sections, DFI Standards Manual and PXP, and additionally where installation is not completely shown on 2D Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity. Coordination models and drawings will be the result of a Contractor driven Spatial Coordination effort as spelled out in the PXP. The Contractor models, as defined in the PXP may include Existing Conditions Model, Construction Model, Federated BIM Model, and As-Built BIM Models.

B. Field verify all existing dimensions and any as-built dimensions, whether built by the Contractor or others, necessary to produce accurate coordination and working drawings to meet the established requirements.

C. Content: Project-specific information, modeled accurately to a scale to indicate and resolve conflicts. Do not base coordination models and drawings on standard printed data. Include the following information, as applicable:

1. Use applicable Models/Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
2. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
3. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
4. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
5. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
6. Indicate required installation sequences.
7. Indicate dimensions shown on the Models/Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to DFW Project Manager indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

D. Coordination Model Drawing Organization: Using software as in the PXP, the Contractor shall coordinate these systems per floor or zone per PXP.

1. Review: DFW Project Manager will review coordination models and drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If DFW Project Manager determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, DFW Project Manager will so inform Contractor, who shall make changes as directed and resubmit.

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E. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:

1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings, unless approved otherwise by DFW Project Manager.
2. File Preparation Format: Provided in the DFI Project Execution Plan.
3. File Submittal Format: Submit or post coordination models and drawing files as required in the Project Execution Plan.
4. The submittal must be logged in accordance with the submittal procedure.
5. For all projects, receiving official variance from the BIM requirements not utilizing BIM, coordination drawings must be submitted in acceptable digital format shall be in an industry recognized 3D AutoCAD model.
6. BIM File Incorporation: DFW Project Manager will incorporate Contractor's coordination drawing files into the DFW Digital Twin as established for Project.
   a. Contractor shall lead three-dimensional component conflict analysis as part of preparation of coordination drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by Architect or other sub-consultants.
7. DFW Project Manager will furnish Contractor one (1) set of digital data files of Models and/or Drawings for use in preparing coordination digital data files.
8. The Design consultants and Contractors and Subcontractors acknowledge and represent the following Right of Reliance regarding Electronic Models and/or Drawing deliverables:
   a. Models may be transferred to allow the recipients to develop derivative models to develop the means and methods by which to construct the project.
   b. It must be clear that each party be able to rely on the fact that the model furnished by others “match the 2D Contract Documents or shop drawings in their equivalent state of development.”

1.05 COORDINATION WITH DFW DIGITAL TWIN INTEGRATION

A. The full intent is to produce comprehensive record documents integrating existing data in the form of digital files and models, reconciled to actual field conditions, modifications or additions facilities or components of existing facilities according to new Contract Documents, and to produce record documents that could be incorporated into DFW Digital Twin, including but not limited to: asset management system, GIS, Operation platforms, etc.

B. Utilize the BIM to link all necessary data content to the model and follow the PXP as collaboratively modified by the Contractor, Designer, and DFW DFI Group and approved by AOR/EOR (Architect of Record / Engineer of Record).

C. Provide the following information, in digital format as well as established contract deliverables, through the execution of the Contract for all elements and element types that DFW has designated as assets. The information shall include but is not limited to:

1. Project title, number, Project Manager contact information, Contractor and Subcontractor contact information.
2. Pertaining shop drawings.
3. Operational Manuals and safety information, MSDS and cut sheets, and any pertinent technical information.
4. Details of all components’ maintenance procedures and requirements.

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5. Details of all applicable warranties including, but not limited to, warranty providers, manufacturers information, warranty start and finish dates, contacts, bonding company name, consent of surety.
6. Equipment location (by room number and location description or grid location format acceptable to DFW Project Manager, for civil projects), equipment make, model, serial number, and other asset information as outlined in the DFW DFI Standards Manual.
7. List of all spare parts including but not limited to; equipment make and model, location, submittal number or link, and suppliers reordering information.
8. Commissioning results, acceptance criteria, test reports, and TaB reports

1.06 REQUEST FOR INFORMATION

A. For all BIM related information refer to 01 26 13 Request for Information Specification

B. The Contractor shall limit the RFI to only one (1) BIM-related question each.

1.07 OPERATION AND MAINTENANCE DATA

A. All submittals must be provided in electronic format as indicated by the DFW DFI Standards Manual and as required by the DFW DFI and Asset Management groups.

1.08 PROJECT RECORD DOCUMENTS

A. Follow all the required processes of the approved PXP as approved by DFW for this specific project.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 ROLES AND RESPONSIBILITIES

A. It is the responsibility of all Designers, Contractors, Subcontractors, and certain Materials providers to employ qualified personnel on the project to fulfill the roles and responsibilities necessary to provide proper digital delivery practices as defined in theses specifications and the referenced documents.

B. The PXP template delivered from DFW will establish the project roles, based on scope and complexity of the work, and the responsibilities of each. Typical roles on a project may be: DFI Manager, DFI SME, DFI Coordinator, DFI Engineer.

- END OF SECTION -

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SECTION: 01 31 19

PROJECT MEETINGS

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes the Contractor participation in the following conferences and meetings required for the Project:

1. Pre-Construction Conference
2. Site Mobilization Conference
3. Progress Meetings

1.02 PRE-CONSTRUCTION CONFERENCE

A. The Contract Administrator will schedule the “Pre-Construction Conference” after the Notice to Proceed (NTP) has been issued.

B. Attendance: Contract Administrator, Owner’s Authorized Representative (OAR), Architect/Engineer, Business Diversity and Development Department (BDD), other Airport departments represented as required, and the Contractor.

C. Agenda:

1. Purpose of the meeting
2. Brief Project description
3. Project duration and milestones
4. Introduction and explanation of functions of the Airport, the Airport personnel and organization (including responsibilities and authority)
5. Owner requirements
   a. Wage and Hour Rates
   b. Payroll Audits
   c. S/D/M/WBE Goals
   d. Pay Estimate Forms, Procedures and Applications
   e. Field Alteration Forms and Procedures
   f. Security Badge Procedures
   g. Other Security Procedures
   h. Project Safety
   i. Project Safety Plan
6. Project Control Procedures
   a. Project Meetings
   b. Project Schedules
   c. Major Equipment Deliveries and Priorities
   d. Submittals
   e. Alternates/Substitutions
   f. Utilities
   g. Contractor’s Quality Control Plan
   h. Security and Housekeeping
   i. Maintenance and Protection of Vehicular and Pedestrian Traffic
   j. Coordination of the Work
7. Construction Management Procedures

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a. Permits
b. Correspondence and Documentation
c. Processing of a Request for Information (RFI)
d. Processing of Non-Conformance Report (NCR)
e. Coordination of Project Work with adjacent projects
f. Monthly Progress Photographs and Videos
g. Environmental Concerns and Drainage Control
h. Contract Modification and Claim Procedures
i. Completion of the Work and Punch List procedures
j. Record Drawings
k. Final payment and Closeout Procedures

1.03 SITE MOBILIZATION CONFERENCE

A. The OAR will schedule a conference at the Project site prior to Contractor occupancy.

B. Attendance: OAR, Architect/Engineer, Contractor, and major Subcontractors.

C. Agenda: A standard agenda for the Project shall be determined based on the Project type. The standard agenda shall be coordinated between the Contractor's Authorized Representative (CAR) and the OAR at least one (1) week prior to the first meeting. A sample of a standard agenda for an Airfield project follows:

1. Roadways use by the Owner's personnel, OAR, and Contractor
2. Roadway closing
3. Transporting equipment
4. Temporary utilities
5. Schedules
6. Procedures for maintaining record documents
7. Requirements for start-up of equipment
8. Inspection and acceptance of equipment put into service during construction period

1.04 PROGRESS MEETINGS

A. Project Meetings will be scheduled weekly to monitor the progress of the Work.

B. The OAR will be responsible for physical arrangements for meetings; prepare an agenda with copies for participants.

C. The OAR will preside over these meetings; record minutes and will prepare and distribute copies of minutes.

D. Attendance: Contractor's Authorized Representative (CAR), major Subcontractors and suppliers, Architect/Engineer as appropriate to agenda topics for each meeting.

E. Meeting Agenda:

1. Review Previous Meeting Minutes
2. Safety
3. Schedule (3 Week Look Ahead, Pre-Activity Meetings, Work Progress, Work Status)
4. Davis-Bacon (if applicable)
5. Submittals
6. Requests for Information
7. Non-Conformance Reports

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8. QA/QC
9. Environment/Erosion Control/Utilities
10. Correspondence
11. Changes & Revisions (Pending CO, Potential CO, Problems)
12. Application for Payment
13. Airport Operations
14. Code/Commissioning
15. Other Business

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

- END OF SECTION -

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SECTION: 01 32 16

SCHEDULES

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes the administrative and procedural requirements for Schedules and reports required for proper performance of the Work.

B. A Project Schedule shall be prepared and submitted by the Contractor for approval from the Owner's Authorized Representative (OAR), prior to the Contractor commencing with any construction activities.

1.02 RELATED REQUIREMENTS

A. Section 01 11 00, Summary of Work

B. Section 01 71 13, Mobilization

1.03 REQUIREMENTS

A. Preliminary scheduling meetings before preparation of the Project Baseline Schedule, and prior to the start of work. Meet with the OAR to discuss the proposed Schedule and the requirements of this section. Develop and submit a Preliminary Project Schedule as part of its Proposal.

B. All submissions shall be submitted in Oracle-Primavera P6 PDF and supporting compatible .XER export file format.

C. The Contractor shall prepare and maintain a Project Schedule per the requirements of this Section. The requirement for a Project Schedule is included in:

1. Ensure the scheduling of construction activities and sequence of work is the responsibility of the Contractor.
2. Ensure adequate planning and execution of the Work by the Contractor.
3. Ensure the Contractor's Work is coordinated with other Contractors, Subcontractors, and Suppliers.
4. Ensure proper coordination of the Work between the Owner and the airlines/tenants/Stakeholders.
5. Ensure adequate time for document review by the OAR.
6. Ensure adequate time for commissioning.
7. Use the Critical Path Method (CPM) of network calculation to generate all Project Schedules.
8. Assist the Contractor and the OAR in evaluating:
   a. Contract performance relative to the Milestones included in the Project Schedule as referenced in Section 01 11 00 Summary of Work
   b. Monthly and Biweekly progress
   c. Proposed Contract modifications

D. The Project Schedule and all its subsequent updates shall include:

1. Detailed Critical Path Method (CPM) Diagram of all Project activities, including procurement and delivery of major deliverables or field equipment, and Subcontractor Schedules.
2. Work Breakdown Structure (WBS) as defined by the Project's Scope of Work

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3. Respective WBS assignment for each Activity
4. Summary Bar Chart (Gantt Chart)
5. Resource, Cost and Unit/Quantity loading. The Schedule Cost/Unit Loading must include the following:
   a. Budgeted Cost to be computed by units via price per unit times (x) budgeted units. (Rate source override settings)
   b. Cost to Date.
   c. Identification of Cost via Cost Account/Activity code, matching the Schedules of Values.
   d. (S-Curve) graphical report including Contract amount line, Baseline curve, Milestone markers, Work-in-Progress, ETC Curve, and EAC line.
   e. The Schedule for resource loading must include the identification of D/S/M/WBE Contractors based on the Contract commitment in Special Provisions Section 2.0 and as approved by the Business Development & Diversity Department (BDDD).
   f. Budgeted Costs associated with the D/S/M/WBE resource must be provided.
   g. Planned cash flows based on early and late activity dates. Bi-weekly graphical reporting of Earned Value Cost actual cash flow vs. Baseline plan.
   h. Activity Cost Loading must be reasonable and without front-end loading resource curves unless prior approval received by OAR.
6. Responsibility Code by Company.
7. Moratorium dates shall be built into the project calendar and incorporated into the Project Schedule and all P6 layouts shall use published Moratorium date curtains.

E. The Contractor shall provide a Project Schedule suitable for planning, scheduling, and reporting the Work to be performed under the Contract. The Project Schedule shall be developed using the Owner's approved project planning software, Oracle-Primavera P6 (current version) as updated by Oracle (Primavera) throughout the Project. Other Primavera P6 versions that are fully compatible with the current version, or other schedule software, may be acceptable if approved by the OAR.

1. The principles and definitions of terms herein are outlined in the Project Management Institute (PMI) publications, "A Guide to the Project Management Body of Knowledge (PMBOK) 5th Edition" (ISBN: 978-1-933589-67-9), "Practice Standard for Scheduling" (ISBN: 978-1-93069984-7) and "Practice Standard for Work Breakdown Structures, Second edition" (ISBN: 978-1-933890-13-5). In the event of conflicts, the provisions of these articles shall govern.
2. Acceptance of the planning software and version by the OAR shall be used for the Baseline Schedule, Project Schedule, and any updates throughout the Project unless the OAR approves a new planning software version.

F. All Project Schedules shall be Resource and Cost Loaded at the Activity Level.

1. Cost can be loaded as either a lump sum nonlabor resource or a price per unit labor/material resource as appropriate and agreed upon by the OAR.
2. The cost shall be broken down to align with the Activity level and loaded to match the Contract Items or Schedule of Values (SOV) breakdown/milestone payments, as appropriate, for the Contract. Cost shall be identified by using Cost Accounts.
3. Mobilization Payment Activities shall be loaded across a Level of Effort (LOE) activity and invoiced as required in Section 01 71 13. Also, a discreet Mobilization task (non-LOE) shall be represented in the Schedule as appropriate that reflects the Contractor's Mobilization period.

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4. Period Cost and Cost to Date shall match between consecutive Payment Applications and the construction activity progress.
5. The cumulative amount of Cost Loaded Work activities shall equal the total Contract Amount.
6. Change Orders, including changes that are addressed using one or more Allowances, shall be added to the Project Schedule and Cost Loaded with corresponding cost, activity description, cost account identification, and logic. An updated CPM Diagram, Gantt Chart, and S-Curve must be submitted with all Change Order requests and shall include the impact of each request.
7. Notwithstanding paragraph D above, all Schedules must include the D/S/M/WBE resource based on the Contract commitment in Special Provisions Section 2.0 and as approved by BDDD and must include the associated cost and cost account identification.
8. The Contractor shall include additional cost breakdown or information requested by the OAR at no additional cost.

G. The Project Schedule shall, at a minimum, adhere to industry standards for scheduling of activities' maximum durations, the use of open-ended activities, the percentage of logic types, the use of constraints and their type, and the use of activity leads and lags, etc.

H. Develop the Project Schedule to the appropriate level of detail to address major milestones and to allow for satisfactory project planning and execution using the agreed upon P6 coding structures.

I. Failure to develop the Project Schedule to an appropriate level of detail will result in its disapproval.

J. The Contractor shall use the following Planning Schedule Logic:
1. Calculate Start-to-Start lag from Early Start.
2. Calculate the Schedule using the Retained Logic scheduling option.
3. Define Critical Activities as; Total Float less than or equal to zero.
4. Show Open-Ends as non-critical.
5. Calculate the Total Float as Late Finish – Early Finish.
6. The calendar for scheduling shall be seven (7) days/week with no holidays considered unless otherwise approved by the OAR (Moratorium dates shall be built into the project calendar).
7. The use of Terminal Float or Buffering Activities within the Project Schedule shall not constitute Ownership of that Float by the Contractor.

K. The Contractor shall assign Activity Assignments to the following:
1. The duration type is Fixed Duration and Units.
2. Activity % Complete Type should be as Physical.
3. Activity Type should be Task Dependent for “working” activities.

L. The Contractor shall use the following Project Calculation and Settings:
1. Link Actual to Date and Actual this Period.
2. Link Budget and Estimate to Completion (ETC) for non-progressed activities.

M. Schedule Detail shall be broken down such that the Activity Duration is no longer than fourteen (14) Calendar Days unless otherwise approved by OAR.

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N. Include activities associated with the submittals and their approvals, procurement, fabrication, and delivery of long lead materials, equipment, fabricated assemblies, supplies and any pre-commissioning, acceptance testing as determined in the scope of work.

O. Activity Descriptions shall be unique and follow the naming convention of "LOCATION –VERB NOUN." That is: a common Location ID followed by an action verb (i.e., DEMO, INSTALL, SET, etc.), followed by the item name (noun) requiring action.

P. Resource and Cost Accounts shall fall under an appropriate unique grouping using a Contract number or another unique identifier within each of their respective sections. Cost Accounts shall be assigned to projects under the Defaults tab using the unique identifier.

Q. Summary Bar Chart (Gantt Chart)

1. The Summary Bar Chart shall be based on the activity durations and logic indicated in the CPM Diagram area of the Schedule.
2. The Contractor and the OAR shall jointly select Summary Level activities.
3. Each Summary Level activity shall include:
   a. A concise description of the Work represented by the activity.
   b. A Time Bar indicating planned/actual Activity Start and Activity Finish dates and actual Cumulative Percent Complete at the end of each reporting period.
   c. A status line as of the end of the reporting period. (Data Date)
   d. Major procurement items required to support the summary activity duration.
4. The Summary Bar Chart shall display all Contract milestones.
5. Contract Time extensions for abnormal weather shall be granted following Paragraph 1.10 only to the extent that the actual time lost during a particular month exceeds the average lost time indicated in the General Provisions, Section 80, Prosecution and Progress. Contract Time extensions granted for abnormal weather are not compensable. Any abnormal weather event must impact critical path work to be considered for Contract Time extensions.

R. The Contractor shall **NOT** use the following types of logic relationships:

1. Negative lags (Leads)
2. Positive lag in excess of ten (10) calendar days
3. Start-to-Finish relationships (SF)
4. Open ends:
   a. Only the first activity shall have no predecessor and only the last activity shall have no successor.
5. Constraints:
   a. The Contractor may use a limited number of constraints. An appropriate number of constraints is at the sole discretion of the Owner and shall be established during Baseline Schedule submission/acceptance.

S. Failure to meet the requirements of this specification may result in the disapproval of the preliminary, initial, or periodic Schedule updates and subsequent rejection of payment requests until compliance is met. If the OAR directs Schedule revisions and those revisions have not been included in the subsequent Project Schedule revisions or updates, the OAR may withhold 10% of the pay request amount from each payment period until such revisions to the Project Schedule have been made.

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1.04 SCHEDULE REPRESENTATIVE

A. Within seven (7) Calendar Days after receipt of the NTP, the Contractor shall designate in writing, a P6 Schedule Representative. The Schedule Representative in the Contractor's organization, shall be responsible for coordinating with the OAR during the preparation and maintenance of the Schedule.

B. The P6 Schedule Representative's qualifications must demonstrate a minimum five (5) years of experience in preparing CPM Schedules for large, complex projects, preferably in the aviation or transportation infrastructure sector.

C. The P6 Schedule Representative and their qualifications shall be documented, attainable and available for review and approval by the OAR.

D. The Schedule Representative must have available bandwidth to fulfill the request of the project and/or program.

E. The Contractor's Schedule Representative shall have complete authority to act for the Contractor, in fulfilling the Schedule requirements of the Contract. If such authority is interrupted during the Contract, it shall be obtained in writing by the OAR. This Schedule Representative cannot be replaced without the approval of the OAR.

1.05 BASELINE SCHEDULE

A. Within fourteen (14) Calendar Days after receipt of the NTP, the Contractor shall submit their Baseline Schedule.

B. The Contractor and major Subcontractors shall meet initially with the OAR immediately after the issuance of the NTP to jointly agree on P6 Schedule guidelines, WBS & level of detail and Cost Breakdown Structure developed during the construction solicitation phase and P6 summaries & layouts to be used in developing the Baseline Schedule. The Contractor must then prepare a Baseline Schedule per the agreed upon methods discussed in the first meeting for a second baseline review meeting showing in detail the activities to be accomplished during the entire Project using the P6 standards established in the initial meeting. The Baseline Schedule shall become the final Baseline Schedule upon approval of the OAR and shall not be revised for the remainder of the Project.

C. The Baseline Schedule needs to include reasonable operational, seasonal, economic, weather, facility, or manpower restrictions required for the sequencing of Work.

D. The Contractor shall be responsible for assuring all work sequences are logical and the Baseline Schedule shows a coordinated plan for a complete performance of the Work. Failure of the Contractor to include any element of work required for the performance of the Contract in the Baseline Schedule shall not excuse the Contractor from completing all Work within the Contract Time.

E. The Baseline Schedule shall comply with the various limits imposed by the Contract Documents and by any Contractually specified intermediate milestone dates and completion dates.

F. The degree of detail shall be to the satisfaction of the OAR and shall be sufficient to identify:

1. The Work Breakdown Structure of the Project.
2. Contract Milestones and phasing.
3. The types of work to be performed by the Contractor, Subcontractor, and labor trades involved including the respective quantities and durations required for timely prosecution of stated work.
4. The D/S/M/WBE Contractors based on the Contract commitment as approved by BDDD.

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5. Submittal review, procurement, fabrication, delivery, installation, and testing of all materials and equipment.
6. Access and availability to work areas.
7. Manpower, material, space, and equipment constraints.
8. Delivery of Owner-furnished equipment as applicable.
9. Coordination activities, interfaces and dependencies with preceding, concurrent, and following Contractors.
10. Cash flow curves showing the planned cash flow at each Payment Application including the cumulative cash flow for the Contract.
11. Schedule of Value relationships to loaded costs and associated cost accounts.

G. The Contractor shall submit the Baseline Schedule with a baseline narrative to the OAR.

H. Owner Activities: Show the Owner and other agency activities that could impact progress. These activities include, but are not limited to, approvals, environmental permit approvals by State regulators, inspections, utility tie-ins, Owner Furnished Equipment (OFE) and Notice to Proceed (NTP) for phasing requirements.

I. Responsible Party Coding (RESP): Assign responsibility code for all activities to the Prime Contractor, Subcontractor(s), or Owner stakeholders responsible for performing the activity.

1. Activities coded with an Owner Responsibility code include but are not limited to: Owner approvals, Owner design reviews, environmental permit approvals by State regulators, Owner Furnished Property / Equipment (OFP) and Notice to Proceed (NTP) for phasing requirements.

J. Contract Milestones and Constraints

1. Milestone activities are to be used for significant project events including, but not limited to, project phasing, project start and end activities, or interim completion dates. The use of artificial float constraints such as "zero free float" or "zero total float" is prohibited. Mandatory constraints that ignore or affect network logic are prohibited. No constrained dates are allowed in the Schedule other than those specified herein. Submit additional constraints to the OAR for approval on a case-by-case basis.

K. Out-of-Sequence Progress

1. Activities that have progressed before all preceding logic has been satisfied (Out-of-Sequence Progress) will be allowed only on a case-by-case basis, subject to approval by the OAR. Propose logic corrections to eliminate out-of-sequence progress or justify not changing the sequencing for approval before submitting an updated Project Schedule. Address out-of-sequence progress or logic changes in the Narrative Report and the periodic Schedule update meetings.

L. Added and Deleted Activities

1. Do not delete activities from the Project Schedule or add new activities to the Schedule without approval from the OAR. Activity ID and description changes are considered new activities and cannot be changed without OAR approval.

M. Original Durations

1. Activity Original Durations (OD) must be reasonable to perform the work item. OD changes are prohibited unless justification is provided and approved by the OAR.

N. Leads, Lags, and Start-to-Finish Relationships

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1. Lags must be reasonable as determined by the Owner and not used in place of realistic original durations, must not be in place to artificially absorb float or to replace proper schedule logic.
   a. Leads (negative lags) are prohibited.
   b. Start to Finish (SF) relationships are prohibited.

O. PROJECT SCHEDULE SUBMISSIONS

1. Provide the submissions as described below. The data XER file, narrative reports, and network diagrams required for each submission are contained in the paragraph SUBMISSION REQUIREMENTS. If the Contractor fails or refuses to furnish the information and Schedule updates as set forth herein, then the Contractor will be deemed not to have provided an estimate upon which a progress payment can be made.
2. Review comments made by the DFW Controls & Analytics on the Schedule(s) do not relieve the Contractor from compliance with the requirements of the Contract Documents.

1.06 ROLLING THREE-WEEK LOOK AHEAD SCHEDULES

A. A Rolling Three Week Look Ahead Schedule shall be submitted weekly from the current P6 Schedule and shall be the basis of the weekly Progress Meetings.

B. The Rolling Three Week Look Ahead Schedule shall be the actual detailed work plan used by the Contractor in meeting the Project Schedule and Milestones.

C. The basis of the Rolling Three Week Look Ahead Schedule shall be the updated Project Schedule.

D. The Rolling Three Week Look Ahead Schedule shall display at minimum:

1. Activity ID & Description.
2. Schedule of Value ID & Description if assigned.
3. Planned Activity Expected Duration and representative Dates.
4. Physical Percent Complete.
5. Activities or data for the previous week, current week, and the next two (2) following weeks.
6. Indicator for Action Items that require resolution before execution of the Activity can occur.
7. Indicator of all Critical Path activities with Total Float.
8. Main/Immediate Milestones Status (Plan/Forecast).
9. Any additional information the Contractor wishes to include information to assist in the organization and understanding of the selected Activities.

E. The Contractor shall prepare a written narrative status report of the project progress and key forecasted activity starts or completions or any anticipated issues to accompany the Rolling Three Week Look Ahead Schedule. The reports shall be submitted to the OAR as part of the weekly OAC meetings. Written status reports shall include but are not limited to:

1. Status of major project deliverables.
2. Progress made on critical activities indicated on the Project Schedule.
3. Explanations for any lack of work on Critical Path activities planned to be performed during last week and a recovery plan of how the project will be brought back on Schedule.
4. Explanations for any proposed Schedule changes, including changes to logic or to activity durations.
5. Status of major material and equipment procurement.

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6. Any delays encountered or expected during the reporting period and upcoming reporting periods. Delays involving D/S/M/WBE Contractors should be specifically addressed.
7. Any changes in the planned early and late Cash Flow curves.

1.07 BI-WEEKLY PROJECT STATUS REPORTING AND UPDATING

A. After the Baseline Schedule is approved, the Project Schedule shall be updated Bi-Weekly until Final Completion. Entering of actual progress made through the end of the reporting period, including actual dates activities started and/or completed, the percentage of work completed, Payment Application amounts, and estimated remaining duration for each activity in progress shall be subject to the approval of the OAR. If requested by the OAR, the Contractor shall participate in pre-update conferences to verify progress and review modifications to the Project Schedule before the formal submittal.

B. In case of disagreements concerning actual progress to date, the OAR's determination shall govern.

C. The Contractor shall update the Project Schedule to reflect the period and cumulative progress and reflect any approved Schedule revisions.

D. The updated Project Schedule shall be submitted and entered into the Owner's database within three (3) Calendar Days of the Project Schedule status date, with the corresponding Payment Application and early/late/actual cash flow curves, and shall include the following:

1. A PDF file of the complete Project Schedule sorted Early Start, Total Float, then by Remaining Duration and shall identify the following:
   a. Activity Identification
   b. Activity Description
   c. Original Duration
   d. Remaining Duration (based on an estimate of the actual days remaining to complete the activity and not the quantity survey percent complete)
   e. BL (Baseline) Start Date or Actual Start Date
   f. BL (Baseline) Finish Date or Actual Finish Date
   g. Total Float
   h. Variance from BL (Baseline)
2. If required by OAR, a PDF of the 90-day Look Ahead grouped by WBS Sorted by Early Start, Total Float, then by Remaining Duration.
3. If required by the OAR, a PDF of the 90-day Look Ahead Grouped by Responsibility Code (with page breaks), Sorted by Early Start, Total Float, then by Remaining Duration.
4. A copy of the Contractor's updated Primavera P6.xer file, unless other OAR approved software is being used, and then the data shall be transmitted electronically in a format compatible with the current version of Primavera P6.
5. A Narrative Report:
   a. Provide a Narrative Report with each Schedule submission. The Narrative Report is expected to communicate to the Government the thorough analysis of the Schedule output and the plans to compensate for any problems, either current or potential, which are revealed through that analysis. Include the following information as a minimum in the Narrative Report:
      1) The Contractor shall explain all progress made during the period.
      2) Status of critical Project components (percent complete, amount of time ahead or behind Schedule) and an explanation of Corrective Actions taken or proposed to bring the Project back on schedule if delays have occurred.

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3) The Contractor shall include a Schedule analysis along with calculations. The following is a minimum analysis to be reported:
   (a) Earned Value at the Project Summary Level
   (b) EV to Pay Application Request Variance
   (c) Cash Flow Variance
   (d) Estimated at Completion (EAC)
   (e) Estimate to Completion (ETC)
   (f) Current and projected Schedule Variance
   (g) Cost Variance
4) Updates for the forthcoming report period.
5) Status of major material and equipment procurement.
6) Mitigation measures on all negative variances.
7) Delaying factors/problem areas, current and anticipated.
8) Identify known current and or potential risks and detail mitigation options for each.
9) Identify and provide explanations for all Schedule changes, including changes to logic or to activity durations.
10) Explanations for any lack of work on Critical Path activities planned to be performed during the last period.
11) Identify any changes to the Critical Path and the drivers for them.
12) Report indicating actual versus planned resource loading for each trade and each activity.
13) Any variances related to D/S/M/WBE Contractors should be specifically addressed.
14) The Contractor may include any other information pertinent to the status of a project.
15) The Contractor shall include additional status information requested by the OAR at no additional cost.
16) Identify and discuss the work Scheduled to start in the next update period per P6 detail.
17) A description of activities along the two most critical paths where the total float is less than or equal to 18 workdays.
18) A description of current and anticipated problem areas or delaying factors and their impact and an explanation of corrective actions taken or required to be taken.
19) Identify and explain why activities based on their calculated late dates should have either started or finished during the update period but did not.
20) Identify and discuss all Schedule changes by activity ID and activity name including what specifically was changed and why the change was needed. Include at a minimum new and deleted activities, logic changes, duration changes, calendar changes, lag changes, resource changes, and actual start and finish date changes.
21) Identify and discuss out-of-sequence work.

E. Status reports, and the information contained therein, shall not be construed as claims, notice of claims, notice of delay, or requests for changes or compensation. Refer to the requirements in the General Provisions and Special Provisions of the Contract to address these matters.

F. If the Contractor's update of the Project Schedule reflects, or OAR determines, that the Contractor is at least ten (10) or more Calendar Days behind the approved Baseline Schedule for any of the Project interim or completion milestones, then the Contractor shall submit a Recovery Schedule. The OAR may also request Bi-Weekly (every other week) Schedule updates where this condition exists on a project. A Recovery Schedule shall be submitted separately from the update of the Project Schedule within seven (7) Calendar Days of identification of a recovery condition or upon receipt of a written request from the OAR.

1.08 SCHEDULE REVIEW AND APPROVAL

A. The OAR and the Contractor shall meet within five (5) Calendar Days of receipt of the Baseline Schedule for joint review of the proposed Baseline Schedule. The Contractor shall revise any

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areas which, in the opinion of the OAR, conflict with either the intent of this Section or the timely completion of the Project.

B. If the Contractor fails to define any element of work activity or logic currently designed and the OAR review does not detect this omission or error, such omission or error shall be corrected by the Contractor with the Baseline Schedule or the next update to the Project Schedule.

C. The Contractor shall revise the Baseline Schedule following agreements reached during the joint review meeting of the Baseline Schedule. The final Baseline Schedule shall be submitted in the same form and detail as the Baseline Schedule.

D. Approval of the Baseline Schedule shall be a condition precedent to any Progress Payment under the Contract.

1. All or part of any Progress Payment may be withheld for work performed before the approval of the Baseline Schedule. Approval of the Baseline Schedule shall not be unreasonably withheld.
2. All or part of any Progress Payment may be withheld for work performed during the subsequent progress periods without acceptance of the respective update to the Project Schedule. Acceptance of any update to the Project Schedule shall not be unreasonably withheld.
3. Acceptance of approval of the Baseline Schedule by the OAR does not relieve the Contractor of any of its responsibility for the accuracy or feasibility of the Baseline Schedule; however, to the extent that the approved Baseline Schedule is reasonable, it shall become a part of this Contract and defines the obligations of both the Contractor and the Owner to achieve a timely Contract completion.
4. If the approved Baseline Schedule indicates the Contractor's Finish Date shall be before Final Completion, the Contractor and the Owner may execute a Change Order adjusting the Final Completion to coincide with the Contractor's planned Finish Date at no expense to the Owner.

1.09 PROJECT SCHEDULE REVISIONS

A. The update to the Project Schedule to reflect Actual Progress to Date shall not be considered a revision of the Project Schedule. All Schedule revisions must follow the process prescribed for Contract changes in the General Provisions.

B. The Contractor shall revise the Project Schedule when one or more of the following conditions occur:

1. When a change or delay significantly affects any specified intermediate milestone dates or completion dates.
2. When the Contractor elects to change any sequence of activities affecting the Critical Path or to significantly change the previously approved Baseline Schedule logic.
3. When the Contractor has received written approval from BDDD to add, remove, or replace a D/S/M/WBE Contractor.
4. When, in the opinion of the OAR, the Project Schedule and supporting analysis are no longer representative of the planning and evaluation of the Work.

C. Submit any revision to the Project Schedule in the same form and detail as the approved Baseline Schedule.

D. The OAR must approve any revision of the Project Schedule.

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1.10 TIME IMPACT ANALYSIS FOR CONTRACT MODIFICATIONS, DELAYS AND TIME EXTENSIONS

A. When changes to the Contract are initiated or delays are experienced, the Contractor shall submit to the OAR a written Time Impact Analysis (TIA) illustrating the influence of each change or delay on any specified intermediate Milestone and the current projected completion date.

1. TIA must use an updated and approved Schedule within 30 Calendar days of the delay event.
2. The Contractor, as required by the General Provisions and Special Provisions of the Contract, shall notify the OAR of a change that may impact an intermediate Milestone or Final Completion.
3. The calendar for Time Impact shall be seven (7) days/week with no holidays considered.
4. Each TIA shall include a fragmentary network (fragment) indicating all necessary logic, duration of impact, D/S/M/WBE resources affected, and demonstrate how the Contractor proposes to incorporate the change or delay into the current approved Project Schedule.
5. The event times used in the TIA shall be those included in the latest update of the detailed progress Schedule or as adjusted by mutual agreement to reflect project status at the time the delay occurred, or notification of the change was issued.
6. The TIA should include any additional supporting evidence that the OAR deems necessary.
7. A PDF copy of the TIA along with compatible P6 XER file shall be submitted and entered into the Owner's document control system or as otherwise directed by the OAR.
8. A Primavera P6.XER of the Project Schedule representing the impact calculations shall be submitted to the OAR.
9. A narrative in the same form and detail as the Project Schedule update identifying all steps taken to calculate the impact and Recovery Schedule, shall be submitted to the OAR for review and acceptance.
10. Upon agreement by the Contractor and the OAR, the influence of changes and delays shall be incorporated into the next update of the Project Schedule.
11. Where the OAR has not completed a determination of any Contract Time extension, or the OAR and Contractor are unable to agree to the Contract Time extension due, the Contractor shall reflect that amount of time extension in the update to the Project Schedule as the OAR may determine to be appropriate for such interim purpose. It is understood and agreed that any such interim determination shall not be binding upon either party for any other purpose and that, after the OAR has determined any Contract Time extension, the Contractor shall revise the update(s) to the Project Schedule prepared thereafter in accordance with the final determination.
12. It is understood and agreed that Schedule Float time is not for the exclusive use of either the Owner or the Contractor. Extensions of Contract Time for performance under any and all of the provisions of this Contract shall be granted only to the extent that equitable time adjustments for the activity or activities affected exceed the Total Float along the channels involved at the time a delay occurred, or notification of a change was issued. It is expressly agreed and understood that the Contractor shall not be entitled to any compensation or damages on account of potential delays that can be avoided by re-sequencing activity times or logic used to sequester the available Float.

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13. TIA related to a Contract Time extension and/or changed work shall be incorporated into and attached to the applicable Contract Change Order.

1.11 RESPONSIBILITY FOR COMPLETION

A. The Contractor shall furnish sufficient forces, offices, facilities, and equipment, and shall work such hours including night shift and overtime operations, as necessary to ensure the prosecution of the Work. If, in the opinion of the OAR, the Contractor, due to its own action, falls behind in meeting the Project Schedule, the Contractor shall take such steps as may be necessary to improve its progress. The OAR may require the Contractor to increase the hours of work, the number of shifts, the amount of supervision, overtime operations, and/or the amount of construction plant and equipment without additional cost to the Owner. The provisions of this Section shall not be construed as prohibiting work on Saturdays, Sundays, and/or holidays, if the Contractor elects and gives reasonable notice to the OAR. Work hours shall conform to Section 01 11 00, Summary of Work, and the Plans.

B. The Contractor may improve its progress by performing sequential activities concurrently, by performing activities more quickly than planned, or by revising the logic within the Project Schedule to reflect a workaround sequence. The Contractor may make minor logic changes, which are required to reflect actual work as it is performed, pertaining to out-of-sequence work. The minor logical changes shall be included in the Schedule narrative and incorporated into the Project Schedule in the approved format.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

- END OF SECTION -

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SECTION: 01 33 23

SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes the administrative and procedural requirements for submittal of shop drawings, coordination drawings, product data and samples, to verify that products, materials, and systems proposed for use comply with provisions of the Contract Documents.

B. Refer to Section 01 31 01 Building Information Modeling (BIM), if applicable, for BIM-related procedures.

1.02 RELATED REQUIREMENTS

A. Section 01 25 13, Product Substitution Procedures

B. Section 01 31 01, Building Information Modeling (BIM)

C. Section 01 78 39, Project Record Documents

1.03 SHOP DRAWINGS

A. Shop Drawing Requirements:

1. Present drawings in a clear and thorough manner. Title each drawing with the Contract name and number; identify each element of the shop drawings by reference to sheet number and detail, schedule, or room number shown on the Plans.
2. Briefly and clearly identify field dimensions and field conditions; show relation to critical features, work, or adjacent products as applicable.
3. Shop drawings shall be of size and scale appropriate for their purpose and insofar as possible shall be uniform in size.
4. Shop drawings shall show design, materials (kind, thickness and finish), dimensions, connections, and other details necessary to ensure that they accurately interpret the Plans and Specifications, including adjoining work, in such detail as required to provide proper connection with the existing or adjoining work. Shop drawings shall not be reproductions of the Plans.
5. Shop drawings shall be numbered consecutively. Retain the numbering system throughout revisions.
6. Identification: All Shop drawings shall be identified with the Project name, building, or buildings for which shop drawings are being submitted. The Project name and Owner's Contract Number, Contractor's name, Subcontractor's name, date of submittal, drawing number, revision number, date of each revisions if any, as well as the Specification under which the work is to be performed and the drawing and detail numbers shown in the Plans that relate to the shop drawings.
7. Check and coordinate shop drawings of section or trade with requirements of other sections or trades as related and as required for proper and complete installation of the work.

B. Shop Drawings Submittal Procedures

1. The Contractor shall submit shop drawings using the Unifier software application or as otherwise directed by the Owner's Authorized Representative (OAR).

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1.04 PRODUCT DATA

A. Product Data Requirements:

1. All product data in the form of manufacturer standard drawings, certificates, reports, catalog cuts, brochures, etc. shall be uploaded using the Unifier software application or as otherwise directed by the OAR.
2. All product data shall be clearly labeled to identify pertinent products or models.
3. Product information shall show performance characteristics and capacities, dimensions and clearances as required, applicable wiring and piping diagrams and controls, and the specified finish.
4. Product data in the form of a manufacturer's standard schematic drawings and diagrams shall be modified to delete information which is not applicable to the Work and should be supplemented to provide information specifically applicable to the Work.

B. Product Data Submittal Procedures:

1. Product Data, Certificates, and Reports shall be submitted using the Unifier software application or as otherwise directed by the OAR.

1.05 SAMPLES

A. Sample Requirements:

1. Samples shall be submitted from the same source, which will supply the actual product on the Project. Provide samples of sufficient size to clearly illustrate quality, function, finish characteristics of product, with integrally related parts and attachment devices and full range of color, texture and pattern. In no case shall the sample be less than 4 inches x 4 inches.
2. Where possible, all samples required for a particular Specification Section shall be submitted together. Manufactured products that generally degrade with time such as rubber, plastic, etc. shall have a production / assembly date of no more than eighteen (18) months prior to installation / assembly on the Project.
3. In the event that a range of variations in texture, graining, color or other characteristics may be anticipated in furnished materials, assemblies, or elements of the Work, a sufficient number of samples of such materials or products shall be submitted to indicate the full range of characteristics which will be present in the materials or products proposed for the Work. Any such materials or products delivered or erected prior to approval of full range samples shall be subject to rejection by the OAR.
4. Samples of materials or products, which are normally furnished in containers or packages, which bear descriptive labels or application or installation instructions, shall be submitted with such labels or instructions.
5. Identification: All samples shall be labeled, tagged, or otherwise clearly identified. Labels or tags shall set forth the Project name, building or buildings for which the sample is being submitted, Contractor, Subcontractor, supplier, the name of the manufacturer, fabricator, or processor, the trade designation, grade and quality of the material or product, the date of submittal, and specific identification of each sample and a precise reference to the Specification Section and paragraph in which the material, product, or element of the Work is specified. Each label or tag shall have sufficient clear space to permit the application of the approval stamps of the Contractor and the OAR or the Architect/Engineer as required.

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6. Where appropriate, test data or manufacturers' certificates shall be referenced in and forwarded with the letter of transmittal. Samples without accompanying certificates or test data will be returned without action.

B. Samples Submittal Procedure

1. The Contractor shall submit at least three (3) sets of each sample required to the Field Office or a site designated by the OAR. Submit one (1) additional sample for civil, landscape, structural, mechanical, electrical, baggage handling systems, and security/information technology/communications systems work.
2. Upon completion of review, the OAR will return one (1) sample of each set of samples to the Contractor.
3. Project Record Document Samples:
   a. Items requiring submittal for color, texture or finish selection shall be included in Record Document Finish Manual in accordance with Section 01 78 39.
   b. A sample of selected color, texture or finish shall be provided on sample chip at least 4 inches x 4 inches, suitable for adhering to cardboard page in Record Document Finish Manual.
   c. Record sample shall match actual material installed.
   d. The Contractor shall prepare record samples, assemble on pages, and submit in accordance with Section 01 78 39.
   e. The Contractor shall submit two (2) copies of the Record Document Finish Manual.

1.06 OWNER REVIEW

A. The OAR or the Architect/Engineer will review the Contractor's submittal such as shop drawings, product data and samples, for conformance with the design, intent, and Specifications. During this phase, the OAR or the Architect/Engineer shall review and provide appropriate action code response or take other appropriate action on the submittal and return the reviewed submittal to the Contractor within 14 Calendar Days of receipt. Depending upon the complexity of the submittal, amount of review required, and number of concurrent submittals, the OAR will attempt to return submittals within shorter time frames whenever possible.

B. The Contractor shall submit shop drawings, products data, and samples sufficiently in advance of scheduled installation dates to allow for the 14 Calendar Day review period, including consideration for the possibility of submittal rejection.

C. All submittals will be tracked by the OAR using the Unifier software application or other tracking mechanism as required.

D. The OAR or Architect/Engineer review of any submittal will be for conformance with the Plans and Specifications. The Contractor shall be solely responsible for confirmation of dimensions and correlated at job site; information pertaining to the fabrication process or to techniques of construction; and for coordination of the Work for all trades.

E. Contractor's Responsibility:

1. Any acceptance or other response of shop drawings, product data or samples shall not relieve the Contractor of responsibility for any deviation from the requirements of the Contract Documents unless the Contractor has informed the OAR or Architect/Engineer, in writing, of such deviation at the time of submission and approval has been given within the Unifier software application to the specific deviation. Similarly, any approval or other response shall not relieve the Contractor from such responsibility for ambiguities in the shop drawings, product data, or samples.

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2. Any acceptance or other response of shop drawings and product data shall not relieve the Contractor of any responsibility, including responsibility for accuracy of dimensions and details, and for conformity of its drawings with the Plans and Specifications.
3. The Contractor shall review all submittals for completeness, accuracy, and format concurrence with the Plans and Specifications prior to forwarding the submittal.

F. Reviewer's Distribution and Approval:
1. Following the OAR or Architect/Engineer's review of each submittal, comments and/or approval the submittal will be provided using the Unifier software application.

G. Contractor's Distribution:
1. The Contractor shall distribute approved submittals using the Unifier software application.

1.07 COORDINATION DRAWINGS

A. Coordination of Drawing Submittal Procedures:
1. Coordination drawings for each work area shall be submitted and approved before shop drawings are submitted. Shop Drawings submitted before coordination drawings have been approved will be returned without comment and marked "NOT ACCEPTED." Any resulting delays will be the responsibility of the Contractor.
2. Prepare coordination drawings to indicate how work shown by separate civil, structural, mechanical, electrical, baggage handling system, security/information technology/communications systems shop drawings shall be interfaced, intermeshed and sequenced for installation.
3. A minimum of three (3) weeks before materials are fabricated or work begins, submit complete coordination drawings prepared using 1/4" minimum scale with congested areas and sections through shafts at 3/8" minimum scale. Submit total sieving, piping, ductwork, electrical wiring and lighting, plumbing, fire sprinkler, baggage handling system, security/information technology/communications systems and HVAC coordination drawings.
4. The Contractor shall be solely responsible for coordination of the Work. Every civil, structural, baggage handling system, security/information technology/communications systems, mechanical and electrical Subcontractor shall be responsible for coordination of its portions of the Work with the Contractor and with each affected trade.
5. The Contractor shall schedule coordination meeting with Subcontractors to coordinate the Work for each work area. After coordination and corrections, each Subcontractor shall sign the originals of the coordination drawings. The Contractor shall submit coordination drawings to OAR for review indicating all conflicts that could not be resolved in coordination meeting. After review and approval by OAR or Architect/Engineer, the Contractor shall prepare shop drawings for each separate discipline, as required.
6. The Contractor shall coordinate with reflected ceiling plan's exact location and dimensioning of exposed items, and items which occur within hung ceilings. In the event of a conflict, the Contractor shall request a clarification from the OAR and Architect/Engineer as to the correct locations of items in question prior to proceeding with fabrication or installation.
7. The Contractor shall prepare coordination drawings from drawings provided by the Subcontractors as follows:
   a. Each Subcontractor shall prepare original drawings showing the respective work, layout, and type of the new and existing systems and lines along with supporting details of the new materials and systems including how the new work is integrated

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into the existing conditions. The submittal shall include any manufacturer's specification sheets for any associated equipment. The Subcontractor shall certify the drawings with the Subcontractor's signature prior to forwarding to the Contractor.

b. The Subcontractor responsible for the civil work shall indicate on the drawings any utility relocations.
c. The Subcontractor responsible for the fire alarm system shall indicate on the drawings the existing and new fire alarm components, fire alarm wiring to control panels.
d. The Subcontractor responsible for the baggage handling system shall indicate on the drawings the existing and new system equipment and rights of way.

8. The Contractor shall resolve conflicts between the submittals of the Subcontractors prior to submission.
9. The coordination drawings are for the OAR, Construction Manager (CM), and Contractor's use during construction and shall not be construed as replacing shop drawings or other Project Record Documents required by Contract Documents.
10. The review of coordination drawings by the OAR, CM, or Architect/Engineer shall not relieve the Contractor from the overall responsibility for coordination of the Work performed pursuant to the Contract.
11. Electronic media copies of CAD architectural or engineering data may be obtained from the Architect/Engineer upon approval of the OAR, for the express purpose of preparation of in-house coordination drawings or to use as the basis for preparing the Contractor and Subcontractor shop drawings by executing the required Release Form. Contract Drawings take precedent over CAD files.
12. Provision of this CAD data is subject to both the terms described in this Section and on the Release Form.
13. The Contractor shall prepare composite shop drawings and installation layouts when necessary or requested to depict proposed solutions for field conditions. Coordinate in the field and with affected Subcontractors for proper relationship to the work of other Subcontractors based on field conditions.

1.08 SCHEDULE OF SUBMITTALS

A. The Contractor shall furnish the OAR with a schedule of submittals, within 30 Calendar Days of receipt of the Notice to Proceed (NTP). This schedule shall indicate, organized by Specification Section, the items to be submitted, the anticipated item submittal date, and the approximate number of shop drawing sheets (when applicable) to be included in the submittal.

B. Large and complex submittals may exceed the fourteen (14) Calendar Days review period as specified in the paragraph 1.5. The OAR or Architect/Engineer shall identify these submittals (exceptions) upon receipt of the submittal schedule received from the Contractor.

PART 2 – PRODUCTS

2.01 GENERAL SUBMITTAL PROCEDURES

A. The Contractor shall provide submittals promptly in accordance with approved schedule of submittals and in such sequence as to cause no delay in the Work. Only the Contractor shall submit submittals to the OAR or Architect/Engineer unless specifically approved by the OAR. The Contractor shall provide submittals using the approved Unifier software application unless otherwise noted or directed by the OAR.

B. The Contractor shall submit and upload shop drawings, and product data for structural, mechanical, fire protection and fire alarm systems, electrical, baggage handling systems, and

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security/information, technology/communications systems work using the Unifier software application. The submittal shall be provided with a letter of transmittal contained within the approved Unifier software application.

C. The Contractor shall submit product samples for structural, mechanical, fire protection and fire alarm systems, electrical, baggage handling systems, and security/information, technology/communications systems work in the original packaging to the OAR. The submittal shall be provided with a paper letter of transmittal along with the sample submission.

D. Any deviation from the Contract Documents shall be noted by the Contractor on the submittal with a detailed description of the deviation. Such a notation does not relieve the Contractor from complying with the requirements for a Substitution in accordance with Section 01 25 13.

E. The Contractor shall not be relieved of responsibility for deviations in submittals from requirements of Contract Documents by the review of the OAR or Architect/Engineer unless the response provides specific written acceptance of the specific deviation.

PART 3 – EXECUTION

3.01 CONTRACTOR REVIEW

A. The Contractor shall review each submittal prior to forwarding to the OAR, The Contractor shall determine and verify field measurements, field construction criteria, manufacturer's catalog numbers, and conformance of submittal with requirements of the Contract Documents.

B. Coordinate the submittals with requirements of Work and of Contract Documents.

C. Apply the Contractor’s stamp, sign and stamp cover sheet of shop drawings, stamp cover sheet for product data, and each sample label to certify compliance with requirements of Contract Documents. All submittals shall be uploaded using the Unifier software application, except as noted in paragraph 2.1 C., and any deviations from requirements of Contract Documents shall be noted.

D. Submittals that include a product sample shall be provided to the OAR in accordance with paragraph 2.1 C.

E. The fabrication of products or beginning work prior to the return of any approved submittal that impacts such work is performed at the sole risk of the Contractor.

F. Any submittal without the Contractor’s stamp and a submittal which is considered incomplete, contain numerous errors, or has not been checked or only checked superficially, will be returned without comments. Any resulting delays shall be the Contractor’s responsibility.

G. The Contractor shall be responsible for quantities and dimensions shown on the submittal taken from Contract Drawings.

3.02 RE-SUBMITTALS

A. The Contractor shall provide re-submittals under procedures specified for initial submittals and all changes since previous submittal shall be noted.

B. Shop Drawings and Product Data:

1. Revise the original drawings or data and resubmit as specified for initial submittal.
2. Any revised drawing shall be noted with a revised or updated name or number in the title block.
3. Indicate any changes which have been incorporated other than those requested by the previous review.

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4. Mark number of submission and resubmit to the OAR until the submittal is returned as "accepted."

C. Samples: Submit new samples as required for initial submittal. Remove samples, which are not accepted or designated "RESUBMIT."

- END OF SECTION -

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SECTION: 01 33 29.06.01

CONTAMINATED MEDIA MANAGEMENT PLAN

PART 1 – GENERAL

1.01 SUMMARY

A. The Contaminated Media Management Plan (CMMP) provides Airport Board employees, tenants and Contractors with information and guidance on potential environmental concerns that may be encountered during the disturbance, excavation and relocation of soil at Dallas Fort Worth International Airport (DFW Airport).

1.02 RELATED REQUIREMENTS

A. Section 01 55 29, Staging Area.

B. Section 01 57 13, Temporary Erosion and Sediment Control

C. Section 01 74 19, Construction Waste

1.03 SUBMITTALS

A. Contractors will be required to submit:

1. Soil Management
2. Excavation Soil Management Plan
3. Environmental Authorization to Transfer Soil Form

1.04 REFERENCES

A. The following is a list of policies and regulations which may be referenced in this Section:

1. DFW International Airport Contaminated Media Management Plan
2. Texas Administrative Code (TAC): Title 30 Chapter 335, Industrial Solid Waste and Municipal Hazardous Waste.
3. Code of Federal Regulation (CFR): Title 40 Part 131 Water Quality Standards.

1.05 QUALITY ASSURANCE

A. Persons conducting environmental related construction activities shall possess the training and experience necessary to recognize environmental conditions, conduct soil screening, and use field instrumentation.

1.06 CONTAMINATED MEDIA MANAGEMENT PLAN

A. The Contractor shall adhere to all requirements as specified in the CMMP. Below is a summary of the requirements. In the event of a conflict between the specification and CMMP, the CMMP shall govern, the full document accessed at: Contaminated Media Management Plan v.2

B. No soil can leave or be brought onto DFW Airport Property unless approved by DFW Environmental Affairs Department (EAD).

C. Work Areas

1. The CMMP classifies a jobsite into three potential work areas: General Work Area, Area of Concern, and Remediation Area. See design plan sheet for delineation of work areas.
2. Work area delineation is based on known potential contaminants. The Work area delineation may change as new information becomes available.
   a. General Work Area

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1) Soil will be monitored for visual and olfactory evidence of contamination. Contact EAD immediately if potential contamination is encountered.
2) The Contractor will complete the Excavation Soil Management Form to track excavation activities, refer to page 65 of CMMP document. This form will be turned in to the assigned EAD representative weekly.
3) Water that collects on site will be monitored for visual or olfactory evidence of contamination. If no evidence of contamination is observed, the Contractor may pump the water in accordance with all applicable SWPPPs or ECPs. If contamination is present, contain the water and contact EAD for sampling requirements. The Contractor will be responsible for all sampling and disposal.

b. Area of Concern
1) All soil will be either:
   (a) Field-screened every fifty (50) Cyd or
   (b) Sampled every two hundred and fifty (250) Cyd
2) The screening method is determined by EAD based on the chemical of concern present onsite.
3) Photoionization Detector (PID) a sensor for detecting volatile organic compounds and toxic gases using ultraviolet light for ionization.
   (a) PID will be equipped with a 10.6 eV lamp or greater. Equipment calibration will be conducted on a daily basis regardless of the manufacturer's recommendations; and documented on the Excavation Soil Management Form.
   (b) If PID readings greater than twenty-five (25) ppm are encountered, stop working immediately and contact EAD. All field screening results must be submitted to EAD for review. The Contractor is responsible for all sampling and disposal.
4) Laboratory Analysis
   (a) Samples will be collected and submitted to a National Environmental Laboratory Accreditation Certification (NELAC) certified laboratory for analysis. All analytical reports must be submitted to EAD for review. The Contractor is responsible for sample collection and analysis.
5) The Contractor will complete the Excavation Soil Management Form to track excavation activities, and field screening results. This form will be turned in to the assigned EAD Compliance Inspector weekly.
6) Water that collects on site will be checked for visual or olfactory evidence of contamination. If no evidence of contamination is observed, the Contractor may pump the water in accordance with all applicable SWPPPs or ECP's. If contamination is present contain the water, and contact EAD for sampling requirements. The Contractor will be responsible for all sampling and disposal.

c. Remediation Area
1) Place soil back into the excavation whenever possible.
2) All soil generated that cannot be placed back in the excavation shall be stockpiled and sampled to determine appropriate soil classification.
   (a) Excavated soils are to be stored on, and securely covered by, ten (10) mil plastic sheeting or similar method to protect the soil from exposure to rain or storm water runoff (i.e., lined roll-off). These soils cannot be combined or commingled with soils from other work areas within the project.
   (b) A soil sample shall be collected every fifty (50) Cyd and submitted to a NELAC certified laboratory for analysis. All analytical laboratory reports must be submitted to EAD for review. The Contractor is responsible for sample collection and analysis. Refer to page 26 in the CMMP for additional details.
3) The Contractor will complete the Excavation Soil Management Form to track excavation activities and the transport of soil. This form will be turned in to the assigned EAD Compliance Inspector weekly.
   (a) Water that accumulates on the site will be collected and stored in a labeled, water-tight container. EAD will identify the chemicals of concern. Water samples will be

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collected and submitted to a NELAC certified laboratory for analysis. All analytical laboratory reports must be submitted to EAD for review. The Contractor is responsible for sample collection and analysis.

D. Soil Transfer

1. The CMMP identifies five methods to transfer soil: Deposit at a DFW Materials Management Site, remove from a DFW Materials Management Site, Transfer Between DFW Airport Project Sites, Import Material from an Off-Airport Location, Export Material to an Off-Airport Location.
   a. Deposit at DFW Materials Management Site
      1) Complete the Environmental Authorization to Transfer Soil Form, refer to page 59 of CMMP document. The form must be submitted for EAD and DCC review at least 48 hours in advance with analytical results. EAD and DCC must approve the request prior to any soil leaving the project site.
      2) The Contractor will complete the Excavation Soil Management Form to track field screening results and truck transport information. This form will be turned in to the assigned EAD Compliance Inspector weekly.
      3) Soil originating in a general work area must have analytical samples every, one thousand (1,000) Cyd. The sample must be below Texas Risk Reduction Program (TRRP) Tier 1 Residential levels. EAD will determine the contaminants of concern for sampling.
      4) Soil originating in an area of concern must have analytical samples every two hundred and fifty (250) Cyd. The samples must be below TRRP Tier 1 Residential levels. EAD will determine the contaminants of concern for sampling.
      5) Soil originating in a Remediation Area cannot be transferred to a DFW Material Management Site.
   b. Remove from area DFW Material Management Site
      1) Complete the Environmental Authorization to Transfer Soil Form. The form must be submitted for EAD and DCC review at least 48 hours in advance. EAD and DCC must approve the request prior to any soil leaving the project site.
   c. Transfer Between DFW Airport Project Sites
      1) Complete the Environmental Authorization to Transfer Soil Form. The form must be submitted to EAD and both project OARs at least 48 hours in advance. EAD and both project OARs must approve the request prior to any soil leaving or entering the project site.
      2) The Contractor will complete the Excavation Soil Management Form to track field screening results and truck transport information. This form will be turned in to the assigned EAD Compliance Inspector weekly.
      3) Soil must:
         (a) Originate from a general work area or area of concern
         (b) Must be PID screened every fifty (50) Cyd with a reading less than 25 ppm or have lab analysis every two hundred and fifty (250) Cyd and have results below Tier 1 Residential standards.
   d. Import Material from an Off-Airport Location
      1) Complete the Environmental Authorization to Transfer Soil Form. EAD must approve the request prior to any soil entering the project site.
   e. Export Material to an Off-Airport Location
      1) Complete the Environmental Authorization to Transfer Soil Form. EAD must approve the request prior to any soil leaving the project site.
      2) The Contractor will complete the Excavation Soil Management Form to track field screening results and truck transport information. This form will be turned in to the assigned EAD Compliance Inspector weekly.
      3) Soil must originate from either
         (a) A general work area with either:

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(1) PID readings of zero (0) ppm or,
(2) Analytical samples non-detect

(b) An area of concern with
(1) PID readings of zero (0) ppm and,
(2) Analytical samples non-detect.

4) EAD must approve of the off-Airport location(s). The off-airport location may have additional sampling requirements. The Contractor shall:
(a) Be responsible for all sampling, laboratory analytical, and site fees.
(b) Provide EAD any analytical information and/or documentation resulting from the transfer to the off-airport location within 48 hours.

5) Soils must be taken directly to the off-airport location and not commingled with other unauthorized soils.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

- END OF SECTION -

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SECTION: 01 35 13.13

MINIMUM STANDARDS FOR CONSTRUCTION AND MAINTENANCE ON THE AOA

PART 1 – GENERAL

1.01 SUMMARY

A. These procedures specify requirements and limitations imposed on construction and maintenance activity within the Air Operations Area (AOA), the purpose of which is to ensure the safe and efficient operation of the Airport while providing maximum allowable flexibility for personnel. Any deviation from the procedures as stated herein constitutes a violation and shall be subject to enforcement in accordance with subsection 1.16.

1.02 RELATED REQUIREMENTS

A. 01 18 16, Protection of Existing Underground Utilities and Cables

B. 01 35 13.13.01, Minimum Standards for Construction and Maintenance on AOA Appendix

C. 01 55 20, Contractor Badging, Air Operations Area Access and Revenue Area Access

D. 32 92 19, Seeding and Sodding

1.03 AOA PROCEDURES

A. Construction projects at the Airport are reviewed through conferences prior to the start of work, to establish the parameters within which the work can be performed.

B. Construction projects within the Security Identification Display Area (SIDA)/AOA require that personnel display appropriate Airport Access/Identification Badges issued in accordance with paragraph 1.13.

C. Motor vehicles entering the AOA must display an AOA Access Permit and be in compliance with paragraph 1.15.

D. Construction projects that take place in the public areas of terminal concourses (Sterile Area) to include “back of house” areas such as offices and concessions within the Security Identification Display Area (SIDA)/ Air Operations Area (AOA) require a tool management plan in accordance with Section 01 35 13.13.01.

E. Prior to beginning the Project, the Contractor shall submit to the Owner’s Authorized Representative and the Airport Department of Public Safety (DPS) a Security Plan that describes how the Contractor intends to provide security for the construction site, Contractor Staging Area, and property throughout the duration of the project.

F. The Contractor’s Authorized Representative (CAR) is responsible for ensuring that these procedures are followed. Any exceptions require specific authorization by the Airport’s Operations Department and DPS on a case-by-case basis.

G. Disruption of underground Utilities on the Airport can cause degradation of aviation safety, and widespread loss of the use of airport facilities and or services. Procedures concerning the underground utility’s location and protection are located in Section 01 18 16 and shall be adhered to at all times.

H. Progress meetings are to be held weekly unless otherwise stated in Contract Documents. In order to discuss schedules, planned closures, dig book, safety and security issues, and other related matters.

I. The Contractor is required to conduct daily safety briefings with all workers who will access AOA construction sites and include topics relevant to these requirements and the activities being performed. Discuss specific project movement restrictions as well as general AOA

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safety procedures and guidelines. Follow the safety meeting agenda provided by the Owner's Authorized Representative (OAR). The meeting will be conducted both in English and Spanish when the size of the worker population requires bilingual communications. All Contractor and Subcontractor personnel who are working inside the AOA that day, need to attend. The Contractor shall record meeting attendance, including attendees' names and employers, and shall provide a copy of the attendance sheet to the OAR. Failure by the Contractor or Subcontractor personnel to attend these mandatory meetings could result in AOA access being denied to those individuals.

J. The Contractor's designated Quality Control representative will conduct an "AOA Readiness Checklist" to review with all personnel prior to crews entering the AOA. The AOA Readiness Checklist form is included in Section 01 35 13.13.01.

1. The AOA Readiness Checklist is to be provided to the OAR upon completion. The purpose of the checklist is to ensure that all personnel entering the AOA understand the limits of the designated work area, have all tools, materials, and equipment necessary to complete the planned activities. Have the operability of all powered equipment and hand tools verified prior to entering the AOA.
2. The intent of the AOA Readiness Checklist is to reduce or eliminate superfluous travel to and from the work site due to Contractor's lack of initial readiness. The OAR will not call for Operations escort until the checklist review is complete.

K. Prior to the start of any project on the AOA, the Contractor through the OAR, shall provide the Integrated Operations Center (IOC) with an Emergency Phone Listing a cell phone and/or home phone number of key members of the construction team including the OAR. Additionally send the list to Airfield Operations. The listing shall be in priority order for contacting personnel during off-duty hours. Specifically identify the individual(s) on call 24 hours a day for emergency maintenance of hazard lighting and barricades, this list shall be revised as required.

L. Project management including the Contractor's Safety Officer must be on duty at the Airport whenever the Contractor is performing work on the AOA. Contractor shall provide Safety Officer's contact information to Airfield Operations.

M. The Contractor shall document the condition of the work site and access roads leading in and out to it, prior to start of construction, and restore the area to original (or better) condition when area is no longer marked as a construction site. Including restoration of all markings/ signs/ lights that have been disturbed by the contractor from centerline intersection to intersection. Contractors must restore markings as an entire circuit; patching is not permitted. The requirement will be met when all AOA areas that were previously under construction meet FAR Part 139 requirements and applicable AC's. Refer to "Airfield Signage Plan" in Section 01 35 13.13.01 for example map of restoration requirements.

1.04 FORMS AND INSTRUCTIONS

A. The following forms and instructions are included in Section 01 35 13.13.01 for the Contractor's use, as applicable on the Project:

1. Contractor's AOA Readiness Checklist
2. Lockout Procedure for Airfield Series Lighting Circuits
3. Lockout Log for Airfield Series Lighting Circuits
4. Airfield Closure/Activity/Circuit Lockout Instructions
5. Airport Construction Security Procedures Tool Management Plan
6. Escort Release/Pick up Point Notice/Instructions

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7. Airport Airspace Review Form
8. AMP Airside Construction Part 139 Checklist
9. Airfield Signage Plan

1.05 CONSTRUCTION AIRCRAFT MOVEMENT AREA

A. When construction is being performed within the Aircraft Movement Area (AMA), the following procedures will apply:

1. All vehicle operators shall abide by the Airfield Safety Handbook, published by the Operations Department and available at the following location:

   Airside Safety Handbook

2. The OAR will provide notification to and obtain approval from Airfield Operations before entering the AOA and proceeding into the construction site.
3. Approval to enter closed areas within the Movement Area must be obtained from Airfield Operations.
4. A log of each vehicle entering and exiting the closed area shall be maintained per the Airfield Operations AOA Access Procedure.
5. Contractors are required to obtain approval to vacate a work site which must be compliant with these requirements.
6. The OAR will again notify Airfield Operations when the construction activity has been vacated of all personnel.
7. Summary of Notification Requirement: Notify the OAR and the Airfield Compliance and Projects Office in advance of commencement of the following work activities by no less than the number of calendar days shown:

Activity	**Notice (Days)**
1. Work Activities in AOA	Daily **
2. Airfield Operations Escort	2
3. Installation of Safety Area and Object Free Area boundary and Haul Route Markers	5
4. Temporary Lighting	5
5. Disconnect or Disabling of Power Circuits	5
6. Rerouting of ARFF Road	14
7. Runway/Taxiway Closure (First Notice)	30*
8. Runway/Taxiway Closure (Second Notice)	7
9. Crane Operations (FAA Approval)	60*
*Denotes "Notice" process initiated by the Airport ** Daily schedules of work activities, closures, and circuit lockouts within the AOA must be submitted in Unifier.	

B. Vehicle Operator

1. As approved by Vice President of Operations or their designee, contractors may approve personnel to complete Airport approved training for driving within the AMA. In order to receive and sustain AMA driving privileges, an AMA driver must successfully pass the AMA driving training curriculum. Airside Safety states "Everyone possessing a Movement Area Endorsement must successfully complete Movement Area training and testing at

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least once every twelve (12) consecutive calendar months for the AMA driver's endorsement 139 & IETS training.

2. For initial AOA training it is required, aside from the standard Certification Airport Practices, that all Contractor personnel complete a one-hour video arranged by Operations and DFW pertaining to Airside Construction Part 139. The Contractor must designate an Airfield compliance representative within seven (7) days after Notice to Proceed (NTP), to maintain a report checklist per shift as of Part 139 minimum standard. The checklist can be found in Section 01 35 13.13.01.
3. For Airfield Training driver's certification "The Movement Area Driver Certification Test" (simulator or practical) is required every two (2) consecutive calendar years. ACM states annual and biannual recurrent training is required for all AMA unescorted access persons. All drivers shall be knowledgeable and follow all directives outlined in the Airside Safety Handbook.
4. Trained and qualified vehicle operators shall only drive routes within the AMA specified by Airfield Operations. These routes shall not include crossing of an active Runway or any portion of an active Runway Safety Area (RSA). Vehicle operators will not operate in the AMA during Surface Movement Guidance & Control System (SMGCS) Conditions (low visibility operations).
5. No vehicle shall operate unescorted within the AMA unless it is equipped with an operational flashing yellow beacon, an Airport Board radio (800 MHz), a runway incursion warning system (RIWS), and a VHF frequency radio, and airfield map. All equipment needs to be furnished by the Contractor. In order to monitor FAA ATCT communications in addition to items outlined in the Non-Movement Familiarization Manual.
6. All vehicles, unescorted and escorted, operating within the AMA shall not interfere with aircraft operations. Everyone must always yield right-of-way to aircraft and emergency vehicles.
7. Airfield Operations may issue notice of violations, suspend, or discontinue contractor vehicle operations involving AMA trained drivers at any time it is deemed necessary for safety and/or operational purposes.

C. Personnel Escort Requirements

1. At least one person, following the rules and regulations set forth by The DFW Code of Rules and Regulations, Chapter 9 with escort privileges possessing an Airport Identification/Access Badge, must escort any individual or group of unbadged persons.
2. Unbadged Individuals: Individuals requiring an escort into the Secured Area, Security Identification Display Area (SIDA) or Sterile Area must be for official business only and cannot exceed fourteen (14) calendar days total within one calendar year. Each day an individual is escorted will count as one (1) day. Once an individual reaches fourteen (14) calendar days (Calendar Year: January to December), they will be required to have a valid Airport issued ID Badge to enter the Secured, SIDA or Sterile Areas again.
3. The proximity of the badged person to non-badged person(s) must be such that the unbadged person(s) must remain within sight and sound of the escort at all times and be under the control of the badged escort individual at all times.
4. At a minimum, the CAR, Contractor's Quality Control Representative, Safety Officer, and all Subcontractor superintendents, foremen, and lead men will be badged. Although other members of the construction work force may obtain an Airport Identification/Access Badge, not all badged personnel will be granted escort privileges based on job classification.

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5. The maximum ratio for escorting individuals within the AOA/SIDA will be one AOA badged individual to five non-badge individuals.

D. Vehicle Escort Requirements

1. Each Certified Movement Area Escort (CMAE) must be currently licensed as required by the State of Texas. Possess valid insurance coverage as required by the Airport, possess a valid and unexpired Airport Identification/Access Badge with the “CM” endorsement, and escort privileges, and be thoroughly familiar with the provisions of this Section and Airside Safety Handbook. A CMAE must escort all other vehicle operators at all times within the movement area. Any person operating a vehicle (tracked or wheeled) inside an AOA closed surface must, at minimum, obtain a non-movement driving endorsement. If they are operating autonomously inside the closure, then training and credentialing rules apply.
2. A CMAE must possess their unexpired CMAE endorsement on their SIDA badge at all times during driving unescorted within the AMA. That certification must be presented to an Airport Board employee upon request.
3. In order to sustain AMA driving privileges, a CMAE must ensure training (retraining) is completed within twelve (12) consecutive calendar months of their initial or previous training session.
4. The vehicle operated by a CMAE during the performance of a vehicle escort within the AMA shall be clearly marked with "ESCORT" on both sides and on the back of the vehicle. The minimum height of the letters must be four (4) inches. Magnetic signs are acceptable.
5. A maximum of five (5) vehicles may be escorted for a total of six (6) vehicles including the CMAE vehicle.
6. All vehicle operators must have the ability to communicate via radio or phone with project management. Each vehicle must possess a map of the Project site with detailed depictions of AOA entrance/exit points, Haul Roads, restricted areas, and other vital information.
7. Contractor shall furnish own escorts for AOA access. However, contractor may request a dedicated escort from Airfield Operations. Airfield Operations shall review requests on a case-by-case basis.

E. All vehicle Escorts must enter the AOA through a DPS Security services staffed AOA gate.

F. The Escort and person(s) to be escorted will meet prior to the escort outside of the AOA gate and verbally communicate the location of the intended destination, the route to be taken, and give further instruction, as necessary. All escorts for construction projects on the AOA, including without limitation the AMA, shall be performed in a manner calculated to ensure that the escorted party (Contractor equipment, vehicles, personnel, etc.) will be released from the escort only at the designated Release Point inside the construction work area.

Details of Contractor Provided Escort Operations (Details of an Airport provided escort are identical to using an Airfield Agent):

Methods listed shall concur with the Airfield Operations Escort Policy.

1. The CMAE will arrive at the location to begin an escort.
2. The CMAE will get out of their vehicle and meet with all personnel who will be under their escort and will pass out laminated Release/Pick-Up Point Escort Instruction Sheets to the operator of each vehicle to be escorted.
3. The CMAE will ensure there is at least one (1) badged person for every five (5) non-badged persons.

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4. The CMAE shall verbally instruct each vehicle operator to follow the escort vehicle at all times, and as closely as considerations of safety will permit, until the vehicles are released from the escort at the Release/Pickup Point. Preferably located at least fifty (50') inside of the construction work area. The Contractor shall be responsible for the materials and maintenance at the Release/Pickup Point.
5. The CMAE will then escort the vehicles to the Release Point within the construction work area.
6. Upon arrival at the construction work area Release Point, the CMAE will drive around inside the closure and verify that all vehicles have arrived.
7. After the CMAE has verified that all escorted vehicles have arrived, all escorted vehicles will be directed to stop. All escorted vehicle drivers will stop to return the laminated escort instruction sheets back to the Airfield Operations employee.
8. Same procedure will apply for escorting vehicles out of the construction work area to an AOA gate.
9. The CMAE will not terminate the escort or release any escorted party except at a designated Release Point. For example, the CMAE shall not release the vehicle(s) being escorted outside of a cone line established for a closure and allow the vehicles to drive past the cone line into the work area unescorted. The CMAE will perform the escort past the cone line into the construction work area.
10. An Escort performed to construction work areas on the AOA in which a closure of a Taxiway or Runway is not in effect and an established Release Point is not being used, will be conducted in a manner that the vehicles will be released at the designated point agreed to by the CMAE and the person being escorted. The Release Point of the Escort will be agreed to at the verbal briefing performed prior to the start of Escort.
11. Pullbacks are reviewed on a case-by-case basis by Airfield Operations. Pullbacks will be considered if the work will be done in less than thirty (30) minutes with hand tools only. Machinery or vehicles are prohibited from entering operational surfaces during a pullback operation.

G. Airport provided escorts must be coordinated with Airfield Operations in advance through the OAR. Airfield Operations will not provide escorts on a continual basis. Contractor will be responsible for providing own escorts.

H. Contractors may perform an escort only along approved and established Haul Roads, provided the following procedures are adhered to:

1. The vehicle operator displays a valid Airport Identification/ SIDA Access Badge.
2. The vehicle displays a valid AOA Access Permit.
3. The vehicle is clearly marked with a three-foot square orange and white checkered flag for daytime activities. Or a 360-degree rotating or flashing amber light for daytime or nighttime activities.
4. Supervisor and escort vehicles shall have a rotating or flashing amber light that operates continuously

NOTE: Only authorized Airport Board and FAA personnel or their assigned agents may perform Escorts off established Haul Roads.

1.06 HAUL ROADS

A. Airfield Operations must approve the establishment of Contractor Haul Roads. Prior to approving Haul Road activities, the following must be established:

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1. Green flags or markers, not to be smaller than six (6) inches square mounted on wooden stakes no higher than eighteen (18) inches above the ground, must prominently mark each side of the Haul Road at intervals of not more than one hundred (100) feet apart.
2. Stop signs (thirty (30) inches x thirty (30) inches), or other traffic control devices, conforming to the Texas Manual of Uniform Traffic Control Devices (TMUTCD), must be clearly posted on either side of intersecting roadways, emergency roads, Taxiways and other areas specified by Airfield Operations. Signs shall normally be no nearer than one hundred forty-two point five (142.5) feet (one hundred sixty-seven point five (167.5) feet for certain taxi routes) from the Taxiway centerline or ten (10) feet from the edge of the emergency road.
3. In some cases, traffic control signal lights may be required for controlling Taxiway crossings. When signal lights are used, they shall have either eight (8) inch or twelve (12) inch circular red and green lenses, and shall normally be located a minimum of one hundred forty two point five (142.5) feet (or up to one hundred sixty seven point five (167.5) feet) from the Taxiway centerlines and between two (2) and ten (10) feet from the outside edge of the Haul Road surface. The signal height shall be no less than nine (9) feet or more than fifteen (15) feet above the Haul Road surface. Approval for use of traffic control signal lights will be approved on a case-by-case basis, only by Airfield Operations.
4. Flaggers, wearing bright reflective outer clothing, shall be posted at each crossing to control Haul Road traffic reversible stop/ slow signs. A flagger may not be allowed to perform any other function and must be able to speak and understand English.
    a. Fully qualified flaggers or identified safety sensitive areas, shall have completed Airport approved training concerning the AMA. Successful completion of the annual training includes passing all required tests. Each flagger must actively monitor a VHF tower radio (Contractor furnished) tuned into the appropriate frequency when engaged in flagging operations at or near an active Taxiway. Unless otherwise specified, a flagger is required on each side of the active Taxiway to be crossed, i.e., two (2) for a single crossing point. Additional flagger positions will be at the direction of the Airfield Compliance Manager or their designee.
5. Paved areas must be kept clean at all times. An operational vacuum sweeper driven by a CMAE shall be provided at each active Taxiway crossing during hauling operations. The sweeper vehicle may not be used as an escort vehicle.
    a. If the sweeper driver is not a CMAE, they shall obtain a non-movement endorsement and will be counted as one vehicle in the escort train.
6. All vehicles shall stop at each Taxiway and/or emergency road before crossing to ensure the route is clear.
7. Construction vehicles must yield right-of-way to all Airport vehicles and aircraft at all times.
8. Hauling operations will be discontinued at the direction of Airfield Operations when the operation of the airfield warrants, due to inclement weather or other conditions affecting aircraft movement.
9. Contractor shall provide wheel wash stations for the removal of mud from trucks and other vehicles at the following locations:
    a. Prior to entry onto public thoroughfares.
    b. Prior to crossing Airport roadways, Ramps, Taxiways and Runways.

    NOTE: If the Contractor can successfully exhibit his ability to keep the paved areas, listed above, clean, the OAR may waive the requirement for wheel wash stations.

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1.07 CLOSING AIRFIELD AREAS

A. No portion of the airfield may be closed to aircraft or vehicles without specific authorization from Airfield Operations. Any construction activity that affects the utilization of roadways, Taxiways, Runways, Navigational Aids (NAVAIDs), or associated electrical circuits must be prearranged and scheduled in accordance with contract documents, and specific approval granted by Airfield Operations. The Lockout Procedure for Airfield Series Lighting Circuits is included in Section 01 35 13.13.01. Airfield Operations may require that a phased closure may be directed to be delayed or reassigned to a different date due to operational impacts. This will be done at no additional cost to the owner.

B. The following activities are considered an impact to airfield areas and require closures:

1. Obstruction of any roadway or emergency access road.
2. Objects, excavations, personnel, or material within:
   a. Runway Safety Area – two hundred fifty (250) feet from the centerline
   b. Runway Safety Area – one thousand (1000) feet off the end
   c. Taxiway Object Free Area – one hundred forty-two point five (142.5) feet from centerline (one hundred sixty-seven point five (167.5) feet for certain taxi routes)
   d. Taxilane Object Free Area – one hundred thirty-five (135) feet from centerline (up to one hundred sixty-one (161) feet for certain taxi routes)
   e. Within a NAVAID Critical Area (NCA)

C. Initial notification of intended airfield closures should be prearranged no less than thirty (30) Calendar Days in advance, except where noted otherwise within the Contract Documents or as granted by Airfield Operations on a case-by-case basis.

D. In order to enable proper coordination of Airfield Activity/ Closure Requests/ Lockout Requests all must be submitted within Unifier by the Contractor's Authorized Representative (CAR) sent to the Owner's Authorized Representative (OAR) by 0900 hrs. of the morning preceding nighttime AOA activities/ closures/ circuit lockouts (1900 to 0700 hrs.) and/or the following day's daytime activities/ closures/ circuit lockouts (0700 to 1900 hrs.). For activities/ closures/ lockouts on a holiday, daytime on the day following a holiday, Saturday, Sunday, and daytime on Monday, the requests must be submitted into Unifier by 0900 hrs. on the last workday prior to the start of holiday or weekend. Two requests (one for nighttime work and one for daytime work) shall be submitted. No more than one workday's activities will be included on each form. A cancelation notification of scheduled closures should be submitted by contacting the Coordination Center by the most expeditious means available.

E. Airfield Operations reserves the right to refuse any closure due to unforeseen conditions that may require continued utilization of the area for aircraft operations. These conditions include, but may not be limited to:

1. Inclement weather/low visibility conditions
2. Delayed aircraft operations
3. Closures of higher priority (e.g., urgent maintenance activities)
4. Emergency situations
5. The Annual Part 139 FAA Inspections

F. Closures require the placement of low-profile barricades (edge of grass to edge of grass) with reflective tape and red flashing lights placed across closed Taxiways or portions of the Runway. Airfield Operations can require the Contractor to modify the locations of the barricades, from what may be shown on the Plans, if in their opinion such modification is necessary due to aircraft utilization of the Airport. Lighted cones may be approved in certain

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circumstances at the discretion of Airfield Operations. For closures involving a cross Taxiway intersecting at a Runway, the closure will include the portion of that same Taxiway on the opposite side of the Runway.

G. Runway closures require the placement of lighted “X’s” at each end of the Runway if personnel or equipment will be on the Runway at any time. Preferably, those will be trailed X’s. Note, Runway closures are only restrictions for aircraft takeoffs and landings and not necessarily restrictions for aircraft taxi operations on available Runway pavement.

1. On Runways with intersection departures, the placement of barricades (edge of grass to edge of grass) with reflective tape and red flashing lights placed across the closed Runway to prevent inadvertent departures from the intersection will be directed by Airfield Operations, i.e., south of Taxiway Z, north of Taxiway B.

H. For work that requires any Runway closure, any required construction equipment, materials, etc. shall be mustered on-site or at a designated area approved by the OAR prior to the execution of a Runway closure. Prior to a Runway closure, the Contractor may also be required to demonstrate the good working order of his equipment, availability of materials if off-site, adequacy of material quantities on-hand, or any other factors which might delay the Contractor's work and subsequent reopening of the closed Runway to the satisfaction of the OAR and/or Airfield Operations.

I. All areas closed to aircraft operations must be prominently marked and lighted in accordance with these standards, or as directed by Airfield Operations or the OAR.

J. Taxiway guidance signs, centerline lights, and edge lights that could otherwise lead an aircraft into a closed area shall be deactivated and/or covered as directed by Airfield Operations. Signs must be properly modified with blank panels and all modified signs must meet FAA airfield signage specifications and standards. Plastic wrap is prohibited.

K. Taxiway centerline markings that could otherwise lead an aircraft into a closed area shall be obliterated by means of water blasting. Any existing markings that are affected by the removal operations must be restored for continuity, i.e., centerline removed over top of Runway edge marking.

L. For any work activity located at or beyond the Runway holding position markings and on or within fifty (50) feet of the outside edge of the taxiway shoulder, a Runway closure is required regardless of the distance from the Runway centerline.

M. No construction activities will be allowed to begin prior to completion of the barricading, and modification to markings, signs, and lights as required by section 1.08.

1.08 MARKING AND LIGHTING

A. All construction equipment must be marked by a three (3) foot square orange and white checkered flag during daylight hours, or an amber rotating or flashing beacon during daylight or nighttime. Supervisory and escort vehicles must display a 360-degree amber rotating or flashing beacon. For nighttime construction, certain other vehicles, cranes, and pieces of construction equipment may require lighting as directed by Airfield Operations.

B. All excavations and closed areas on the AOA must be prominently marked and lighted with low profile barricades with reflective tape and lighted with red flashing lights, or as directed by Airfield Operations and the OAR.

C. The low-profile barricades shall be interconnected and must extend from edge of grass to edge of grass or across entire paved surface of closed area.

D. No construction activities will be allowed to end before all excavations have been marked, lighted, and/or covered as required.

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E. Excavations adjacent to full strength Taxiway pavement of an active Taxiway or excavations within a Taxiway Safety Area, shall be marked with lighted barricades that must be as low as possible to the ground. Must be of low mass, easily collapsible upon contact with an aircraft or any of its components and weighted or sturdily attached to the surface to prevent displacement from prop wash, jet blast, wing vortex, or other surface wind currents. If the barricades are affixed to the surface, they must be frangible at grade level or as low as possible, but not to exceed three (3) inches above the ground. Non- frangible hazard markings, such as concrete barriers, metal-drum type barricades or timbers (railroad ties) shall not be used in the AOA.

F. Excavations within the Non-Movement Areas shall be marked with collapsible barricades marked with diagonal, alternating orange and white stripes. Each barricade attached or joined together needs two flashing red lights on each end.

G. Excavations within ten (10) feet of emergency roads shall be marked with lighted Type A barricades or Airport approved traffic control devices.

H. Orange construction fencing shall be used in the AOA as depicted in the construction phasing plans in accordance with the following:

1. Plastic construction fencing shall not be utilized within a Runway or Taxiway Object Free Area (OFA), within one hundred forty two point five (142.5) feet (up to one hundred sixty seven point five (167.5) feet in some locations) of a Taxilane centerline, or in any other area where jet blast could be a problem.
2. Approval of the material by the OAR is required before using construction fencing on the AOA.
3. Construction fencing and supports must be kept in a satisfactory condition (all supports in place, material securely attached to the supports and no tears in the material).
4. The use of construction fencing is prohibited for prominently marking and lighting an excavation.
5. The posts shall have a white reflective marker at the top of the post that is visible from outside the construction site.

I. Barricades, cones, and/or construction fence shall be removed when directed by the OAR, or when the requirement for marking of hazardous areas no longer exists, or when there is no more work to occur in the protected area and there is no intent to return.

J. Release/Pick Up Point markings shall consist of a three (3) foot square black and white checkered flag located within a group of five (5) orange cones with amber lights placed fifty (50) feet inside of the closed area.

K. All marking, lighting, signs, flags, cones, barricades, and other safety related devices shall be maintained to one hundred percent (100%) serviceability at all times.

L. Should these requirements not be met, all work activities shall be halted until the aforementioned requirements are met in full. Delays as a result of nonconformance will be at no cost to the owner.

1.09 SAFETY AREAS

A. A Safety Area is the surfaces surrounding a Runway and Taxiway in which no potentially hazardous ruts, humps, depressions, or other surface variations (in excess of three (3) inches) may exist. Surface conditions must be capable under dry conditions of supporting the Aircraft Rescue and Fire Fighting (ARFF) vehicles and other heavy equipment and supporting the occasional passage of aircraft without causing major damage to the aircraft.

B. Safety Area dimensions are as follows:

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1. Runways: two hundred fifty (250) feet either side of centerline, one thousand (1000) feet off each end.
2. Taxiways: one hundred and seven (107) feet either side of the centerline, total two hundred and fourteen (214) feet side (one hundred thirty-one (131) feet from centerline on certain taxi routes).

C. The Contractor may be required to immediately terminate his work within an RSA at the instructions of the OAR or Airfield Operations. Work may be performed outside an RSA without closure as long as weather minimums are not less than one thousand (1000)-foot ceiling and/or three (3) miles visibility.

D. Barricades with lights and interconnected will be required to mark the RSA adjacent to the actual work areas.

E. Barricades will be required to be placed on both sides of the nearest Taxiway intersection to prevent any planes turning into the closed area.

1.10 PROTECTED SURFACES

A. Obstacle Free Zone

1. An Obstacle Free Zone (OFZ) is a three-dimensional area involving imaginary surfaces in the vicinity of a Runway. Objects, vehicles, and stockpiled material will not be permitted to penetrate an OFZ whenever the weather conditions are below an eight hundred (800) foot ceiling, or less than two miles of visibility and aircraft are using an Instrument Landing System (ILS) approach.
2. OFZ surfaces are as follows:
   a. An inner-transitional surface OFZ begins at two hundred (200) feet from the Runway centerline, rises vertically to an elevation of 39 feet above the Runway elevation, and then slopes 6:1 to a height of 150 feet above the established Airport elevation. (For Category II/III Runways, the surface rises vertically to an elevation of 23 feet above the Runway elevation and then slopes 5:1 for a distance of 657 feet from the Runway centerline, then slopes 6:1 to 150 feet above the established Airport elevation.)
   b. An inner-approach OFZ begins 200 feet from the Runway threshold at the same elevation as the Runway threshold and ends 200 feet beyond the last approach light unit. Its width is 400 feet, and it rises at a slope of 50:1.
   c. Objects that do not penetrate the OFZ may still require approval by the Airport Operations Department based on the requirements contained in Federal Aviation Regulation Part 77.

B. Object Free Area

1. An Object Free Area (OFA) is a two-dimensional area surrounding a Runway, Taxiway, and Taxilane within which no object may be located that is not completely mobile and capable of clearing the OFA for each passing aircraft. EXCEPTION: Airport Approved objects such as barricades, markers, flags, and lights used to define excavations are allowed to remain within the OFA with approval from Airfield Operations.
2. Normal OFA dimensions are as follows:
   a. Runways – 400 feet from centerline.
   b. Taxiways – 142.5 feet from centerline. (167.5 feet for certain taxi routes).
   c. Taxilanes – 135 feet from centerline. (161 feet for certain taxi routes).
3. Airfield Operations must authorize construction activities within OFAs in advance.
4. No objects will be allowed to remain within a Taxiway or Taxilane OFA above barricade height.

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5. At the approval of Airfield Operations, mobile equipment and/or personnel on foot may operate within the OFA provided it is properly marked and lighted, and a flag person is used to signal the pullback of all persons and equipment for each passing aircraft. A flag person may not be allowed to perform any other function.
6. Using "pull back" procedures when working within a Taxiways' OFA during nighttime hours is prohibited unless the area of work has sufficient light in the opinion of Airfield Operations. Sufficient light may include artificial light that is either existing or supplied by the Contractor. If it is chosen to bring in additional artificial light for the work area, a layout plan shall be submitted to Airfield Operations for approval. At a minimum, the plan shall show the type(s) of light, the location of light(s) and whether or not the light(s) will be shielded. Airfield Operations may require additional information to determine the impact of construction lights on airfield operations.

   Exception: No activities will be allowed within 142.5 feet (167.5 feet for certain taxi routes) of a High-Speed Exit (HSE) Taxiway unless that HSE Taxiway is closed.

C. NAVAID Critical Area
1. Work will not be authorized within a NAVAID Critical Area (NCA) without specific approval by Airfield Operations.
2. NCAs include Runway ILS NAVAIDS and microwave signal paths.

D. Criteria for Marking Construction Sites, Safety Areas, OFA, and NCAs
1. White markers or flags are used to prominently mark the boundaries of construction sites when such marking is determined to be feasible. Alternatively, orange construction fence may be used for this purpose in accordance with subsection 1.06.H above.
2. Red markers or flags must prominently mark the boundary of a RSA and a Taxiway OFA. Prior to beginning any activity within 50 feet of the RSA or Taxiway OFA, the boundary shall be further marked with low profile barricades that are interconnected.
3. Yellow markers or flags must prominently mark the boundary of a Runway OFA (400 feet from a Runway centerline) and an NCA. NOTE: Construction activities are subject to being terminated whenever visibility is at or below 3/4 mile, except as approved on a case-by-case basis.
4. All markers/flags must be made of reflective material and be no smaller than 6 inches square mounted on 2 inches x 2 inches wooden stakes no higher than 18 inches above the ground. Each marker or flag must be placed no further apart than 50 feet and extend to the limits of the construction site. NOTE: Airfield Operations on a case-by-case basis may grant exceptions.
5. No work shall begin in areas requiring these markers or flags until the OAR have confirmed the correct placement.
6. The markers or flags must be continuously maintained as installed unless work is confined to periods when the associated Runway, Taxiway, or Taxilane is closed, or the NAVAID has been removed from service.
7. Workers and equipment are prohibited from passing beyond red or yellow markers or flags designating a Safety Area, OFA, or NCA without the approval of the OAR as obtained from Airfield Operations on a case-by-case basis except when the associated Runway or Taxiway/Taxilane is closed.
8. Markers or flags shall be removed when directed by the OAR or when work within these areas is completed.

E. Trenches, Excavations, and Stockpiles

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1. No trenches or excavations will be permitted within the following areas:
   a. Within 250 feet of a Runway centerline.
   b. Within 1000 feet from the Runway end.
   c. Within 107 feet (131 feet on certain taxi routes) of a Taxiway centerline unless the opening is properly barricaded and lighted.
2. Stockpiles (including spoils piles) are not permitted within the boundaries of the AOA; however, the Contractor may submit a request to the OAR for a stockpile within the AOA. When such a stockpile is permitted, it shall be restricted to 3 feet tall and shall not be permitted in the following areas unless additional specific approval has been granted:
   a. Within 400 feet of a Runway centerline.
   b. Within 142.5 feet of a Taxiway centerline (167.5 feet on certain taxi routes).
   c. Within 135 feet of a Taxilane centerline (161 feet on certain taxi routes).
   d. Within 2700 feet of the end of a Runway (Runway OFA Extension).
   e. Within an NCA.
3. All trenches, excavations, and stockpiles must be prominently marked and lighted.

F. Staging of Construction Equipment

1. Construction equipment is not permitted to be staged (stored) within the boundaries of the AOA; however, the Contractor may submit a request to the OAR for equipment storage within the AOA. When such an authorization has been obtained, the equipment shall not be permitted in the following areas unless additional specific approval has been granted:
   a. Within 400 feet of a Runway centerline.
   b. Within 142.5 feet of a Taxiway centerline (167.5 feet on certain taxi routes).
   c. Within 135 feet of a Taxilane centerline (161 feet on certain taxi routes).
   d. Within 2700 feet of the end of a Runway (Runway OFA Extension).
   e. Within an NCA.
2. All construction equipment authorized to be staged (stored) within the boundaries of the AOA, must be prominently marked and lighted as directed and approved by the OAR.

G. Use of Extended Height Equipment

1. The use or installation of extended height construction equipment (more than 20 ft. high) such as cranes, "cherry pickers," drill rigs, and batch plants are prohibited without prior approval of the Airport.
2. The Contractor shall provide advanced notice for the use of such equipment at any location on the Project site. The Contractor shall complete and submit to the OAR the Airport Airspace Review Form included in Section 01 35 13.13.01.
3. No such equipment shall be transported onto the Airport site prior to the approval of Airfield Operations through the OAR.
4. If utilized at night or in conditions of poor visibility (less than 3 miles visibility), the equipment must be lighted in accordance with FAA Advisory Circular 70/7460-1 (most current version) Obstruction Marking and Lighting and/or as directed in the airspace study. Lights must be visible throughout 360°, and steady burning red lights must have a minimum light intensity of 32.5 candelas and flashing red lights shall have a peak effective intensity of 2000 ± 25 % candela.
5. This equipment shall be lowered to its stowed height when not in use or as directed by the OAR in concurrence with Airfield Operations.

H. Maintenance of Construction Areas

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1. Construction boundaries shall be clearly defined and marked/fenced as directed by Airfield Operations.
2. Gaps under and between fences and gates shall not exceed three (3) inches. Vegetation must be maintained so the bottom of fence lines and gates are visible at all times.
3. The Contractor shall be responsible for maintaining construction areas to the same standards used on the remainder of the airfield including such items as:
   a. Maintaining vegetation height of 6 inches to 10 inches.
   b. Maintaining the work area to remain clear of debris, trash, and excessive construction materials at all times.
   c. Ponding is not permitted. Storm water must completely drain within 48 hours after a rain event. Overwatering from irrigation that causes ponding must be corrected.
   d. Maintaining all markers, barricades, cones, signs, lighting and erosion control devices in proper working/functional condition.

1.11 CONSTRUCTION - NON-MOVEMENT AREAS

A. When construction activity is performed within the Non-Movement Area of the AOA (Ramp, Taxilane, etc.), the procedures established for the movement area generally apply unless otherwise authorized by Airfield Operations, EXCEPT:

1. Unescorted access though CTA Gates is limited to those persons displaying a valid Airport Identification/Access Badge encoded with "terminal gate access" authorization. The term “Terminal gate access” is defined as any badge holder whose badge has been encoded to grant access through security gate checkpoints within passenger terminals. Those badge holders who do not have terminal gate access privileges encoded in their badge must be escorted by someone who has terminal access privileges.

1.12 AIR OPERATIONS AREA SECURITY

A. Each employee working within the AOA must be briefed on AOA security regulations and a record of such training maintained by the Contractor. Each employee must attend AOA Safety Coordination meetings prior to the start of work within the AOA that includes security enforcement subject matter. Failure to attend may result in employee being denied access to the AOA.

B. Each non-badged employee that is allowed escorted access to the AOA for the purpose of construction activities must possess and render for inspection government-issued picture identification. Identification documents shall be subject to being verified through a credential check process by the Airport. All non-badged individuals will be required to carry valid government issued identification with them at all times while working inside the AOA. All non-badged individuals must remain within visual sight of their escort at all times while on the AOA.

C. It is the responsibility of every Airport Identification/Access Badge holder to challenge anyone in the AOA who does not have an Airport Identification/Access Badge prominently displayed unless that individual is under escort by a properly badged individual with escort authority.

D. Construction storage/office areas located outside the AOA must be secured to prevent unauthorized entry by the public.

E. The Contractor shall maintain project related AOA fences intact and secure at all times. A 10-foot clear zone will be maintained on both sides of the fence. The clear zone will remain free of stockpiled materials and/or vehicles.

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F. Notify Airfield Operations Each Working Day, through the OAR, prior to initial entry of any personnel into the AOA. Airfield Operations shall be notified again after the last personnel leave the AOA at the end of each workday.

G. The Contractor shall utilize approved AOA staffed gates to gain access to the AOA provided coordination has been made through the OAR and the DPS. The Contractor may also request approval from the Airport Operations Department and the DPS to install a new gate (normally such gates are not approved within the SIDA). If approved, a gate number will be assigned by DPS, and a work order will be submitted to install a DPS approved lock. Gates in the Central Terminal Area (CTA) will require Access Control equipment and will be manned by DPS Security Officers. Gates not located in the CTA will also be manned by DPS Security Officers.

H. The Contractor will be responsible for funding and coordination of staffing with DPS and the OAR. Additionally, the Contractor will be responsible for installing an air conditioned and heated security post, restroom and telephone. Specifications for guard houses may be obtained from the Airport Design Criteria Manual. Any exceptions will be at the discretion of the DPS. All new gates requiring manned personnel must have a ballistic rated security booth with DPS approved restroom facilities and cameras that can be tied into the DPS Master Control Room.

I. All AOA gates, which are not automatic or manned, shall be secured with the current Airport locking mechanism unless pre-approved by DPS.

J. The use of Contractor provided locks in place of or in addition to Airport locks is specifically prohibited. The DPS will not issue an AOA gate key to the Contractor or any Subcontractor on the Project.

K. In the event that construction requires a portion of the AOA fence or gate to remain open on a temporary basis, the opening will be secured by a DPS Police or Security Officer.

1. The Contractor shall be responsible for the funding and coordination of staffing with DPS. The DPS provides Police or Security Officers from the off-duty employment pool. Contact the DPS Airport Security Staffing Coordinator (972-973-4710) or by email at asi@dfwairport.com.
2. All fence openings or gates shall remain closed until the Security Officer has verified the vehicle and all occupants are authorized to enter the AOA.
3. Persons or vehicles with proper identification shall be denied entry if their presence in the AOA is not related to the Project. Unauthorized entry shall be reported immediately to the DPS and the AOC.

L. Entrance through CTA may be permitted under the following conditions:

1. Unescorted access though CTA Gates is limited to those persons displaying a valid Airport Identification/Access Badge programmed with "access" authorization in a vehicle displaying a valid AOA Vehicle Access Permit.
2. A person issued an Airport Identification/Access Badge with "access" must present their badge to the DPS Airport Security Officer or DPS authorized representative for validation.
3. A person issued an Airport Identification/Access Badge with "access" authorization but does not have the badge in their possession or a person issued a badge without "access" authorization shall not be permitted to enter the AOA through a CTA Gate even under escort.
4. A person who does not possess a valid Airport Identification/Access Badge or has not been issued a badge may be allowed to enter the AOA through a CTA Gate only on

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official business and only when under escort. The non-badged individual will be documented on a visitor's log along with the authorized individual conducting the escort and must also have a valid government issued photo identification on their person at all times.

5. The maximum ratio for escorting individuals within the CTA will be one (1) Airport Identification/Access Badge individual with escort authority to five (5) non-badged individuals. Non-badged individuals must remain within visual and physical proximity to the badge holder and must have valid government issued photo identification on their person at all times.
6. No one will be permitted to enter a CTA Vehicle Gate on foot. All persons and property are subject to inspection by security personnel.

Note: Violations of AOA security requirements within Contractor controlled areas of responsibility, which result in criminal or civil penalties, or fines shall be the responsibility of the Contractor and/or individual to resolve or pay and may result in the temporary or permanent suspension of the Airport Identification/Access Badge.

M. For AOA access and/or construction activities in the west airfield, all badged personnel shall successfully complete the West Cargo Area training program. Upon completion of the training, each badge holder must request the West Cargo Matrix be added to their badge access through the authorized signatory.

1.13 AIRPORT IDENTIFICATION/ACCESS BADGE

A. No person shall enter the SIDA/AOA without authorization. Any person found on the SIDA/AOA without proper identification as described herein shall be considered unauthorized, removed from the SIDA/AOA, and subject to prosecution and suspension or revocation of the Airport Identification/Access Badge.

B. All persons authorized access to the SIDA/AOA shall clearly display a valid Airport Identification Badge on their outermost garment, above the waist and below the neck, with the picture facing forward, at all times or shall be escorted by an authorized agent of the Airport, the FAA, or a representative of the airline or tenant.

C. It is the responsibility of every Airport ID Badge holder to challenge anyone on the SIDA who does not have a valid Airport ID Badge prominently displayed unless that individual is obviously under proper authorized escort.

D. The ACO administers Airport ID Badges and is managed by the DPS: The Airport Identification Badge is an easily identifiable badge, about the size of a standard credit card. It must be prominently displayed on the outermost garment above the waist and below the neck of the person to whom it was issued.

E. Applications

1. New applications for an Airport Identification/Access Badge shall be submitted in the manner prescribed by the ACO DFW International Airport | Official Website and coordinated with the OAR. Copies of the application may be obtained from the OAR. Instructions for filling out the form are on the back of the form. Care should be followed in filling out the application.
2. Each applicant must submit to a Criminal History Records Check (CHRC) through submission of fingerprints to the FBI. In addition, each applicant must receive an “Approved” Security Threat Assessment (STA) result from TSA prior to badge issuance. Those persons who have been convicted of a disqualifying crime and/or who do not receive an “Approved” STA result from the TSA per CFR 1542 shall be denied a badge.

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3. Upon approval of the Airport, the application shall be submitted online, and the applicant is ready for training located at Access DFW Terminal B, gate B17 (outside security).
4. The Contractor and all Subcontractors must obtain and pay for all Airport Identification/Access Badges and Access Permits as required by DFW Airport. (A list of 'Fees & Charges' can be found on Access DFW's website: DFW International Airport | Official Website under Fees & Changes.) Fees are subject to change at any time.
5. For additional requirements and information please reference Section 01 55 20.

F. Revocation

1. Violation of AOA Rules and Regulations, Policies and Procedures, is grounds for immediate revocation of Airport Identification/Access Badge.
2. Upon termination or upon conclusion of the requirement to access the SIDA, the employees of the Contractor shall be responsible for immediately surrendering the Airport Identification/Access Badge to the authorized signatory.
3. The Contractor shall be billed a non-returned badge fee for all badges not returned to the ACO within five (5) business days.
4. DPS and the badge holder's sponsor have authority to revoke an Airport Identification/Access badge. If an individual's Airport Identification/Access Badge is revoked, the person will be immediately escorted from the SIDA/AOA or detained by DPS.

G. Authority

1. The authority to produce and issue an Airport Identification/Access Badge lies solely with the Airport.
2. No person shall produce, copy, issue, or use a similar badge at the Airport.
3. No person shall in any way alter an Airport Identification/Access Badge.
4. The Airport Identification/Access Badge is the sole property of the Airport and issued for the exclusive use of the individual identified thereon.
5. The Airport Identification/Access Badge must be surrendered for inspection upon request of an authorized agent of the Airport.

1.14 AIR OPERATIONS AREA ACCESS PERMIT

A. No motor vehicle shall enter the AOA unless such vehicle displays an AOA Access Permit or is under escort by a duly authorized agent of the Airport, the FAA, or tenant responsible for the AOA gate through which the person is to enter.

B. The ACO administers Access Permits for the AOA.

C. Authority

1. The authority to produce and issue an Access Permit lies solely with the Airport.
2. No person shall produce, copy, issue or use a similar permit at the Airport.
3. No person shall in any way alter an Access Permit.
4. An Access Permit is issued for the exclusive use of the vehicle identified on the permit application.

D. For additional requirements and information please reference Section 01 55 20.

1.15 MOTOR VEHICLES ON AOA

A. Authorization and Registration of Vehicles

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1. No motorized vehicle shall enter the AOA unless its driver thereof is duly authorized to operate such vehicle on state or municipal highways and has duly authorized access to the AOA/SIDA (if required). All persons authorized unescorted access to the AOA/SIDA shall display an Airport Identification/Access Badge issued by the Airport.
2. No motorized vehicle shall enter the AOA unless such vehicle displays an Access Permit issued by the Airport or is under proper escort.
3. All traffic within the AOA shall comply with all lawful orders, signals, or directions of any authorized agent of the Airport. When signs or pavement markings control such traffic, they shall adhere to the rules outlined in the Airside Safety Manual unless otherwise directed by an authorized agent of the Airport.

B. Safe Operation of Vehicles:

1. No vehicle shall be operated within the AOA in a careless or negligent manner, in disregard of the rights and safety of others, at a speed or in a manner which endangers persons or property, while the driver thereof is under the influence of an intoxicant, or if such vehicle is so loaded or poorly maintained as to endanger persons or property.
2. Prior to driving within the AOA, the vehicle operator must complete the Airport Driver Training Program. For activities in the west airfield, the vehicle operator must also complete the West Cargo Area driver's training.
3. Night or Low Visibility Operations: For night or low visibility operation, all headlights, taillights, and running or clearance lights on the vehicle shall be operational. The driver of each vehicle shall be responsible for the proper operation of such lights. During SMGCS conditions (visibility less than 1,200 feet visibility) there may be restrictions on the use of vehicles on the AOA. Vehicles not directly in support of aircraft operations will not be allowed access to the AMA; and non-essential vehicles in support of aircraft operations should not be operated on Ramps and aircraft parking areas.
4. Vehicles to Stay to the Right: All vehicles on the AOA shall remain on the right side of a roadway, shall pass any vehicle approaching on an open unmarked traffic area to the right, and shall yield the right-of-way to vehicles approaching from the driver's right unless otherwise directed by sign, signal, or an authorized agent of the Airport or when necessary to maintain the safe operation of the vehicle relative to traffic flows.
5. Vehicle Speed:
   a. The maximum speed limit on all AOA Ramps is 20 mph and is enforced by the DPS.
   b. Vehicles operating on the Ramps, Aprons, and operational areas of the Airport shall proceed with care. Erratic driving and excess speeds on these areas are forbidden. Judgment of such excess speed or erratic driving shall lie with the DPS, Airfield Operations, the OAR, and other authorized agents of the Airport.
6. Involvement of Vehicles in Accidents:
   a. The driver of any vehicle involved in an accident within the AOA, which results in injury or death to any person or damage to any property, shall stop at the scene of the accident and render such assistance as may be needed. The driver shall also provide their name, address, and operator's license number to the person injured or to the representative of the owner of the property damaged or to any officer or witness of the injury. Further, the operator shall immediately notify the IOC and submit a report of that accident to the DPS.
7. Parking Vehicles:

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a. No person shall park a vehicle or permit the same to remain in the AOA except at such places and for such a period of time as may be prescribed or permitted by the Airport or under emergency conditions.
b. No person shall stop or park a vehicle to block a driveway, an AOA gate, an aircraft gate or a fire lane, or in other than authorized areas or within 15 feet of a fire hydrant.

8. Right-of-Way:
   a. All motor vehicles on the AOA shall yield the right-of-way to aircraft in motion under all conditions, and all Airport vehicles have right-of-way over Contractor vehicles.

C. Prohibited Vehicles:

1. The use of motorcycles, bicycles, and two-wheeled motor scooters on the AOA is prohibited. EXCEPTION: DPS vehicles.
2. Vehicles that are not in sound mechanical order with adequate lights, horn, brakes, and have clear vision from the driver's seat are prohibited from operating on the AOA.
3. Trailers and semi-trailers shall be equipped with proper brakes so that when disengaged from towing vehicle, neither aircraft engine blast nor wind shall cause them to become free rolling. Positive couplings shall be required for all towed equipment.
4. Vehicles that have not obtained specific authorization from Airfield Operations are prohibited from operating on active portions of the AMA. When authorized, vehicles shall have a radio transceiver or shall be escorted by a vehicle with such equipment to ensure clear two-way radio communication with the Control Tower, and all operators shall have successfully passed ground vehicle operator training prior to operating vehicles on the AMA.

D. Driving Under Aircraft: It is prohibited to drive under any portion of an aircraft.

E. Runway Taxiway movement area: At no time shall a vehicle enter an active Runway or Taxiway, unless it is operated by an AMA trained and qualified driver or accompanied directed by a radio-equipped RIWS vehicle and has been so authorized by the FAA Tower.

F. Driving between Aircraft and Loading Gate: No Person shall drive any vehicle between an aircraft and a loading gate, when passengers are using the surface walkway between such gate and aircraft, or between an aircraft signal person and an aircraft being pushed out or preparing to taxi.

G. Driving Distance from Exhaust: Modern, large jet aircraft produce exhaust velocities that can be hazardous to vehicle operations as much as 70 feet behind the aircraft at idle thrust. At the thrust levels required for an aircraft to start moving from a stop, that distance increases to as much as 300 feet. Therefore, extreme caution must always be exercised whenever passing behind large jet aircraft.

H. Fueling or De-fueling of Vehicles:

1. No person shall fuel or de-fuel vehicles, or other equipment, in an enclosed space at the Airport without the prior approval of the DPS Fire Marshal's Office.

I. Special Vehicle Marking:

1. Vehicles operating on a Runway or Taxiway that do not require an escort must display an amber-rotating beacon.

1.16 ENFORCEMENT OF AOA PROCEDURES

A. Violations of any of these procedures and those outlined in the Airside Safety Handbook may, at the discretion of the Vice President of Operations (Vice President of Public Safety for

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regulatory statutes, i.e., Airport Rules & Regulations) or his/her designated representative(s) and depending on the severity of the violation, result in the following:

1. A notice of violation issued with points against a drivers AOA driving privileges.
2. The individual or vehicle in violation being temporarily or permanently removed from the AOA.
3. The Contract work being stopped until corrective measures are taken to preclude a recurrence of the violations.
4. Civil and/or criminal penalties per applicable local, state, and federal laws and the Code of Rules and Regulations.

1.17 RULES AND REGULATIONS FOR THE CONTROL OF AOA BOUNDARY CROSSING BY VEHICLES

A. General Requirements

1. Statement of Policy: It is the policy of the Airport that all vehicles, unless otherwise authorized herein, shall enter and exit the AOA via established gates.
2. Authority for Enforcement: The Vice President of Public Safety is designated the Administrator of the Code of Rules and Regulations (Administrator) for the control of AOA boundary crossings. They may establish procedures not inconsistent with the Code of Rules and Regulations that he/she determines are necessary to affect the policy of the Code of Rules and Regulations. The DPS shall be responsible for the enforcement of the Code of Rules and Regulations.

B. Enforcement of AOA Boundary Crossing Regulations

1. Violations
   a. If the Administrator determines that a badge holder violates the terms of its operating authority, the Code of Rules and Regulations, the Administrator may notify the holder in writing of the violation and by written order direct the holder to correct the violation within a reasonable period of time. In setting the time for correction, the Administrator shall consider the nature of the violation.
   b. If the violation involves equipment that is unsafe or functioning improperly, the Administrator or their authorized agent shall order the holder to immediately cease use of the equipment.
   c. If the Administrator determines that a violation is an imminent and serious threat to the public health or safety, the Administrator or their authorized agent shall order the holder to correct the violation immediately. If the holder fails to comply, the Administrator shall promptly take, or cause to be taken, any action considered necessary for the immediate enforcement of the order.
2. The Administrator shall include in a notice issued under this subsection:
   a. An identification of the violation.
   b. The date of issuance of the notice.
   c. The time period within which the violation must be corrected.
   d. A warning that failure to comply with the order may result in suspension or revocation of operating authority.
   e. A statement indicating that the order may be appealed to the Executive Vice President Airport Operations.

C. Service of Notice

1. A holder shall designate and maintain a representative to:

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a. Receive service of notice required under the Code of Rules and Regulations to be given a holder.
b. Serve notice required under the Code of Rules and Regulations to be given a driver employed or contracting with a holder.

2. Notice required under the Rules and Regulations to be given:
   a. A holder must be personally served by the Administrator or on notice sent by certified United States mail, five (5) day return receipt requested, to the holder or the holder's designated representatives.
   b. A driver must be personally served by the Administrator or notice sent by certified United States mail, to the address last known to the Administrator of the person to be notified, or to the designated representative for the driver.
   c. Service executed in accordance with this subsection constitutes notice to the person to whom the notice is addressed. The date of service for a notice that is mailed is the date of receipt.

D. Appeal

1. A holder may appeal a correction order issued under subparagraph 1.b. above or any other action of the Administrator if an appeal is requested in writing not more than fourteen (14) Calendar Days after notice of the order or action is received.
2. The Executive Vice President Airport Operations shall act as the appeal-hearing officer in an appeal hearing under this subsection. The hearing officer shall give the appealing party an opportunity to present evidence and make argument in their behalf.
3. The hearing officer may affirm, modify, or reverse all or part of the order of the Administrator.

1.18 SURFACE INCIDENTS AND RUNWAY INCURSIONS

A. The Contractor shall perform all work in compliance with this Section and avoid surface incidents and Runway Incursions at all costs. Should a surface incident or Runway Incursion occur due to the Contractor’s negligence, it will constitute a violation and shall be subject to enforcement per subsection 1.14. Entry into the AMA without a CMAE or authorized Airport provided escort and AOA Construction Escort Release/Pick Up Point Instruction Card or without clear instruction/direction from a flag person at a controlled intersection are examples of violations. Course of action for such occurrence includes a monetary fine of $30,000 for each occurrence.

B. Definitions

1. Surface Incident is an unauthorized or unapproved movement within the designated movement area (excluding Runway Incursions) or an occurrence in that same area associated with the operation of an aircraft that affects or could affect the safety of flight. Examples include, but are not limited to, not yielding right-of-way to aircraft; entering a Taxiway when not qualified, under escort, or directed by a flag person; or depositing debris on a Taxiway resulting in a stopped or damaged aircraft.
2. Runway Incursion is any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and takeoff of aircraft. Examples include, but are not limited to, crossing the Runway holding position marking or entering the RSA from the grassy area regardless of whether or not an active aircraft operation was taking place at the time.

C. An AOA Incident Review Board, chaired by the Vice President of Operations or their authorized designator will review the facts surrounding movement area surface incidents

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and/or Runway Incursions including the affected Contractor and/or department's policies and procedures.

D. The Review Board's recommendation(s) will be coordinated with the Human Resources advisor (if required), and a decision as to the level of disciplinary action to be taken per Airport Board Policy will be made by the Chairman.

E. The Chairman will notify the affected Contractor and/or department vice president of the disciplinary action to be administered.

1.19 SURFACE INCIDENTS AND RUNWAY INCURSIONS PREVENTION BONUS

A. A Project monetary bonus incentive in the amount of $50,000 ("Surface Incidents and Runway Incursions Prevention Bonus") may be added to the monies owed the Contractor under the Contract, should the Project be completed without any surface incident and Runway Incursion within the Contract Time and the option is included in the Contract Documents. Under no circumstances will the Contractor be due, or the Airport be liable for such bonus incentive if any surface incident or Runway Incursion occurs, or if the Project is delayed.

1.20 CLOSURE MAINTENANCE AND STANDARDS

A. All gates, fencelines, and gaps that are found to be out of compliance must be immediately corrected to compliance.

B. All temporary fences are to be inspected by Wildlife Staff after final installation and prior to the fence being accepted by the airport.

C. Maintenance of vegetation needs to begin as soon as the contractor takes control of their worksite, and the maintenance must be ongoing- Section 32 92 19 Seeding and Sodding, specifies mowing must commence as soon as the vegetation reaches six inches (6") in height.

D. Vegetation along barricades and construction fences must be maintained the same as the entire work site.

E. Barricades and construction fences must be removed as soon as possible after the project is complete. Barricades are a hiding place for rabbits and other prey animals, and fencelines are a corridor for them to travel along.

F. Permanent vegetation must be maintained as soon as laid down, including watered thoroughly, and kept maintained including watering to the extent that the soil never dries out.

G. Barricades must be maintained in a serviceable condition at all times. Barricades must not be faded, damaged, or in disrepair. Reflective media affixed to barricades must be in good condition free from fading or warping. Red flashing or steady burning lights must be attached to barricades at intervals no greater than ten (10) feet apart. These lights must be fully operational. If barricades fail to meet these standards, the contractor is required to remediate the deficiencies immediately. Failure to comply may result in the suspension of work activities or additional penalties.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

- END OF SECTION -

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SECTION: 01 35 13.13.01

MINIMUM STANDARDS FOR CONSTRUCTION AND MAINTENANCE ON THE AOA APPENDIX

PART 1 – GENERAL

1.01 SUMMARY

A. This Section provides the forms and instructions provided for the Contractor's use, as applicable, for performing the Work of the Project in coordination with Section 01 35 13.13.

1. Contractor's AOA Readiness Checklist
2. Lockout Procedure for Airfield Series Lighting Circuits
3. Lockout Log for Airfield Lighting Circuits
4. Airfield Closure/Activity/Circuit Lockout Instructions
5. Airport Construction Security Procedures Tool Management Plan
6. Escort Release/Pick up Point Notice/Instructions
7. Airport Airspace Review Form
8. AMP Airside Construction Part 139 Checklist
9. Airfield Signage Plan

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CONTRACTOR'S AOA READINESS CHECKLIST
(TO BE COMPLETED DAILY BY THE CONTRACTOR)

_____ Limits of Closure have been clearly identified to all Contractor and subcontractor personnel. Sufficient quantities of closure devices (red flashers, cones, barricades, etc.) are on hand to achieve the day's closure. Contractor has sufficient cones, lights, and appropriate flags to identify the Release/Pick up Point within their work area.

_____ Electrician is standing by for circuit lockouts and appropriate circuits have been identified (if applicable).

_____ All Contractor vehicles entering the AOA have been checked for valid AOA access stickers on driver's side (left) bumper.

_____ All vehicles are equipped with 360 degree rotating or flashing amber beacons and all beacons are in working order.

_____ All vehicles have company name clearly identified on driver's side door.

_____ All AOA badged personnel have badges clearly displayed on their person.

_____ All non-AOA badged personnel have a government-issued identification on their person.

_____ All construction equipment and heavy trucks (non-passenger vehicles) have orange and white checkered flags or 360 degree rotating or flashing amber beacons affixed to the highest point.

_____ Superintendent and QC Supervisor have full set of the Contract Documents, including Plans, Specifications, any Project Addenda, construction permit copy, safety plan, SWPPP copy, approved submittals and Request for Information in their vehicles and available at all times on the Project site. Additional supplies for the Superintendent shall include, but not be limited to, fire extinguisher, and first aid kit.

_____ All foremen and lead men shall have at a minimum, all drawing sheets and specifications related to their specific area of work on hand.

_____ Contractor has verified that all small engine equipment and tools (generators, saws, etc.) necessary for the day's activities are on hand and operable.

_____ Contractor has verified that all necessary manpower, tools, equipment, and materials necessary for the day's activities are on hand and operable.

The purpose of this checklist is to reduce or eliminate the number of superfluous trips to and from the job site that generally are a result of a lack of initial preparedness. Contractor's QC representative will initial each item as it is verified and sign at the bottom when verification is complete. The Board's authorized representative will not call for Operations Escort or circuit lockouts until checklist has been completed each Working Day. This checklist should be attached to the Contractor's Daily Activity Report and submitted to the Owner's Authorized Representative.

Contractor's Authorized Representative Signature _____ Date: _____

Owner's Authorized Representative Signature _____ Date: _____

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LOCKOUT PROCEDURE FOR AIRFIELD SERIES LIGHTING CIRCUITS

1. Purpose: The purpose of this procedure is to provide practical safeguarding of all persons directly or indirectly involved in the installation, operation, construction, or maintenance of the airfield series lighting system at the Airport. This procedure contains the minimum provisions necessary to ensure the safety of Airport employees and Contractors.

2. Definitions and Abbreviations

   A. AM - abbreviation for "Airport Asset Management".

   B. AOA - abbreviation for "Air Operations Area".

   C. CCR - Coordination Center Representative (Airfield Operations Officer) - the central point of contact for submittal of all AOA scheduled lockout requests, including DCC projects, in-house construction projects, tenant alteration projects, and Asset Management projects or repairs. The CCR will notify the AOC Duty Officer and the FAA of scheduled lockout requests.

   D. FAA - abbreviation for "Federal Aviation Administration".

   E. IRMS - abbreviation for "Insulation Resistance Monitoring System".

   F. Lockout - a safety procedure to de-activate series lighting circuits required by Airport authorities to protect the requesting party from the direct or indirect hazards associated with the flow of electrical current through airfield underground cables, connectors, isolation transformers, or other lighting apparatus.

   G. OPS - abbreviation for "Airport Airfield Operations."

   H. Primary Lockout - A required lockout of series lighting circuits when personnel will be working directly on cable, connectors, isolation transformers, or other airfield electrical components which are energized under normal operating conditions.

   I. Safety Lockout - A required precautionary lockout of series lighting circuits when personnel will be involved in construction work activities such as trenching, excavating, or digging in the vicinity of nearby underground airfield lighting circuits.

   J. Un-Locking - a procedure involving the removal of keyed pad locks on disconnect switches to restore the electrical power on series circuits only after satisfactory wiring continuity and insulation integrity have been verified.

   K. Unsatisfactory Test Results - any electrical test measurement deemed unacceptable by AM, which could be indicative of incipient cable insulation failure, an open circuit, dirty connectors, etc.

   L. AOC – abbreviation for “Airport Operations Center.”

3. General Responsibilities

   A. Asset Management shall be responsible for performing and supervising all scheduled circuit lockouts and un-locking. The AM electrical representative (rep) will perform all the insulation resistance tests required to verify the insulation integrity of the airfield lighting cable prior to locking and unlocking series circuits. In the event of "unsatisfactory" test results, the EAM electrical rep shall place an Airport pad lock on the disconnect switch(s) ahead of the circuit(s) in question, and direct the Owner’s Authorized Representative (or

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Owner's Authorized Representative's in the event of multiple lockouts on one circuit) to immediately investigate the problem and perform all necessary repairs until acceptable test results are obtained.

B. Owner's Authorized Representative's will be responsible for initiating all lockout requests for Contractors and required notifications. In the event of work discrepancies during multiple lockouts on one circuit, Owner's Authorized Representative representatives from each involved project shall agree to first investigate the apparent problem and restore the circuit integrity to a satisfactory level before damage assessment responsibility is ascertained. The Owner's Authorized Representative shall also initiate and schedule all Contractor work requests to provide first time electrical service to new airfield series lighting circuits.

C. The CCR will be responsible for reviewing and providing Airfield Lockout Summary information to the AOC Duty Officer and the FAA (SOC).

D. Airfield Operations will be responsible for determining if defective circuits must be repaired immediately or if they can remain locked out until necessary repairs can be performed.

E. The CCR shall review all lockout requests for operational conflicts prior to final acceptance.

4. Notification Protocol

A. In order to disconnect the source of electrical power feeding an airfield series lighting circuit(s), the Contractor shall contact his/ Owner's Authorized Representative in sufficient time as to comply with the notification requirements. The Contractor shall also identify their respective work area in writing to the Owner's Authorized Representative.

B. Daily lockout and/or un-lock requests shall be submitted in accordance with the instructions on the AOA Closure/Activity/Circuit Lockout Request.

C. If a lockout and/or un-lock is to be scheduled between the hours of 2200 hrs. on Fridays and 2300 hrs. on Sundays, the Owner's Authorized Representative shall notify the CCR by 1100 hrs. on the second full Working Day prior to a weekend (normally that will be Thursday).

D. If a lockout and/or un-lock is to be scheduled on an Airport recognized holiday between the hours of 2200 hrs. on the night preceding the holiday and 2300 hrs. the holiday night, the Owner's Authorized Representative shall notify CCR by 1100 hrs. on the second full Working Day prior to holiday.

E. The CCR shall notify the AOC Duty Officer of weekend and holiday lockout/un-lock requests as soon as they become known.

F. The CCR will e-mail or fax the Lockout summary to the AOC Duty Officer and the FAA (MCC) no later than 1500 hrs. each workday. These Lockout requests are for that day's "night lockouts", and for the following day's scheduled "day lockouts".

G. The AOC Duty Officer and the FAA shall notify the CCR immediately if any potential conflicts or problems are detected on the submitted lockout request. Otherwise, the proposed work shall proceed as scheduled.

5. Series Circuit Lockout Procedure: The following procedure applies to all series circuit lockouts, primary or safety type:

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A. Contractor and the Owner's Authorized Representative will meet the EAM electrical representative at the vault for the lock out.

Prior to initiating the lockout, the Owner's Authorized Representative will contact Airfield Operations on OPS "Primary" radio frequency or by calling 3-3121 to verify that the circuit(s) can be locked out as previously scheduled.

The AM Electrical Representative will de-energize the circuit, and the Contractor will install his lock on the scissors clip, with the appropriate safety tag, locking out the regulator primary disconnect switch. The safety tag will show the name of the Contractor, date, the Owner's Authorized Representative radio call number, and the telephone number at which the Owner's Authorized Representative can be reached during the lockout period. The AM Electrical Representative will then "megger" the circuit using the IRMS. The readings will then be entered in the Lockout Log sheet and will be initialed by the Contractor, Owner's Authorized Representative and AM electrical representative. The AM Electrical Representative then will isolate the two field contacts of the S-1 switch and perform a continuity test on each circuit to be locked out. The plastic insulating pieces used to isolate the field contacts shall remain in place until all required circuits are tested for continuity and released for the requested lockout. The Owner's Authorized Representative will then contact AM Control and Airfield Operations to confirm that the lockout of the requested series airfield lighting circuits has been successfully executed. The Contractor may then proceed with his work as scheduled.

Note: In the event of unacceptable continuity test results (less than 100 K-ohms) prior to locking out any series circuit(s), the AM electrical rep shall immediately place an Airport lock on the disconnect switch of the affected circuit(s) which shall remain in place until the problem has been further investigated and resolved by AM.

B. Whenever operationally acceptable to Airfield Operations, complete circuits shall be locked out. Example: only OET-7A will be affected, but OET-7A, B and C will be locked out.

6. Series Circuit Unlocking Procedure

A. The Contractor will notify the Owner's Authorized Representative when they are ready to unlock the series lighting circuits. The Owner's Authorized Representative will then contact the AOC Duty Officer, who will inform the AM Electrical Representative to meet the Contractor and the Owner's Authorized Representative at the vault. The AM Electrical Representative will perform a continuity test on all affected circuits. If continuity is verified, the AM Electrical Representative will close the applicable S-1 switch(s) and enable the IRMS to obtain updated resistance-to-ground circuit measurements. After circuit integrity has been verified and approved by the AM Electrical Representative, the readings shall be recorded on the Lockout Log (Attached) and initialed by the Contractor, Owner's Authorized Representative, and AM. The Owner's Authorized Representative will then notify the AOC Duty Officer and Airfield Operations that the circuits have been returned to service.

B. At the time of unlocking the circuit(s) and returning them to service, the AM Electrical Representative will compare the most previous resistance of the circuit(s) to the present

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resistance. It is desirable not to have the present circuit resistance reading less than 50% of the most previous reading, but in no case shall the reading be less than 100 K-ohms. The AM Electrical Representative's decision is non-disputable.

C. Any reading below 50% of the most previous reading will be reported to the Electric Shop Supervisor for further investigation.

D. All airfield circuits must be unlocked no later than 30 minutes before sunset, unless prior arrangements have been made with OPS.

The Owner's Authorized Representative will notify the AOC Duty Officer when the circuit is ready to be "re-energized". The AOC Duty Officer will dispatch an electrical rep to witness the required circuit continuity tests by the Contractor and to perform cable insulation resistance-to-ground testing using the IRMS.

7. Unacceptable IRMS Readings During Unlocking

A. When the IRMS indicates unacceptable resistance-to-ground measurements in the course of unlocking series circuits (reading less than 100 K-ohms), the AM Electrical Representative shall record these readings and place an Airport lock on the defective circuit(s) immediately. The Owner's Authorized Representative shall then coordinate all necessary investigations and repair work with the Contractor to restore circuit integrity and notify Airfield Operations regarding the status of the affected circuit(s). Airfield Operations shall then determine if the circuit(s) must be repaired immediately or if the circuit can remain locked out until necessary repairs can be rendered. The Airport lock shall only be removed after completion of repair work and satisfactory resistance-to-ground readings have been obtained and approved by the AM Electrical Representative.

8. Multiple Contractor Circuit Lockouts in the Same Vault

A. When it is required for different Contractors to share a lockout on the same circuit, the work shall be coordinated through the AM Electrical Representative. Only one primary lockout shall be allowed on each series lighting circuit; however, there may be multiple safety lockouts if approved by the AM Electrical Representative.

B. All circuits with multiple locks shall have an independent lock with a safety tag from each Contractor/Owner's Authorized Representative installed on the scissors clip provided on the regulator disconnecting means. At no time will these circuits be turned on or tested without the notification and acknowledgement of all parties involved in circuit lockouts. Prior to any testing or energizing circuits, the AM Electrical Representative will contact each Owner's Authorized Representative currently logged out with a circuit lockout by OPS "Primary" radio frequency for positive confirmation that all personnel under their direct supervision have been informed of impending circuit testing or energizing. Failure of Owner's Authorized Representative to acknowledge notification shall result in the immediate refusal by the AM Electrical Representative to test, unlock, or energize circuits.

Note: Confirmation will be accepted only via OPS "Primary" radio. In the instance where multiple Contractor lockouts occur in the same vault but not on the same circuit, the Owner's Authorized Representative, EAM, and all other parties shall follow the above "Lockout Procedure" (See Paragraph V). However, prior to

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application of the required test voltage on any circuit(s), the Owner's Authorized Representative shall, at the direction of the AM Electrical Representative, notify all parties with locked out circuits in that vault and inform them that testing is about to start. This includes other Owner's Authorized Representative, Contractors, the AOC Duty Officer, and OPS. All contacted parties involved in construction activities shall then acknowledge via OPS primary radio frequency that they have received notice of the upcoming circuit testing and that all personnel working under their supervision are "clear".

When all this has transpired, the required circuit testing and unlocking procedure can then proceed.

9. Energizing and Testing of Circuits for the First Time

   A. Prior to the energizing and testing of "pristine" series lighting circuits, the following shall occur:

      1. The Contractor shall notify the Owner's Authorized Representative a minimum of one week in advance of testing or energizing new circuits. The Owner's Authorized Representative shall then notify the AOC Duty Officer at least three (3) Working Days prior to performing this activity stating the proposed test date and time, circuit(s) designation(s), name of the load(s) to be tested/energized, and circuit(s) location(s) on the airfield clearly identified.

      2. Prior to the actual test/energizing of new series lighting circuits, the Owner's Authorized Representative shall give proper notification by OPS Primary Radio frequency to all involved parties including other Owner's Authorized Representative, Contractors, the AOC Duty Officer, and Airfield Operations, that the test/energizing is about to occur.

         Note: The Contractor shall be held solely responsible for any damages that occur during the testing/energizing of new series circuits as well as any indirect damages that occur where existing circuit components are interfaced in manholes, hand holes, conduit, and airfield lighting apparatus.

10. AM Lockouts

   A. AM shall adhere to the above lockout/un-lock procedures during the course of routine daily maintenance and repair of series airfield lighting circuits. In the event of premature cable failure or unplanned outages, AM will provide immediate emergency repair to affected circuits when notified by Airfield Operations. The emergency repair work performed by AM shall take priority over all previously scheduled Owner's Authorized Representative lockouts for that day/night. Owner's Authorized Representative must then re-submit lockout requests for any circuits superseded by the EAM emergency lockout repair work.

11. Utility Lock Out / Tag Out Procedures

   A. Procedures have been established outlining the minimum requirements to be followed for the locking, tagging and trying to prevent injuries by the inadvertent operation of power equipment, the inadvertent opening of valves in pipes, or the energizing of electric circuits. NO work is to be done on any operable equipment until its operation is

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prevented by appropriate lock out / tag out. The procedures are outlined in Airport Manual “Lock Out / Tag Out & Confined Entry.” Following the appropriate procedures outlined will ensure compliance with the requirements of Federal 29 CFR 1910.147, “Control of Hazardous Energies.”

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LOCKOUT LOG FOR AIRFIELD LIGHTING CIRCUITS

CIRCUIT NUMBER	DATE	TIME	MEGGER READING	CONTRACTOR'S REPRESENTATIVE	FIRM	24 HOUR CONTACT PHONE	ASSET MGMT	DCC or CM REP.	24 HOUR CONTACT PHONE
	OUT								
	IN								
	OUT								
	IN								
	OUT								
	IN								
	OUT								
	IN								
	OUT								
	IN								
	OUT								
	IN								
	OUT								
	IN								
	OUT								
	IN								
	OUT								
	IN								
	OUT								
	IN								
	OUT								
	IN								

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AIRFIELD CLOSURE/ACTIVITY/CIRCUIT LOCKOUT INSTRUCTIONS

In order to enable proper coordination of Airfield Activity/ Closure Requests/ Lockout Requests all must be submitted within Unifier by the Contractor's Authorized Representative (CAR) sent to the Owner's Authorized Representative (OAR) by 0900 hrs. The morning preceding nighttime AOA activities/ closures/ circuit lockouts (1900 to 0700 hrs.) and/or the following day's daytime activities/ closures/ circuit lockouts (0700 to 1900 hrs.). For activities/ closures/ lockouts on a holiday, daytime on the day following a holiday, Saturday, Sunday, and daytime on Monday, the requests must be submitted into Unifier by 0900 hrs. on the last workday prior to the start of holiday or weekend. Two requests (one for nighttime work and one for daytime work) shall be submitted. No more than one workday's activities will be included on each form. A cancelation notification of scheduled closures should be submitted by contacting the Coordination Center by the most expeditious means available. Either one request covering an entire workday or two requests (on for the nighttime work and one for daytime work) may be submitted. However, no more than one workday's activities will be included on each form.

NOTE: ALL TIMES ON THIS FORM WILL BE LOCAL 24-HOUR CLOCK TIMES.

- Submitted By: The OAR for the construction activity who has coordinated scheduling and reviewed the request and is emailing this document.
- Revision No.: This is to denote revisions made after initial request. Leave blank on initial request.
- Date/Time of Request: This is the date and time request are made. Example: Nov. 24/1050
- Project Name/Contract No.: Include both the Project Name and Contract Number.
- Contractor: Name of the Contractor (Prime or General).
- Project Manager: Name of individual responsible for Construction Contract.

Note: Any references to the Owner’s Authorized Representative (OAR) may be interpreted to mean the Airport representative for an Airport managed contracts, the staff representative on ADD projects or the FAA authorized representative for FAA managed projects, etc.

- Contractor Phone/Fax: 24-hour telephone and Fax numbers of the contractor.
- Owner’s Authorized Representative. Phone/Radio Call Sign: Telephone number and Radio Call Sign of the responsible Owner’s Authorized Representative that will be on site during the actual work activity.
- From/To: Enter the date (month and day) and times the activity/closure/circuit(s) lock out is scheduled to occur using a 24-hour clock. Example: 2/23/2245 & 2/24/0645
- Closure/Activity Area: Describe the area affected. When no closure is being requested, "No Closure" should be noted along with the description of the area.

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- Circuit(s): List the individual circuits requested to be locked out. Example: ET- 13, OWT-7B, etc.
- Scheduled Activities: A brief description of intended activities to be conducted during the period of the request(s) specifically identifying the work requiring closures/lock outs and any excavation/trenching activities. An airfield diagram or other suitable drawing depicting the area of work shall be submitted whenever complex closures are requested.
- Additional Request/Comments: This is a general-purpose section where unique requirements can be requested such as requests for weekend and/or holiday circuit lockouts and/or lock-ins, or specific comments of explanation made which would be useful to the addressees.

  NOTE: The telephone number for the CCR is 972-973-3121. The OAR will retain responsibility for ensuring contract compliance, project scheduling and coordination, communications between the Contract and the Airport Operations Dept. and the Airport Maintenance Dept. The CCR will not resolve any Contract and technical disputes. All situations relating to problems with electrical circuitry or the Airport's operational requirements shall be handled between the affected Airport Departments, OAR, or Contractor's Authorized Representative (CAR) responsible for the Project.

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AIRPORT CONSTRUCTION SECURITY PROCEDURES
TOOL MANAGEMENT PLAN

Date: _____

Project Name: _____

Permit Number: _____

Terminal: _____

Columns & Lines: _____

Contact Name & Phone Number: _____

Additional Information: _____

_____

_____

Contractor's Signature & Title: _____

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cc: Airport Police Assistant Chief
Construction Manager

AIRPORT
CONSTRUCTION SECURITY PROCEDURES
TOOL MANAGEMENT PLAN

The “Tool Management Plan” is for all construction projects that take place in the public areas of terminal concourses (sterile area) to include “back of house” areas such as offices and concessions within the Security Identification Display Area/Air Operations Area (SIDA/AOA). Mobilization of the “Tool Management Plan” must precede all phases of construction and will be enforced for the duration of the project. The following procedures will be implemented.

- Work hours shall be determined by stakeholders, airport development, and the Contractors.
- The Contractor’s Safety/Security Officer is responsible for the implementation and maintenance of the Tool Management Plan.
- The plan will be reviewed with all construction workers prior to each shift.
- The Contractor’s Safety/Security Officer is responsible for the toolbox inventory that must be maintained by each sub-Contractor. Each Subcontractor must designate a toolbox monitor.
- Consult the “Prohibited Items” list at https://www.tsa.gov/.
- The Contractor’s Safety/Security Officer will prepare the toolbox inventory form, which must be completed by each Subcontractor and kept in the toolbox at all times.
- Each Subcontractor toolbox monitor must also inventory all hand tools brought to the job site by individual workers prior to each shift. This refers to tools carried in the individual’s tool belt or tool bag. The inventory of these tools must be kept in the Subcontractor’s toolbox.
- Each Subcontractor will store its inventoried tools in the locked box kept in the secure areas on the ramp, or concourse.
- Unlocked toolboxes must be monitored at all times by the Subcontractor’s toolbox monitor.
- All hand tools will be checked out on the tool inventory list to an individual worker by the Subcontractor’s toolbox monitor. Each worker is personally responsible for the hand tools they check out.
- Consumables (e.g. razor blades) are included in the toolbox inventory and may be removed from the inventory and disposed of only by the Contractor’s Safety/Security Officer.
- The individual who checked-out a tool must return it to the Subcontractor’s toolbox monitor. The tool will be checked-in by the toolbox monitor.
- Tools must be kept within five feet of the worker responsible at all times. Unattended tools will be confiscated and returned to the Contractor’s Safety/Security Officer.
- It will be the responsibility of the Subcontractor toolbox monitor to reconcile the tool inventory at the conclusion of each shift. The Contractor’s Safety/Security Officer must verify the accuracy of the inventory at the end of each shift prior to workers leaving the job site.
- The Subcontractor’s toolbox monitor will submit the daily toolbox inventory to the Contractor’s Safety/Security Officer who will be responsible for maintaining the permanent document files.
- The Contractor’s Safety/Security Officer will submit a summary of the hand tool inventory weekly to the OAR.
- If the Contractor’s Safety/Security Officer determines tools are missing at the end of the shift or during a shift, the appropriate authorities will be notified immediately in the following order:

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Airport DPS Communications at 972- 973-3210. Airport Operations Center (AOC) at 972- 973-3112.

- ZERO TOLERANCE is being observed for any employee who leaves a tool unattended. The offending employee will be escorted from the work site by the Contractor's Safety/Security Officer and will be removed permanently from the Project.
- Airport and/or the Transportation Security Administration (TSA) representatives may randomly monitor the overall construction area at any time and check the toolbox inventories.
- Work zones that will be established for longer than 24 hours will be separated from the public by barriers or a demising wall.
- Existing concourse trash receptacles will not be allowed in the designated construction area. Construction trash receptacles will be provided in the work zone for the disposal of all construction trash. Receptacles must be removed from the work zone at the end of each shift.
- The Contractor's Safety/Security Officer must conduct a security sweep of the construction area at the end of each shift. Airport representatives may participate in the security sweep at their discretion. It is the responsibility of the Contractor's Safety/Security Officer and Night Superintendent to validate if the security sweep is successful.
- Primary access for all employees, tools, equipment, and materials to the construction area will be from the AOA via a DPS manned AOA gate. Employees will be restricted from accessing an employee portal inside the terminals. Employees may access a TSA screening checkpoint; however, NO tools on the TSA prohibited items list are allowed. All vehicles and persons entering the AOA through the designated construction security gate are subject to search.
- Employees are restricted to the work area designated by the Contractor's Safety Officer. The Contractor's Safety Officer or designee will monitor the work zone to ensure employees do not use public restrooms, concessions, or any other facilities in the concourse. Employees who violate these previsions are subject to removal from the Project. NO EXCEPTIONS.

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SIDA BADGE REQUIREMENTS

SIDA/AOA badge requirements will be enforced for all construction employees using the following process.

- SIDA/AOA access badges will be obtained from the Airport Access Control Office located in Terminal D. Information and badge applications are available on the Airport Department of Public Safety web page https://www.dfwairport.com/dps/.
- This process includes fingerprinting, background check and interactive video/testing.
- Non-badged employees will be allowed on the AOA under the following rules **only**. One badged employee may escort a maximum of five non-badged employees to the AOA/SIDA or Sterile work area. Escorts are not permitted through employee portals. The non-badged employee must have a government issued I.D. in their possession. The badged employee's responsibility will be to continuously monitor and remain in physical proximity of the non-badged employees such that they can control or direct the activity of the non-badged employees at all times.
- **The AOA Badge must be visibly displayed on the outer garment and above the waist at all times while the employee is in the construction area or on the AOA.**

PROCEDURES IN NONPUBLIC AREAS

The following procedures will be used in the nonpublic area of the terminal construction areas.

- Tools used over the long term may be staged within the construction area in locked boxes. One lock box will be permitted for each trade, to reduce the number of trucks entering the AOA on a daily basis.
- Employees are allowed to wear their personal tool belts and hand carry tools into the construction on a daily basis.
- One truck per day will be allowed to deliver tools to the construction area. Vehicles must be permitted by the Airport to enter the AOA.
- **The CONTRACTOR'S Safety/Security Officer will monitor the construction area on a daily basis.**

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ESCORT RELEASE/PICK UP POINT NOTICE/INSTRUCTIONS

RELEASE / PICK UP POINT
NOTICE!!

FOLLOW YOUR ESCORT UNTIL YOU REACH THIS SET OF CONES. THIS IS THE RELEASE AND PICK UP POINT.

1. Follow your DFW Escort closely to the construction Release Point.
2. Yield to Aircraft.
3. If lost or separated, **STOP!**, then call Airport Operations at

972-973-3112

ALWAYS FOLLOW ESCORT!

AIRCRAFT ALWAYS HAVE THE RIGHT OF WAY, EVERYWHERE IN THE AOA!

AIRPORT AIRSPACE REVIEW FORM

FAA No. _____ DFW No.:_____ CA No.:_____

Applicant: _____ Contact:_____ Phone No.: _____

Project Description

Fixed Temporary* _____ Mobile Temporary*_____ Permanent _____

Construction Schedule

Start Date:_____ End Date:_____

Location

(Indicate in NAD 1983 (Geodetic, Lat./Long.) coordinates and attach location plan and site plan)

A. Latitude _____ E. Perpendicular Dist*** _____

B. Longitude _____ F. Runway Elevation AMSL_____

C. Impacted Runway _____ G. Site Elevation AMSL _____

D. Distance from Runway End**_____ H. Object Elevation AGL_____

Mitigation Conditions

☐No Impact ☐As Noted ☐FAA RO Study Recommended

Reviewed By:

FAA Airways Facilities _____ Date: _____

FAA Air Traffic Control _____ Date: _____

Airport Operations Dept._____ Date: _____

* The FAA Regional Office must review temporary structures exceeding 753 ft. AMSL.

** Measured parallel to a Runway from proposed structure to nearest Runway threshold.

*** Measured from proposed structure to the Runway centerline.

The Airport Contacts will be identified in the Pre-Construction Meeting.

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AIRPORT AIRSPACE REVIEW FORM

CRANE/EQUIPMENT OPERATION AREAS (_____') HEIGHT

Coordinate Point	Latitude	Longitude	AMSL at Point	Object AMSl
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				
21.				
22.				
23.				
24.				

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AMP Airside Construction Part 139 Checklist

	RUNWAYS AND TAXIWAY PAVEMENTS	YES	NO	N/A	Comments
1	NO pavement cracks that could impede directional control	☐	☐	☐	
2	Pavement surface irregularities	☐	☐	☐	
3	Cleanliness of pavement	☐	☐	☐	
4	Potholes over 5" in diameter over 3" in depth	☐	☐	☐	
5	Standing water on pavement	☐	☐	☐	
6	Pavement grooves in good condition	☐	☐	☐	
7	Pavement elevation differences (between old and new pavements)	☐	☐	☐	
8	Is pavement clean?	☐	☐	☐	
9	Transition ramps installed correctly	☐	☐	☐	
	PAVEMENT MARKINGS	**YES**	**NO**	**N/A**	**Comments**
1	Are markings in good conditions	☐	☐	☐	
2	Have markings lost reflective characteristics	☐	☐	☐	
3	Markings faded from vehicle traffic	☐	☐	☐	
4	Markings removed from closed sections of pavement	☐	☐	☐	
5	Are new enhanced centerline markings required	☐	☐	☐	
6	Are hold bars in the correct location	☐	☐	☐	
7	Have surface painted signs been replaced	☐	☐	☐	
8	Have markings been removed due to paving operations	☐	☐	☐	
9	Have all temporary markings been painted	☐	☐	☐	
10	Lines leading into closure blacked out or removed	☐	☐	☐	
	RUNWAY SAFETY AREAS (RSA) & RUNWAY OBJECT FREE AREA	**YES**	**NO**	**N/A**	**Comments**
1	All equipment removed from safety area (once runway is opened)	☐	☐	☐	
2	All stockpiles removed from safety area (once runway is opened)	☐	☐	☐	
3	All excavations have been back filed to existing grade	☐	☐	☐	
4	Any elevation changes greater than 3" must be removed (filled in or cut down)	☐	☐	☐	
5	Remove any and all standing water in the safety area	☐	☐	☐	
6	All concrete structures and electrical bases graded to surrounding elevations	☐	☐	☐	
7	Slopes in RSA not to exceed 5% grade change	☐	☐	☐	
8	No tire ruts deeper or higher than 3" above ground elevation	☐	☐	☐	
9	Have all barricades been removed from the safety area	☐	☐	☐	
10	Any work to take place in the runway safety area must be completed when	☐	☐	☐	
11	All excavations in the ROFA are properly barricaded and lighted	☐	☐	☐	
12	All materials and stockpiles removed from ROFA at end of workday	☐	☐	☐	
13	All equipment removed from ROFA at end of workday	☐	☐	☐	

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14	No standing water in the ROFA	☐	☐	☐	
	TAXIWAY SAFETY AREAS (TSA) AND TAXIWAY OBJECT FREE AREAS	**YES**	**NO**	**N/A**	**Comments**
1	Work no closer than the TOFA of a taxiway	☐	☐	☐	
2	Excavations within the TOFA are delineated with low slung barricades	☐	☐	☐	
3	No stockpiles or material permitted within the TSA	☐	☐	☐	
4	No stockpiles or material permitted within the TOFA	☐	☐	☐	
5	All excavations protected with low mass barricades	☐	☐	☐	
	AIRFIELD ELECTRICAL	**YES**	**NO**	**N/A**	**Comments**
1	ALL temporary electrical cables in grass areas in PVC or steel pipe	☐	☐	☐	
2	ALL temporary electrical cables on pavement areas in steel pipe ONLY	☐	☐	☐	
3	Electrical conduits securely attached to pavements	☐	☐	☐	
4	Vehicles crossing temporary cables have ramps been constructed to protect pipe	☐	☐	☐	
5	Temporary conduit CLEARLY Marked	☐	☐	☐	
6	Have all electrical circuits that were shutdown, been energized and are	☐	☐	☐	
7	ALL Manhole lids MUST fit flush with frame of manhole	☐	☐	☐	
8	Base cans firmly attached to ground/ pavements	☐	☐	☐	
9	Runway edge light lenses facing the correct way	☐	☐	☐	
10	In-surface light fixtures not obscured by paint, debris, or dirt	☐	☐	☐	
11	Runway pavement sensors in good condition	☐	☐	☐	
12	Pavement in-surface fixtures colored lenses are placed in the correct location/sequence	☐	☐	☐	
13	ALL Runway lighting in correct color sequence	☐	☐	☐	
14	Are yellow taxiway lights in position at service road crossings	☐	☐	☐	
15	All guidance signs in correct location	☐	☐	☐	
16	Guidance sign bases poured at surrounding ground elevations	☐	☐	☐	
17	All signs in place before a runway or taxiway is opened	☐	☐	☐	
18	ALL Mandatory Hold signs in place before runway or taxiway is	☐	☐	☐	
19	If Mandatory Hold Sign is missing, has a NOTAM been issued?	☐	☐	☐	
20	Are all guidance signs legends clean and readable?	☐	☐	☐	
21	Are new mandatory hold signs installed in line with painted hold bar?	☐	☐	☐	
22	ALL electrical bases and foundations in the RSA or TSA graded to existing	☐	☐	☐	
23	Runway wind cones in good condition and operational	☐	☐	☐	
24	Have all electrical lockout and tagging procedures been adhered to?	☐	☐	☐	
25	All signs blacked out/covered inside closure	☐	☐	☐	
	NAVIGATIONAL EQUIPMENT (NAVAIDS)	**YES**	**NO**	**N/A**	**Comments**
1	Are NAVAIDS properly marked and adequately barricaded to protect critical	☐	☐	☐	
2	Is any material, stockpiles, equipment parked near a NAVAID	☐	☐	☐	

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3	Have all NAVAID Locates been completed prior to excavations	☐	☐	☐	
4	Are PAPI's clear of any obstructions	☐	☐	☐	
5	Are lenses on PAPI's clean and free of any debris	☐	☐	☐	
	CRANE OPERATIONS	**YES**	**NO**	**N/A**	**Comments**
1	Has 5 day notice been given to Operations before a crane is used for the first time?	☐	☐	☐	
2	Do you have the correct location for your crane?	☐	☐	☐	
3	Has Operations been notified prior to the crane being erected (issue NOTAM)	☐	☐	☐	
4	Are red obstruction lights placed on the crane (and operational)	☐	☐	☐	
5	Is a Construction safety flag required for operation of the crane	☐	☐	☐	
6	Has Operations been notified when the crane has been boomed down (cancel NOTAM)	☐	☐	☐	
	GENERAL AIRPORT CONSTRUCTION SAFETY	**YES**	**NO**	**N/A**	**Comments**
1	Are all barricades in good condition and lights operating properly (10 ft spacing max)	☐	☐	☐	
2	ONLY Approved barricades used for runway and taxiway closures	☐	☐	☐	
3	Are all haul routes approved	☐	☐	☐	
4	Haul routes that cross a taxiway constantly monitored for cleanliness	☐	☐	☐	
5	Are all Mandatory hold bars clear and visible	☐	☐	☐	
6	Are all fire access roads clear and passable by the fire department	☐	☐	☐	
7	Cleanliness on the job site (NO FOD Hazards)	☐	☐	☐	
8	Are all electrical circuits operational	☐	☐	☐	
9	Inoperable lighting circuits - have they been NOTAMed inoperative	☐	☐	☐	
10	Any work taking place outside designated work areas or out of phase	☐	☐	☐	
11	Does the above have any conflicts with other airfield projects	☐	☐	☐	
12	Have all temporary electrical circuits been properly protected	☐	☐	☐	
13	Has all drainage been properly maintained for the site	☐	☐	☐	
14	Are enough sweepers present on the site	☐	☐	☐	
15	Flags and beacons on top of construction equipment	☐	☐	☐	
16	All stockpiles less than 3ft	☐	☐	☐	
17	No ponding water on site	☐	☐	☐	
18	All snow fence in good condition	☐	☐	☐	

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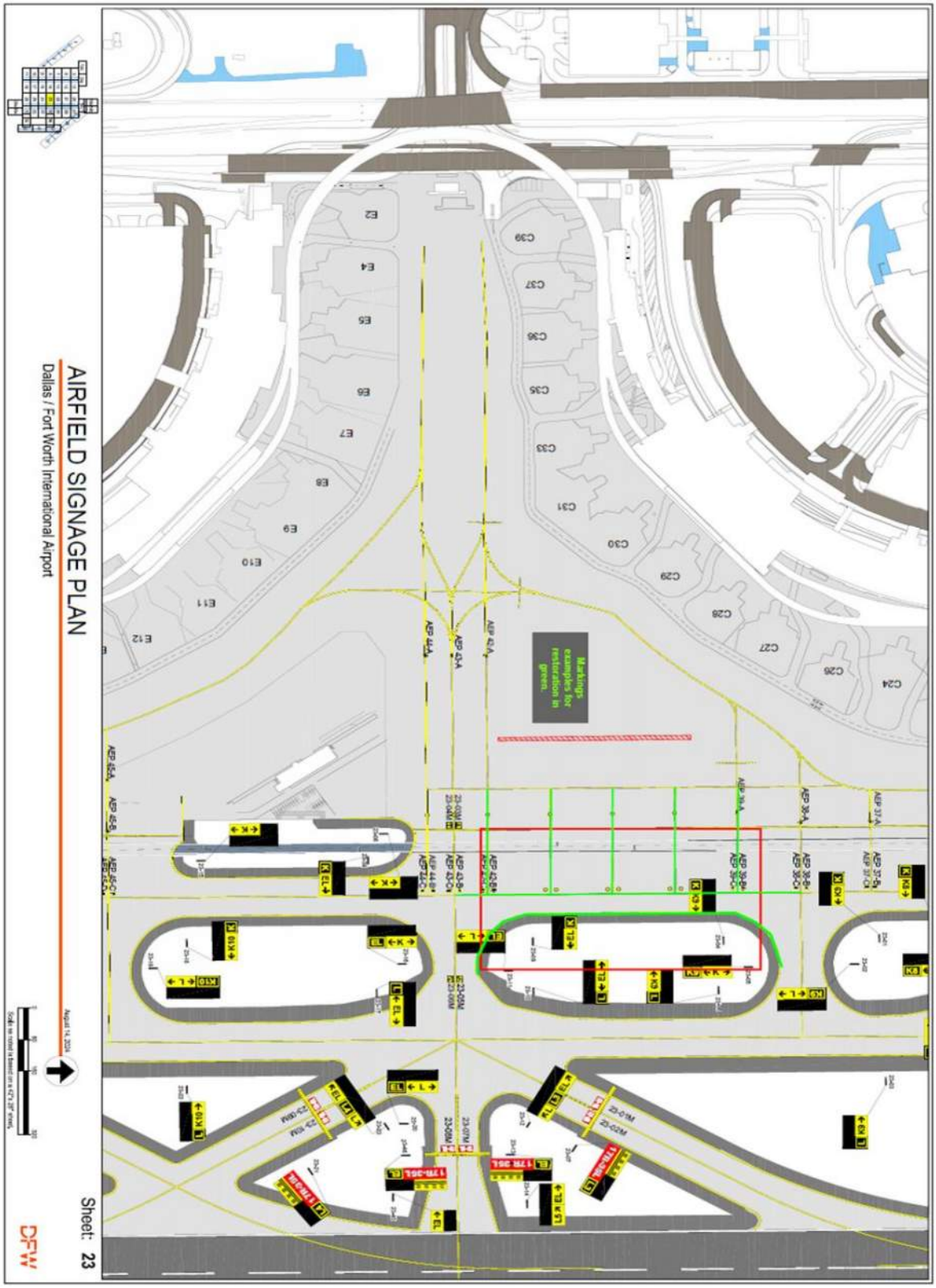
Construction Representative: _____

Date: _____

AIRFIELD SIGNAGE PLAN



PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF SECTION

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SECTION: 01 35 23

HOT WORK OPERATIONS AND CONTROL

PART 1 – GENERAL

1.01 SUMMARY

A. This Section covers the requirements of the Contractor for use of Hot Work operations on the Project Site.

B. Hot Work operations shall include any cutting, welding, thermal welding, brazing, soldering, grinding, thermal spraying, thawing pipe, installation of roof systems requiring the use of a torch or any other open flame device or any other similar operation.

1.02 REFERENCES

A. Code of Federal Regulations (CFR) 29 CFR 1910, Subpart Q – Welding, Cutting and Brazing

B. National Fire Prevention Association (NFPA) 51B, Standard for Fire Prevention During Welding, Cutting, and Other Hot Work.

1.03 PERMIT

A. The Contractor shall not begin any Hot Work operations on the Project prior to receiving the approved Hot Work Permit from the Airport Fire Prevention and Planning Department.

B. The Contractor may obtain the Hot Work Permit from the Airport Fire Prevention and Planning Department or from the following link: PowerForm Signer Information | Docusign

C. The Contractor shall complete the form and submit to the Airport Fire Prevention and Planning Department for review and approval.

D. The Airport Fire Prevention and Planning Department shall record and approve the Hot Work Permit and notify the Contractor when approved.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 REQUIREMENTS

A. The Contractor shall employ and utilize only qualified individuals to perform Hot Work operations on the Project.

B. The Contractor shall perform all Hot Work operations in accordance with the requirements of the Airport Hot Work Permit; 29 CFR 1910, Subpart Q - Welding, Cutting and Brazing; and NFPA 51B – Standard for Fire Prevention During Welding, Cutting, and Other Hot Work.

3.02 FIRE WATCH

A. The Contractor shall provide and assign a designated Fire Watch for each location and occurrence where Hot Work is performed as part of the Project.

B. The Contractor shall provide and post one (1) or more Fire Watch personnel during such operations and maintain such personnel for at least thirty (30) minutes after operations have ceased. Fire watch personnel shall monitor the entire Hot Work Area.

C. Fire Watch personnel shall possess at least one (1) functioning fire-extinguisher and be trained in the use of such equipment. The fire-extinguisher shall be meet or exceed a fire extinguisher rating of 2A:20B:C and shall not be located beyond thirty (30) feet from such work.

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D. Each Fire Watch shall be trained in accordance with NFPA 51B.

3.03 WORK AREA SAFETY

A. The Contractor shall prepare a pre-Hot Work check report, and the report shall be available on site at least 48 hours prior to operations.

B. The Contractor shall provide adequate signage in accordance with the reference documents in subsection 3.01 B.

C. The floor in the work area shall be maintained in a clean condition and the work area shall be free of any combustible materials, otherwise appropriate shielding shall be provided and installed prior to the start of such operations.

D. The Contractor shall not perform any such work on any containers or equipment that contain, or have contained, flammable liquid, gas, or solid materials until the container or equipment has been thoroughly cleaned and lines purged of any such material.

E. Where the work requires wet hose lines, the hose lines shall be connected, charged, and ready before and during all such operations.

F. Refer to the Hot Area Permit instructions for more stringent requirements in the Aircraft Operations Area (AOA) and additional instructions and requirements.

- END OF SECTION -

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SECTION: 01 35 24

ASBESTOS OPERATIONS AND CONTROL

PART 1 – GENERAL

1.01 SUMMARY

A. This Section covers the requirements for asbestos surveys, abatements, reporting and training regarding the work at the Airport. This Section shall be conducted in accordance with other Specification Sections, regulations promulgated by the Environmental Protection Agency (EPA), and the Occupational Safety and Health Act. Also, guidance set forth in the National Institute for Occupational Safety and Health (NIOSH), the Texas Administrative Code (TAC), and any other applicable Federal, State, and local government regulations. Whenever a conflict or overlap of the above references may exist, the most stringent provisions are applicable. Any variances from this Section or any of the supporting documentation must have prior approval from the Airport Environmental Affairs Department (EAD).

1.02 RELATED REQUIREMENTS

A. Section 01 74 19, Construction Waste

1.03 REFERENCES

A. Texas Administrative Code (TAC): Title 25 Part 295 Chapter C Texas Asbestos Health Protection Rules.

B. Code of Federal Regulations (CFR):

1. Occupational Safety & Health Act:
   a. Title 29 Part 1926.1101, Construction Asbestos
   b. Title 29 Part 1926.134, Respiratory Protection
2. Environmental Protection Agency (EPA):
   a. Title 40 Part 61, Subpart M, National Emission Standards for Asbestos (NESHAP).
   b. Title 40 Part 763, Asbestos Hazard Emergency Response Act of 1986 (AHERA).
   c. Department of Transportation: Title 49 Part 171 & 172, Transportation of Hazardous Materials.

1.04 DEFINITIONS

A. Asbestos: Asbestiform varieties of Chrysotile, Amosite (Cummingtonite-grunerite), Crocidolite (Riebeckite), Anthophyllite, Actinolite, and Tremolite.

B. Asbestos-Containing Material (ACM): Any material containing more than one percent asbestos.

C. Poly Sheeting: Six (6) mil. poly sheeting.

D. Preparation for Abatement Work: The Texas Department of State Health Services (TDSHS) defines the term preparation as including, but not limited to:

1. Pre-cleaning, sweeping, wet wiping, High Efficiency Particle Arresting (HEPA) vacuuming, sealing penetrations and openings, installing polyethylene, installation of isolation barriers (critical barriers, demising/dividing walls, etc.). Installation of any part of a decontamination enclosure system or any part of the water line connections to the shower, drains, and/or filtration, installation, set-up, or use of any load-out/bag-out systems, installation, maintenance, or selection of respiratory systems of fiber reduction systems (i.e.: misting, spraying, etc.), positioning of warning signs.

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2. Installation of engineering controls (local exhaust ventilation equipped with HEPA filter dust collection systems, constructing enclosures or isolation mechanisms to control processes producing asbestos dust, ventilation of the regulated area to move contaminated air away from the breathing zone of employees and toward a filtration or collection device equipped with a HEPA filter). Installation of scaffolding (in an area that may disturb asbestos during the installation), installation, set-up, calibration, and etc. of monitoring devices (including sampling systems and manometers).
3. Removal of any item from a space within a public building, once the Contractor, or the Abatement Subcontractor, takes control of that space. Removal of an item (fixture, furnishing, etc.) that is in no way contaminated with asbestos, or does not pose a risk of asbestos disturbance by its removal. Is permitted if done prior to allowing the Contractor, or the Abatement Subcontractor, to occupy or take control of the space.

E. Presumed Asbestos-Containing Material (PACM): Any material, yet to be sampled using Polarized Light Microscopy (PLM), containing an unknown amount of asbestos.

1.05 SUBMITTALS

A. Asbestos Survey Requests. The Contractor shall fill out and submit an “Asbestos Survey Request Form.” This form may be located at the following link:

Asbestos Inspection Request Form

B. Abatement Submittals: If the Contractor requires PACM or ACM removed on the Project, the Contractor shall submit the following:

1. Abatement Notification: The Contractor, or the Abatement Subcontractor, shall provide the following information to the EAD, at least 20 Working Days prior to the abatement start date.
   a. Type of abatement work
   b. Abatement Work Schedule
   c. Demolition Work Schedule – OPTIONAL
   d. Asbestos Amounts
   e. Abatement Subcontractor Information
   f. Abatement Subcontractor Supervisor Information
   g. Abatement worker Information
   h. NESHAP Training Individual Information
   i. Demolition Subcontractor Information – OPTIONAL
   j. Waste Transporter License
2. Contractor Pre-Abatement Submittals. The Contractor, or the Abatement Subcontractor, shall provide the EAD with current copies of the following documents listed below at least 20 Working Days prior to the abatement start date.
   a. Abatement Subcontractor
      1) TDSHS Asbestos Abatement Contractor License
      2) Respirator Protection Program
   b. Materials specification, including Safety Data Sheets (SDS) for chemicals used for abatement activities.
   c. Equipment certificates
   d. One million dollars of insurance coverage for environmental spills and releases.
   e. Waste Transporter
      1) TDSHS waste transporter license
      2) One million dollars of insurance coverage for environmental spills and releases.

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3. Post Abatement Documentation: The Contractor, or the Abatement Subcontractor, shall provide all abatement related documentation to the EAD within THIRTY (30) Calendar Days of the abatement end date.
    a. Abatement Supervisor(s)/Worker(s)
        1) TDSHS licenses/registrations
        2) EPA certifications/accreditations
        3) TDSHS Physician's Written Statements
        4) Respiratory Fit Tests
        5) Any specialized training – IF APPLICABLE
        6) Any amendments to the abatement project submittals

C. Safety Data Sheets

1. The Contractor shall submit an electronic version of the SDS for all building materials to the Owner's Authorized Representative (OAR) for review by the EAD, prior to closure of the building permit.

D. Correspondence between the regulatory agencies and the Contractor (and/or any Subcontractor) regarding Work at the Airport.

1. The EAD shall be the sole agency to correspond to the TDSHS regarding any work at the Airport.
2. All correspondence received by the Contractor related to work at the Airport shall be submitted to the EAD within 24 hours.

1.06 QUALIFICATIONS

A. General Construction Work

1. All onsite construction personnel who potentially work near ACM are required to have two (2) hours of Asbestos Awareness training as required by 29 CFR 1926.1101.

B. Asbestos Abatement Areas

1. All asbestos abatement personnel shall be appropriately licensed or registered in accordance with the Texas Asbestos Health Protection Rules (TAHPR). Onsite personnel shall have their current license and supporting documentation while onsite and readily available upon request.

C. Asbestos Transport

1. The Contractor, or the Abatement Subcontractor, shall be appropriately licensed in accordance with the TAHPR while transporting any asbestos waste.

D. Competent Person

1. The Contractor, or the Abatement Subcontractor, shall designate a "competent person" having the qualifications and authority required by 29 CFR 1926.1101.

1.07 ASBESTOS SURVEYS AND ASBESTOS REMOVAL PLANS

A. If required for the Project, an Asbestos Survey will be provided by the OAR prior to the start of the abatement work. The document will discuss the areas that were inspected, materials that were observed, any PACM/ACM that was discovered, the condition of any PACM/ACM and locations of the PACM/ACM. The document shall be communicated with the Contractor, the staff, all Subcontractors, and shall be onsite and readily viewable to all Project employees.

B. If the abatement work extends outside of the current Project site or new materials are revealed during the performance of the abatement work, it is the Contractor's responsibility to notify the OAR. The Contractor, Subcontractors, and all personnel shall refrain from disturbing any unsurvey areas or materials prior to obtaining an ACM Survey.

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C. If the Contractor determines ACM/PACM will be disturbed, an abatement project design will be provided through the OAR by the EAD. The document will come in the form of a project manual that will outline the type(s) of asbestos, abatement methodologies, personal protective equipment to be employed, and waste handling and disposal by the Contractor or the Abatement Subcontractor.

1.08 REGULATORY REQUIREMENTS

A. The Contractor, or the Abatement Subcontractor, shall comply with all Federal, State, and local laws and regulations governing asbestos abatement. Including, but not limited to, regulations listed in subsection 1.03.

B. General construction personnel shall not disturb any PACM or ACM without appropriate asbestos licensing/training and approval from the EAD.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 GENERAL WORK ACTIVITIES

A. The Contractor, or the Abatement Subcontractor, shall follow these measures while conducting work if PACM/ACM are present in the Project site.

1. Instruct workers where the PACM/ACM is known to be located and instruct them not to disturb the material. New workers shall be informed prior to working in the Project site.
2. Instruct workers on emergency procedures should a PACM/ACM become dislodged or accidentally disturbed. In the event PACM/ACM become dislodged or disturbed, the Contractor, or the Abatement Subcontractor, shall perform the following:
    a. Remove all persons from the room. All personnel shall be removed, and the area secured to prevent entry.
    b. Contact the Airport Operations Center (AOC) at 972-973-5572, and report the location, time of the release, and quantity of the dislodged material. EAD will contact the Contractor with further instructions.
    c. Minimize further migration of asbestos fibers by isolating the HVAC system to the affected room. EAD will contact the Contractor and provide further direction.

B. The Contractor shall ensure that all abatement work areas have been surveyed for ACM prior to any disturbance. If the abatement work extends outside of the current Project site or impacts materials that have not been addressed in the ACM survey, it is the Contractor's responsibility to notify the OAR. The Contractor shall refrain from disturbing any unsurvey areas or materials prior to obtaining a new ACM Survey in accordance with subsection 1.07.

C. Review the SDSs to ensure that no asbestos mineral forms are installed at the Airport.

3.02 ASBESTOS ABATEMENT

A. The Contractor, or the Abatement Subcontractor, shall follow the following measures when conducting work that disturbs PACM/ACM.

B. Work Preparation, no activities including preparation work shall commence at the abatement project site until:

1. All submittal requirements in subsection 1.05 have been fulfilled and approved.
2. An asbestos abatement design has been provided by the EAD.
3. The start date on the asbestos abatement notification submitted to the TDSHS.

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C. Emergency Precautions

1. The Contractor, or the Abatement Subcontractor, shall:
   a. Establish emergency and fire exits from the abatement work area and train employees and Subcontractors with evacuation procedures.
   b. Be prepared to administer first aid to injured and contaminated personnel. When an injury occurs, stop Work and implement fiber reduction techniques (e.g., water spraying) until the injured person has been removed safely from the Work area. Treat seriously injured personnel immediately or evacuate without delay for decontamination.
   c. Prominently post the location of the nearest telephone, as well as the telephone numbers of all emergency response personnel in the Clean Room.

D. Signs & Labels

1. The Contractor, or the Abatement Subcontractor, shall post signs and labels as required by the TAHPR and 29 CFR 1926.1101 regulations.

E. Personal Protection and Decontamination

1. The Contractor, or the Abatement Subcontractor, shall provide necessary protective and safety equipment to all staff to conduct the abatement operations stated in the asbestos project design. In addition, the Contractor, or the Abatement Subcontractor, shall provide to authorized visitors and Inspectors:
   a. Protective disposable clothing, eye protection, and hard hats as required by job conditions.
   b. Respiratory protective equipment approved by NIOSH and the Mine Safety and Health Administration (MSHA).
   c. Decontamination: Shower and bath water shall have hot and cold-water mixing faucets. Wastewater shall either be filtered or collected and discarded as asbestos waste. Provide soap and shampoo to aid in removing dust from the entrant's skin and hair.

F. Abatement Preparation

1. The Contractor, or the Abatement Subcontractor, shall prepare for the abatement work by:
   a. Clearing all personnel and all moveable objects from the abatement area before the abatement work commences unless specified otherwise. The removal and the replacement of removed items upon completion of the abatement shall be the sole responsibility of the Contractor.
   b. Secure the area and provide adequate protective controls for the HVAC system, mechanical systems, electrical systems and plumbing systems.
   c. Disabling HVAC Systems
      1) The HVAC system(s) that service the regulated area shall be deactivated and locked off. All ducts, grills, access ports, and vents shall be sealed off with two layers of Poly Sheeting to prevent entrainment of contaminated air.
   d. Shared HVAC Systems
      1) If components of an HVAC system are connected to a system that will service another zone during the project, the portion of the duct in the regulated area shall be sealed and pressurized. Additional precautions shall include but are not limited to caulking and covering all duct joints, and other openings in the HVAC system with two layers of Poly Sheeting. The duct shall remain pressurized throughout the duration of the project to prevent entrainment of contaminated air.
   e. Sealing Elevators

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1) If an elevator shaft is in the regulated area, it shall be shut down and isolated with two layers of plastic sheeting. The sheeting shall provide enough slack to accommodate the pressure changes in the shaft without breaking the air-tight seal.

f. Removing Mobile Objects
   1) Cleaning all movable objects and remove from the abatement work area before an enclosure is constructed, unless moving the objects creates a hazard. Mobile objects shall be assumed to be contaminated and shall be either cleaned with amended water and a HEPA vacuum and then removed from the area or wrapped and disposed of as regulated waste.

g. Cleaning and Sealing Surfaces
   1) Cleaning all surfaces with water and a HEPA vacuum prior to constructing the enclosure. Covering surfaces of stationary objects with two layers of Poly Sheeting secured with duct tape or an equivalent method to provide a tight seal around the object is acceptable.

G. Enclosure

1. The Contractor and the Abatement Subcontractor shall follow the EAD provided abatement project design regarding enclosure construction. The enclosure shall protect all building systems not planned for abatement removal. Enclosures shall be both airtight and watertight except for those openings designed to provide entry and/or air flow control. Enclosures shall be constructed, monitored, maintained in accordance with TAHPR and 29 CFR 1926.1101 requirements.

2. The Contractor, or the Abatement Subcontractor, shall construction each enclosure to contain a work area, a decontamination area, and waste storage area and meet the following requirements.
   a. Structural Integrity
      1) Frames shall be constructed to support all unsupported spans of sheeting. The walls, ceilings, and floors shall be supported in such a manner that portions of the enclosure will not fail during normal use.
   b. Openings
      1) All necessary openings into the enclosure shall be constructed with one or more airlocks that will automatically close in the event the enclosure loses negative pressure. Charcoal filters shall be used to mitigate any nuisance odors.

H. Enclosure Airflow

1. The Contractor, or the Abatement Subcontractor, shall ensure:
   a. All negative pressure devices are in good working order and maintained properly through the entire duration of the abatement.
   b. Air exhausted from the enclosure shall pass through HEPA filter during the entire duration of the abatement.
   c. All HEPA filters used are in accordance with the manufacturer's requirements.
   d. The HEPA filters shall be replaced when the air flow volume is reduced by the build-up of dust in the filtration material.
   e. Exhaust air from the negative pressure unit shall be directed away from the public, adjacent workers and intakes for HVAC systems.

I. Tools and Equipment

1. The Contractor, or the Abatement Subcontractor, shall provide, prepare, and maintain any tools and equipment used in the abatement work as follows:
   a. Any contaminated equipment or tools brought to the abatement work area shall be sealed inside two layers of Poly Sheeting and appropriately labeled. The tools or

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equipment shall not be unsealed until they are placed inside of an operational negative pressure enclosure.

b. Scaffolding, as required to accomplish the abatement work, shall meet all applicable Federal, State, and local safety regulations.

c. Transportation Equipment

1) Equipment used to transport contaminated materials shall be suitable for loading, temporary storage, transport and unloading of contaminated waste without exposure to persons or property.

d. Vacuum Equipment

1) All vacuum equipment utilized in the abatement work area shall utilize HEPA filtration systems.

e. High-speed abrasive disc saws shall be equipped with point of cut ventilator or enclosures with HEPA filtered exhaust air.

J. Exposure Monitoring and Medical Surveillance

1. The Contractor, or the Abatement Subcontractor, shall be responsible for all exposure monitoring and medical surveillance for all personnel. Monitoring shall be performed in accordance with TAHPR and 29 CFR 1926.1101 requirements.

2. Negative exposure assessments must be reviewed and approved by the EAD and their asbestos consultant, if any, prior to use.

3. Exposure monitoring and/or medical surveillance shall be provided to the EAD, or their asbestos consultant, upon request within 24 hours.

K. Abatement Monitoring and Inspection

1. The performance and execution of the abatement work shall be monitored by an EAD appointed asbestos consultant and or asbestos project manager/air monitoring technician. This consultant or their staff shall not be employed by the Contractor, or the Abatement Subcontractor, for the Occupational Safety and Health Administration (OSHA) personnel exposure monitoring during the duration of the Project.

2. The frequency of monitoring will be at the discretion of the asbestos consultant.

3. The Contractor, or the Abatement Subcontractor, shall cooperate and support the asbestos consultant throughout the abatement process.

4. The asbestos consultant will provide copies of the sample results to the Contractor and the Abatement Subcontractor.

5. Aggressive air sampling for clearance, conducted by the asbestos consultant, of the containment area and completion of abatement will be based on results of ambient air sampling inside the containment area.

6. If clearance monitoring fails, the Contractor shall be solely responsible for any costs of additional sampling.

L. Asbestos Removal

1. The Contractor, or the Abatement Subcontractor, shall:

a. Be responsible for managing emissions and contaminated media in accordance with TAHPR and 29 CFR 1926.1101 to prevent asbestos exposure during the asbestos abatement.

b. Keep materials adequately wet with amended water to prevent fiber emissions.

M. Cleaning

1. The Contractor, or the Abatement Subcontractor, shall:

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a. Manage debris within the regulated area in accordance with TAHPR and 29 CFR 1926.1101 requirements.
b. Ensure all surfaces within the enclosure shall be cleaned and HEPA vacuumed before the exhaust ventilation system is deactivated and the enclosure is disassembled. An approved encapsulant shall be sprayed onto areas after the visible dust has been removed.

N. Disposal Activities

1. The Contractor, or the Abatement Subcontractor, shall manage all asbestos wastes in accordance with the TAHPR, 29 CFR 1926.1101 and Section 01 74 19, Construction Waste Management.
2. The asbestos waste disposal facility will be listed in the asbestos project design. Any variance from the facility must be approved by the EAD prior to transporting the waste materials.
3. Asbestos waste shall be secured until the waste is received by the approved disposal facility.
4. A universal waste manifest will be provided by the EAD.
5. All waste manifests shall be signed by an authorized designee of the EAD.

O. Repair and Restoration

1. The Contractor shall be responsible for repair of any damages incurred to the finishes, floor, walls, or any other item or fixture during the execution of the Work.
2. A pre-construction inspection report and video may be used as the basis for the assessment of damages.

- END OF SECTION -

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SECTION: 01 41 26.10

CONSTRUCTION AIR PERMITTING

PART 1 – GENERAL

1.01 SUMMARY

A. This Section covers the requirements for obtaining the appropriate authorization (air permit or permit by rule) for air emissions that are released into the atmosphere during construction.

B. This Section addresses the requirement for special tracking to demonstrate air quality general conformity and greenhouse gas emissions analysis.

1.02 REFERENCES

A. United States Environmental Protection Agency (EPA), U.S. Code of Federal Regulations (CFR):

1. 40 CFR 60, Standards of Performance for New Stationary Sources.
2. 40 CFR Part 63, National Emission Standards for Hazardous Air Pollutants.

B. Texas Administrative Code (TAC):

1. 30 TAC 101, General Air Quality Rules
2. 30 TAC 106, Permits by Rule
3. 30 TAC 115, Control of Air Pollution from Volatile Organic Compounds

1.03 DEFINITIONS

A. Emission Events (EE): Any upset event or unscheduled maintenance, startup, or shutdown activity that results in unauthorized emissions from an emissions point.

B. Excess Opacity Events (EOE): An opacity reading(s) equal to or exceeding 15 additional percentage points above the applicable opacity limit, averaged over a six-minute period.

C. Facility: A discrete or identifiable structure, device, item, equipment, or enclosure that constitutes or contains a stationary source, including appurtenances other than emission control equipment.

1.04 SUBMITTALS

A. The Contractor shall:

1. Submit an air emission memorandum to the Owner's Authorized Representative (OAR) prior to obtaining a building permit. The memorandum shall identify the Project's regulated air emission sources, provide an estimate of the emissions, and identify what permit is required (new source review permit (30 TAC 115), standard air permit, or Permit-by-rule (30 TAC 106).
2. Prepare the required air permit application(s), and submit to the OAR for review, prior to submittal to Texas Commission on Environmental Quality (TCEQ). Air permit applications shall be submitted to OAR 15 Calendar Days prior to submittal to TCEQ.
3. Submit a copy of the approval letter from TCEQ for authorization (air permit or permit by rule) to the OAR and the Construction Manager (CM). Regulated activities cannot begin until the Contractor receives approval from TCEQ.
4. Submit to TCEQ, the OAR, and the CM, a completed TCEQ Form 10360 for any Emissions Events (EE) or Excess Opacity Events (EOE) that occur at the facility or during the Project as-soon-as practicable and no later than 24 hours of discovery.

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1.05 PERMITS GENERAL

A. The Contractor shall:

1. Submit an air emission memorandum to the OAR prior to obtaining a building permit.
2. Complete the air permit application and submit to the OAR for review 15 Calendar Days prior to submission to TCEQ.
3. The Contractor shall be responsible for obtaining all necessary air permits, including all permit application fees and public notification requirements.
4. The Contractor shall be held liable for payment of any fines assessed by TCEQ or EPA due to Contractor's failure to adhere to the requirements of the permits and/or permit by rule(s).

B. Standard Air Permit:

1. Use the current applicable PI-1 form, Core Data form, applicable TCEQ checklist form, and notification form. TCEQ forms can be found at the TCEQ website:

   TCEQ - Updates to the Form PI-1 General Application
2. The Contractor shall coordinate with TCEQ for any required inspections of the permitted facility or operation.
3. The Contractor shall notify the CM within 24 hours of the scheduled inspection, or immediately for non-scheduled TCEQ inspection.

C. Permit by Rule:

1. Use form TCEQ PI-7 and applicable TCEQ specific checklists. TCEQ forms can be found at the TCEQ website: TCEQ Form 10228 - Registration for Permits by Rule PI-7 Form and Instructions

D. Special Tracking:

1. The Contractor shall provide project tracking and air emissions analysis to demonstrate compliance with general conformity analysis as requested by the OAR. The Contractor shall be responsible for supplying air quality expert personnel to perform any necessary general conformity tracking/analysis. Additionally, annual project greenhouse gas emissions analysis will be required for all large capital projects (Contract value in excess of $1,000,000.00) upon the request of the Environmental Affairs Department (EAD), through the OAR.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 PERMIT COMPLIANCE

A. The Contractor shall:

1. Comply explicitly with all requirements of the air permit or permit by rule.
2. Document compliance with air permit and permit by rule conditions, including permit by rules that do not require registration with TCEQ.
3. Monitor the air emissions and submit to TCEQ and CM a completed TCEQ Form 10360 for any Emissions Events (EE) or Excess Opacity Events (EOE) that occur at the facility. Submit the form as soon as practicable, and no later than 24 hours after discovery.

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4. Estimate emissions for permitted sources on a monthly basis (or as specified) for the purpose of demonstrating compliance with permit and/or permit by rule limits.

- END OF SECTION -

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SECTION: 01 41 26.13

CONCRETE BATCH PLANT AND HOT MIX ASPHALT PLANT PERMITTING

PART 1 – GENERAL

1.01 SUMMARY

A. This Section covers the permitting requirements for the construction and operation of concrete and hot-mix asphalt batch plants that may be required for the Project.

B. All concrete and hot mix asphalt plants shall adhere to Texas Commission of Environmental Quality (TCEQ) requirements whether listed herein or omitted.

C. Any such plants shall obtain coverage under the applicable air permit and stormwater permit required for the construction of the Project.

1.02 SUBMITTALS

A. The Contractor shall determine which air permit to obtain coverage under (Standard Air Permit, or New Source Review Permit) and submit the permit application and TCEQ letter of authorization to the Owner's Authorized Representative (OAR) prior to initiating construction of the concrete batch plant or hot mix asphalt plant.

B. All asphalt plants and concrete batch plants seeking stormwater coverage under TXR150000, shall follow the submittal requirements listed in Section 01 57 13.

C. For concrete batch plants seeking stormwater coverage under TXG110000, the Contractor shall submit the Stormwater Pollution Prevention Plans (SWPPP) and core data form to the Airport Environmental Affairs Department (EAD), through the OAR, for review prior to submitting to TCEQ.

D. The Contractor shall submit all monitoring data and sample results to EAD, through the OAR, upon request.

E. For concrete batch plants seeking stormwater coverage under a Multi-Sector General Permit, the Contractor shall submit the Notice of Intent (NOI) and permit application to EAD, through the OAR, for review.

F. Submit all monitoring data and sample results to EAD, through the OAR, upon request.

1.03 REFERENCES

A. Texas Administrative Code (TAC), Title 30 Chapter 116, Control of Air Pollution by Permits for New Construction or Modification.

B. Code of Federal Regulations (CFR), Title 40 Part 131 Water Quality Standards.

1.04 DEFINITIONS

A. Contact Stormwater: Stormwater that comes in contact with any raw materials, products, by-products, waste material, or equipment.

B. Discharge Monitoring Report (DMR): A regulatory term for a periodic water pollution report prepared for industry, municipalities, and other facilities discharging to the surface waters.

C. Facility Wastewater: Wastewater that is generated at ready-mix concrete plants, concrete products plants, or associated facilities.

PART 2 – PRODUCTS

Not Used.

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PART 3 – EXECUTION

3.01 GENERAL

A. Concrete Batch Plants and Asphalt Plants will need to obtain coverage under the applicable air permit and stormwater permit.

3.02 AIR PERMITTING OPTIONS

A. Concrete batch plants and hot mix asphalt plants shall be registered and comply with TCEQ rules found in 30 TAC Chapter 116. The Contractor may use any of the air permit options provided to fulfill these requirements.

B. For the purpose of air permitting, leaseholders at the Airport are considered offsite receptors according to TCEQ and must be represented in the permit application and associated plot-plan. The Airport Board operated facilities are not considered receptors.

C. The Contractor shall locate the concrete batch plant at least 550 feet from any crushing plant or asphalt plant. (If located within the distance limit, TCEQ prohibits simultaneous operation of these facilities.)

D. The Contractor shall provide copies of TCEQ permit applications and approval letters to the EAD, through the OAR, prior to start of operations.

1. Temporary Concrete Batch Plants
   a. Temporary concrete batch plants located adjacent or contiguous to a public works right-of-way project are exempt from TCEQ Public Notice requirements found in 30 TAC §39.604. Concrete batch plants which meet the following requirements fulfill the TCEQ definition for “temporary.”
      1) Occupy a designated site for less than 180 consecutive Calendar Days.
      2) Supply concrete for a single project under one contract; or
      3) Supply concrete for the same contractor for related project segments.
   b. Temporary concrete batch plants shall conduct public notice that complies with the requirements in 30 TAC Chapter 39. The Contractor shall notify the EAD and coordinate sign locations prior to issuing public notice.
   c. TCEQ written approval is required prior to the start of construction of the plant (including stockpiles). If the Contractor operates a facility which has previously been authorized under a TCEQ Standard Permit for Temporary Concrete Batch Plants and is relocating the facility to the Airport, the Contractor may submit the original TCEQ approval letter for the facility along with the 30 Calendar Day relocation notice to the TCEQ Region 4 office (in this case, the Contractor will subsequently be allowed to begin construction 30 Calendar Days from the date of the relocation letter to TCEQ Region 4). NOTE: Concrete Batch Plant equipment may be brought onto the Project site provided there are no connections made to utilities which make the unit operable.
2. Permanent Concrete Batch Plant
   a. The requirements may be found on TCEQ’s Air Quality Standard Permit for Concrete Batch Plants.
3. Temporary Asphalt Batch Plant
   a. The requirements may be found on TCEQ’s Standard Permit for Hot Mix Asphalt Plants.
4. Engines
   a. Requirements for temporary or portable engines may be found in TCEQ Standard Permit, Section 6. The Contractor shall submit TCEQ Table 29 certifying that no engine (or combination of engines) exceeds one thousand (1000) total horsepower.

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If an engine (or combination of engines) exceeds one thousand (1000) total horsepower, then additional permitting requirements may apply.

3.03 STORMWATER PERMITTING OPTIONS

A. The Contractor may obtain stormwater coverage under any of the following Texas Pollutant Discharge Elimination System (TPDES) permits or through an Individual Permit.

1. TPDES Construction General Permit (TXR150000):
   a. Applies to a plant that is in close proximity to and directly supports the permitted construction activity. If not associated with construction, use of this permit is not allowed.
   b. Plant is authorized by TCEQ to discharge only stormwater runoff. Stormwater discharges must be monitored prior to initial discharge and then annually as stated in the permit.
   c. Project seeking coverage under TXR150000 shall adhere to the requirements in Section 01 57 13.
2. TPDES General Permit for Discharges from Concrete Production Facilities (TXG110000):
   a. Plants that supply concrete to multiple projects or that discharge process water may obtain coverage under TXG110000.
   b. Authorizes discharge of wastewater and Contact Stormwater from the plant and associated facilities with the following Standard Industrial Classification (SIC) Codes.
      1) 3271 Concrete Block and Brick
      2) 3272 Concrete Product Except Block and Brick
      3) 3273 Ready-mixed Concrete
   c. Requires a separate SWPPP to be prepared for the plant.
      1) Refer to General Permit (TXG110000) for the SWPPP requirements.
      2) Submit the NOI at least 30 Calendar Days before beginning the discharge.
         (a) Submit the NOI and Core Data form to the EAD, though the OAR, for review prior to submitting to TCEQ. The Core Data form may be found on the TCEQ website.
         (b) The Airport does not meet the definition of discharger under the TXG110000 permit and is therefore not required to submit an NOI along with the Contractor.
         (c) The Contractor, being operator of plant, is the permitted discharger.
         (d) Within six (6) weeks to eight (8) weeks following processing of the NOI, a DMR (EPA Form 3320-1) will be mailed to the operator of discharge.
   d. Sampling:
      1) Monthly sampling and analysis for flow, oil and grease, total suspended solids (TSS), and pH are required and at a minimum, once a year analysis is required for heavy metals and whole effluent toxicity. Refer to the General Permit (TXG110000) for sampling requirements.
      2) Submit an original DMR with results of sampling activities to TCEQ on a quarterly basis.
3. TPDES Multi-Sector General Permit (TXR050000):
   a. Applies to plants supplying to multiple projects or customers and discharging only stormwater runoff.
   b. If the Contractor elects to seek coverage under this permit, he shall notify the EAD Construction Application Review staff, through the OAR, before proceeding further.
   c. Regulated facilities are required to notify the operator of the Municipal Separate Storm Sewer System (MS4) that receives the discharge. The Airport is a permitted MS4.
   d. Notification:

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1) If the Contractor applies under the Multi-Sector General Permit (MSGP) to discharge to an MS4, a signed copy of the Contractor's Notice of Intent (NOI) or No Exposure Certification shall be submitted to the MS4 operator and TCEQ.
2) The Contractor shall also submit a copy of any Notice of Change (NOC) or Notice of Termination (NOT) to the MS4 operator and TCEQ.

e. Discharge Monitoring Report (DMR):
1) The Contractor shall:
(a) Follow the permitting requirements for collecting analytical data and reporting to TCEQ.
(b) Submit monitoring data and sample results to the EAD, through the OAR, when requested.

4. Individual Stormwater Permit:
a. Suitable for plants supplying to multiple projects or customers.
b. If the Contractor intends to pursue a discharge permit using this type of application, the Contractor shall notify the EAD, through the OAR, before proceeding with this option.

- END OF SECTION -

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SECTION: 01 41 26.21

MIGRATORY BIRD PROTECTION

PART 1 – GENERAL

1.01 SUMMARY

A. This specification provides airport board employees, contractors, and tenants with information and guidance on protecting avian wildlife that may be encountered during construction projects at Dallas Fort Worth International Airport (DFW Airport). The intent is to comply with the Migratory Bird Treaty Act.

B. The Contractor shall be responsible for all cost associated with nest surveys, reports, mitigation activities, and training to maintain compliance with this specification.

1.02 RELATED SECTIONS

A. Section 01 41 26.19, NEPA Requirements

B. Section 01 57 23, Temporary Storm Water Pollution Control

C. Section 01 74 19, Construction Waste Management and Disposal

1.03 REFERENCES

A. The following is a list of policies and regulations which may be referenced in this Section:

1. Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. §§ 703-712)
   Migratory Bird Treaty Act of 1918 | U.S. Fish & Wildlife Service
2. Endangered Species Act
   Endangered Species Act | U.S. Fish & Wildlife Service
3. Bald & Golden Eagle Protection Act
   Bald and Golden Eagle Protection Act | U.S. Fish & Wildlife Service
4. DFW Airport Wildlife Hazard Management Plan
   Wildlife Hazard Management at Airports
5. DFW Airport Nest Survey Guidance Map
   DFW_Sustainability_Nest_Survey_Guidance_Map.pdf

1.04 DEFINITIONS

A. Active Nest: Nest containing birds and/or eggs.

B. Inactive Nest: A nest is considered inactive if any one of the following conditions is present.

1. The nest is empty containing no birds and/or eggs.
2. The nest contains non-viable eggs as determined by a qualified third party.
3. This nest is only partially constructed.

C. Natural Wooded Areas: Areas primarily consisting of natural tree cover, with trees capable of producing timber or other wood products and exerting an influence on the climate or water regime. Refer to the Nest Survey Guidance Map.

D. Nesting Season:

1. February 1st to August 31st.
2. Year round in natural wooded areas.

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E. Buffer Zone: A 100-foot radius identified by a visual barrier surrounding an active bird nest. No activity shall occur within this area.

F. Bird: Refers to any species federally protected under the MBTA.

G. Depredation: Includes agricultural damage, private/public property damage, threats to human health and safety, and threats to recovery of protected wildlife. The nest itself or birds attending to the nest must be contributing to physical damage or physical loss to constitute a depredation problem and must not merely be causing a nuisance.

H. OAR: Owner's Authorized Representative.

1.05 SUBMITTALS

A. Nest Survey: A Nest Survey shall encompass all areas within their project site, one hundred (100) feet adjacent to their project site, and all areas that will be impacted by their project operations.

1. Surveys must be conducted within five (5) days prior to disturbance.
2. Survey shall address and contain:
    a. Dates & Times
    b. Maps of project site indicating nests
    c. Photos of nests, project site
    d. Identified species
    e. Active vs Inactive
    f. Methodology (grid, transects)
    g. Metadata
    h. Qualifications

B. Self-Certified Nest Survey: A small-scale nest survey that may be conducted by the contractor for a site less than 1 acre and in a developed area. This template will provide instruction and methodologies for the completing a nest survey. See Part 2.01 B.3. - Self Certification Nest Survey.

1. Signatory by the Project OAR and individual conducting the nest survey.

C. Nest Activity Report: Follow up report based on the findings of active nest during a nest survey. Report shall indicate if chicks have fledged, or the eggs were not viable.

1. Report shall address and contain:
    a. Dates & Times
    b. Maps of project site with nests
    c. Photos nest, project site
    d. Identified species
    e. Status of Fledgling and eggs
    f. Methodology (grid, transects)
    g. Metadata
    h. Qualifications

1.06 QUALITY ASSURANCE

A. Persons conducting wildlife related survey activities shall be a third party possessing the education, training and experience necessary to recognize avian species, their nest and/or eggs, their respective habitats, and appropriately permitted with Federal and State agencies for relocation / taking of avian wildlife.

B. Education: Train all employees, contractors, and/or visitors of this specification to protect avian wildlife.

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1. Prohibition of disturbing of nests and birds.
2. Prohibition of the taking of any birds or their parts.

1.07 SEQUENCING AND SCHEDULING

A. Nest surveys shall be conducted within five (5) days prior to any vegetation disturbance activities.

1.08 REPORTING

A. Report any incidental take of a bird or active nest to the OAR within 24 hours.

B. Report any newly identified nests to the OAR within 24 hours for further evaluation.

C. Any other wildlife activities that pose a safety hazard should be reported to AOC (Wildlife) for further evaluation.

D. If activities will extend past the limits of disturbance contact the OAR for direction prior to beginning.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 NEST SURVEY REQUIREMENTS.

A. Conduct a Nest Survey prior to any disturbance of vegetation during nesting season (February 1st to August 31st) or year-round in natural wooded areas.

B. A 3rd Party Nest Survey shall be submitted to the Environmental Affairs Department or Airport Operations for review. In the event a nest is observed refer to section 2.02 Construction Activities with Active Nests.

C. Self-Certification Nest Survey may be conducted if both the following conditions are met:

1. The project's disturbance is less than one acre.
2. The project's area has been previously disturbed and has a maintained landscape. (i.e., lawns, lots, planter beds, and other landscaped areas).
   a. In the event that nest(s) are observed, a qualified 3rd party nest survey will be required.
3. The Self – Certification Nest Survey Template can be found at SWPPP or provided by the EAD Design & Construction Group.

3.02 CONSTRUCTION ACTIVITIES WITH ACTIVE NESTS

A. All active nests identified by a nest survey will establish the buffer zone around the nest to prevent any intrusion or negative impacts to birds.

1. No activity shall occur within the buffer zone. In the event the barrier is compromised work operations in the immediate area will be suspended until the barrier is restored.
2. Artificial Lighting shall not be directed toward active nests. Contractor shall use down shielding or directional lighting to avoid light trespass into bird habitat.
3. Contractors will instruct their staff and sub-contractors to remain outside of the restricted areas and to avoid activities that will disturb the birds.

B. Active nest(s) shall be monitored periodically by third party until chicks fledges the nest or the eggs are no longer viable. The 3rd party will need to submit a professional Nest Activity Report to the OAR. Once the report is approved the visual barrier can be removed and activities in that area can commence.

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3.03 SHOP DRAWINGS FOR THE INSTALLATION OF BIRD DETERRENT SPIKES

A. All bird deterrent spikes installed in any bird deterrent spike project must contain the following:

1. Must be all metal.
2. Must be permanently fastened to the structure using hardware (no glue).
3. Shop drawings must be submitted and approved due to a range of its lengths and widths. Designed bird spikes must be made of all metal and affixed (not glued).

3.04 WILDLIFE PREVENTION (PROHIBITED ACTIVITIES)

A. The Contractor, their staff, subcontractors and others that have access to the property will be responsible for complying with relevant aspects of DFW Airport's Wildlife Hazard Management Plan, which prohibits attracting wildlife intentionally or unintentionally.

1. Contractors shall not allow activities or operations that could attract birds or other wildlife, either intentionally or unintentionally.
2. Contractors will not allow active or passive feeding of birds or any wildlife. The contractor is responsible for proper trash management.
3. Contractors utilizing ponds or causing ponding must implement deterrent devices if they begin to attract birds or other wildlife.

- END OF SECTION -

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SECTION: 01 45 16.13

CONTRACTOR QUALITY CONTROL

PART 1 – GENERAL

1.01 SUMMARY

A. Develop and implement a Contractor Quality Control Program (CQCP) to ensure that all work is performed in accordance with the Contract Documents and that substantiating documentation is provided.

1.02 RELATED SECTIONS

A. Section 01 77 00, Closeout Procedures

B. Section 01 78 39, Project Record Documents

C. General Provisions – Contractor's Quality Control Plan

D. Owner's Quality Assurance Manual

1.03 SUBMITTALS

A. Submit Contractor Quality Control Program Manual in accordance with PART 3 below.

B. Submit detailed Project Quality Control Program for each Construction Contract.

C. Submit the Contractor's Quality Control Program Manual and Quality Control Project Plans to the Owner's Authorized Representative.

1.04 QUALITY ASSURANCE

A. The Owner's Authorized Representative (OAR) will perform periodic reviews and observations of the implementation of the Contractor's Quality Control Program. The OAR's testing and inspection efforts are conducted for the sole purpose of facilitating the OAR's acceptance of the constructed work. The Contractor retains total responsibility for the installed work.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 GENERAL

A. Implement a CQCP including review and approval of shop and/or working drawings, inspection of materials and workmanship. Coordinating testing with the OAR's Materials Testing Agency.

3.02 OWNER'S AUTHORIZED REPRESENTATIVE'S ROLE

A. The Quality Assurance Department will review and accept the Contractor's Quality Control Program and monitor the activities of the Contractor to ensure its effectiveness and compliance with the stipulations within this Section. The OAR's review does not relieve the Contractor of responsibility for the development and implementation of the accepted Contractor Quality Control Program or for full compliance with the provisions of the Contract Documents.

3.03 QUALITY CONTROL SYSTEM

A. Submittal:

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1. Submit the Contractor Quality Control Program to the OAR for review. The CQCP shall be submitted with the Application of the permit. At a minimum, ten (10) calendar days before beginning any work.

B. Contents of the QC Program

1. A description of the Quality Control Organization, including an organizational chart showing lines of authority and acknowledgment that the Quality Control Administrator (QCA) will implement the three-phase control system for all aspects of the work specified.
2. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a QC function. The owner must receive and approve information before any work begins.
3. A copy of the letter to the QCA executed by an authorized official of the firm which describes the responsibilities and delegates authority to adequately perform the functions of the QCA, including authority to stop work which is not in compliance with the contract documents. Letters of direction to all other various Quality Control representatives outlining duties, authorities, and responsibilities will be issued by the QCA.
4. A Submittal Procedure for reviewing, approving, and managing submittals. An initial "Submittal Register" and a list of procedures for scheduling and managing submittals. Provide the name of the person in the Quality Control organization authorized to review and certify submittals prior to submitting for acceptance.
5. A Testing plan and log that includes tests required, referenced by the specification paragraph number requiring the test, frequency, and the person responsible for each test. Testing Laboratory Information plan must indicate both the laboratory to be used and the test method to be employed to meet Accreditation Requirements.
6. Procedures for Three- Phase Control System tracking preparatory, initial, and follow-up control phases, verification, and acceptance tests including documentation. Document discussions and provide meeting minutes to attendees. Monitor work in place throughout the follow-up phase, and conduct additional control phase meetings, as needed.
7. Procedures to complete Construction Deficiencies and Rework. A list of procedures to identify, record, and track construction deficiencies/ rework items from identification through corrective action.
8. Reporting procedures for documentation including proposed reporting formats.
9. A checklist of the Definable Features of Work (DFOW) will be provided to DFW prior to the preparatory meetings. A definable feature of work is a task which is separate and distinct from other tasks, has separate control requirements, and may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a DFOW, there are frequently more than one Definable Feature under a specification section.
10. Coordinate scheduled work with Special inspections required by IBC Chapter 17, "Statement of Special Inspections and the Schedule of Special Inspections".

C. Organization

1. Designate one individual as the Quality Control Administrator. The QCA will have responsibility for the implementation of the Quality Control Program for the Contractor on all construction contracts approved by the OAR. The QCA shall have full authority to represent the company with respect to quality of the work and the Quality Control Program

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and shall have no duties assigned other than quality control activities. QCA shall be a full-time employee and be totally dedicated to Quality Control.

2. Provide a Quality Control Administrator (aka Program Administrator, General Provision, Contractors Quality Control) with a minimum of five (5) years of extensive experience in administrating Contractor Quality Control Programs on projects of a similar size and nature. Experience and qualifications will be evaluated on a case-by-case basis to determine the acceptability of individuals. For the QCA responsible for the implementation of the Quality Control Program on a specific Project or construction contract.
3. Provide qualified QC personnel to inspect the work and perform other Quality Control Program duties to oversee all work, including all shifts, documenting quantities, and location of work. Refer to Construction Contract General Provisions, Contractors Quality Control, for further details on qualifications of the Contractor's Quality Control Program personnel.
4. Designate an alternate for the QCA to serve in the event that the designated QCA is absent. The period of absence may not exceed two weeks at one time, and not more than thirty (30) workdays during a calendar year. The qualification requirements for the Alternate Quality Control Administrator shall be the same for the QCA.
5. These personnel shall be either engineers, engineering technicians, or experienced craftsman with qualifications in the appropriate field.
6. The QCA, Quality Control Inspectors, and Quality Control testing personnel's duties will not include production.
7. The QCA shall be required to track all Quality Assurance cost associated with replacement or rework items determined to be unacceptable by the OAR.
8. Quantities are the measurement required and the procedures and documentation to be followed. These are mandatory guidelines for capturing project quantities for all DFW construction project types including Lump Sum, Design-build, etc. Design-build project quantities shall be submitted as the design packages are completed and approved by the DFW Code Department.
    a. All quantities for the work, form the basis of the contract sum and are subject to applicable verification, and must be agreed to by initials from the OAR and the Contractor's Representative. Where suitable, signed quantity sheets shall accompany all requests for payment.
9. Measurement for Lump Sum Projects:
    a. The Contractor's Quality Control Administrator shall submit a Lump Sum estimate summary to the Owner as part of the Quality Control Plan. Upon acceptance by the OAR, the Lump Sum summary shall be arranged to provide a breakdown of each Lump Sum item into the following format.
        1) Item #
        2) Description
        3) Unit of Measure
        4) Lump Sum Estimated Quantity
10. All Airfield Quality Control shall adhere to the current FAA Requirements for Quality Control. Non-Airfield Quality Control Administrator shall be a full-time employee of the Contractor, or a Consultant engaged by the Contractor. The QCA shall be an Engineer and have a minimum of 5 years of experience in construction and shall have had prior Quality Control experience on a project of comparable size and scope as the Project. Additional qualifications for the QCA shall include at least one (1) of the following requirements:

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a. Professional engineer with 1 year of airport facilities construction and/or paving experience acceptable to the OAR.
b. Engineer-in-training with 2 years of airport facilities construction and paving experience acceptable to the OAR.
c. An individual with 3 years of highway and/or paving experience acceptable to the Engineer, with a Bachelor of Science Degree in Civil Engineering, Civil Engineering Technology or Construction.
d. A state or government license in the field of work being performed, if applicable.

11. The QCA shall have full authority to institute all actions necessary for the successful implementation of the Contractor Quality Control Program.

12. The number of Quality Control Technicians necessary to implement the Contractors Quality Control Program can vary upon scope. All activities shall be monitored at all times. The QCA will be required to suspend any activity that does not have sufficient Quality Control over site. The Quality Control Technicians shall report directly to the Quality Control Administrator and shall perform the following functions:
    a. Inspection of all materials, construction, plant, and equipment for conformance to the technical specifications, and as required by paragraph 100-6.
    b. Performance of all QC tests as required by the technical specifications and paragraph100-8.
    c. Perform daily reports utilizing specifications and design plans. A daily checklist shall be completed for each DFOW. Checklists shall be created by the QCA and provided to the OAR for review prior to use. DFW can provide an example checklist as needed.
    d. QC Technicians shall provide daily quantities and be signed off by the QCA and Quality Assurance Department OAR by the end of the shift. All Quantities shall be submitted to Autodesk by the end of shift.
    e. All reports provided by the QC and QCA shall be performed within Autodesk (seats provided by DFW QA Department) and uploaded to Unifier daily.

D. Approval of Construction Quality Control Plan/ Program

1. The OAR will review the submission and respond within seven (7) calendar days of receipt. Experience and qualifications will be evaluated on a case-by-case basis to determine acceptability of individuals. If approval is conditional, the Contractor will comply with the direction of the OAR.

2. Once approved, the Quality Control personnel may not be replaced, nor any changes made without prior written consent from the OAR.

3. All Contractor Quality Control Representatives are required to complete the three (3) hour DFW Contractor Quality Control Certification Course. The Certification Course will be scheduled and conducted by the DFW QA Department.

E. Provide Quality Control personnel to perform the following activities

1. Field Activities:
    a. Inspect all field work in progress for compliance with the Contract Documents. Inform the Contractor and the OAR of any work that is in noncompliance immediately. Failure to do so will result in immediate removal of QCA and/or Quality Control personnel.
    b. Document all work activities by completing a "Quality Control Daily Construction Report" in Autodesk. Perform daily reports utilizing specs and plans. Daily checklists shall be completed for each DFOW. All checklists will be created by the QCA and provided to DFW QA for review prior to use. Note and maintain records of all deficiencies with corrective action within 24 hours on an electronic format approved

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by the OAR. Provide risk analysis of any deficiency to the OAR within seven (7) days of notification. Enter all deficiency information into the OAR approved program management software application Unifier.

c. Arrange for all necessary testing and retesting of work with the OAR's Materials Testing Agency and Contractor's testing agency. The Quality Control staff shall witness and review the tests and reports for conformance with the Contract Documents.
d. Formulate work lists for items requiring completion for any interim or substantial completion.
e. Approve all concrete placements using approved concrete placement cards.
f. Participate in all final inspections when construction has been completed and formulate and maintain work lists of passed and failed inspections.
g. Participate in all meetings with the OAR as required for implementing an effective Contractor Quality Control Program.
h. Provide the OAR's QA Department with Next Day Look Ahead (NDLA) a daily schedule of work activities showing QC staff coverage for each construction activity. Utilize the NDLA form provided by QA, and have it submitted before the following day's work activities are expected to begin.

2. Office Activities:
   a. Review all submittals for compliance with the Contract Documents. Maintain record of all submittals using the OAR approved program management software application Unifier.
   b. Review record conditions on the Contract Documents per requirements of Special Provisions and General Provisions of executed Contract.
   c. Provide all documentation daily, at end of the shift but no later than 10:00 am the following day, of CQCP activities to the OAR in Autodesk and Unifier. This includes but is not limited to:
      1) Approved Drawings
      2) RFI's
      3) Approved Submittals
      4) Change Orders
      5) Manufacturer Recommendations for installation of products
      6) Quantities
      7) Definable Features of Work (DFOW) Checklists
      8) Job Hazard Analysis (JHA)
   d. Review Contractor's pay requests and maintain appropriate documentation for quality and acceptance of work being claimed for payment.

3.04 QUALITY CONTROL CHECKLIST

A. This specification outlines the requirements for the creation of a comprehensive checklist detailing all definable features of work for the project. The checklist will serve as a tool for the Contractor and the Owner to review and ensure adherence to project standards and specifications throughout the construction process.

   1. A Definable Feature of Work (DFOW) is a task that is separate and distinct from other tasks and has control requirements and work crews unique to that task. Examples are but not limited to electrical, concrete, roofing, mechanical, etc. are all Definable Features of Work.

B. This Specification's objective is to ensure that the Contractor's Quality Control Administrator develops a detailed and practical checklist that includes all Definable Features of Work. This checklist will be used by the Contractor, the Contractors Quality Control Team, and the Owner

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to monitor and review the quality and compliance of the construction activities. The QCA must perform the Three Phases of Control for each DFOW and provide a schedule for DFOW Preparatory and Initial meetings.

C. The Contractor shall develop a checklist covering all Definable Features of Work related to the construction project. The checklist should be comprehensive and structured to facilitate easy review and tracking of construction activities. The Definable Features of Work checklists must have a table detailing the required checklist for each specifications division.

D. Checklist Requirements, this checklist must include, but is not limited to, the following:

1. General Information
   a. Project Title
   b. Project Location
   c. Contractor's Information
   d. Date of Checklist Creation
   e. Revision History
2. Definable Features of Work
   a. Description of each Feature of Work
   b. Applicable Standards and Specifications
   c. Detailed scope of work for each Feature
   d. WBS/Number
   e. Quality Control and Assurance Measures
   f. Safety Requirements and Protocols
3. Tasks and Subtasks
   a. Specific Tasks associated with each Definable Feature
   b. Subtasks as necessary
   c. Responsible Parties for each Task
   d. Dependencies and Critical Path Items
4. Compliance and Verification
   a. Inspection and Testing Requirements
   b. Documentation and Record Keeping Requirements
   c. Criteria for Acceptance or Rejection
   d. Required Approvals and Signoffs
   e. Corrective Actions for Noncompliance
5. Review and Approval
   a. Process for Owner Review and Feedback
   b. Required Documentation for Owner's Review
   c. Approval Process and Sign-Off Requirements by the Quality Assurance Department

E. Submission and Approval

1. Inclusion in QC Plan
   a. The checklist shall be submitted as an integral part of the Contractor's Quality Control (QC) Plan.
2. Draft Checklist
   a. The Contractor shall submit a draft checklist within 30 days from the date of the contract award for the Owner's review and feedback.
3. Final Checklist
   a. The Contractor shall incorporate any feedback from the Owner and submit the final checklist within 10 days after receiving feedback.

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4. Updated Checklist
    a. The Contractor shall provide updated versions of the checklist as needed throughout the project, reflecting any changes or additional Definable Features of Work.

F. Review and Approval Process

1. The Owner will review the draft checklist as part of the QC Plan and provide feedback within 14 days of receipt.
2. The Contractor shall address all feedback and submit the final checklist within 7 days of receiving the Owner's comments.
3. The checklist will be considered final and approved upon the Owner's formal sign-off.
4. Upon review and approval of the OAR, the Contractor will be required to use the checklist for all production work on the project and submit it with the QC daily report in Unifier.

G. Compliance

1. The Contractor is responsible for ensuring that the checklist is comprehensive, accurate, and complies with all project specifications, standards, and regulatory requirements.

3.05 QUALITY CONTROL PROCESS

A. QC Meetings

1. After the start of construction, the Quality Control Administrator shall conduct weekly Quality Control meetings. At a minimum, these meetings shall occur with the following individuals present:
    a. DFW Quality Assurance OAR
    b. Quality Control Administrator QCA
    c. Engineer of Record EOR
    d. Code Department
    e. Contractor’s Testing/Inspection agency
    f. DFW’s Testing/inspection agency
    g. Meetings must be conducted in person at the Design Code and Construction building at DFW Airport.

B. Meeting Minutes

1. The QCA shall prepare the minutes of the meeting and provide a copy to the DFW Quality Assurance Department within one Calendar Day after the meeting. At a minimum, the following shall be accomplished at each meeting:
    a. Review the minutes of the previous meeting.
    b. Review the schedule and the status of work and rework.
    c. Review the status of submittals.
    d. Review the work to be accomplished in the next two weeks and documentation required.
    e. Resolve QC/QA and production problems (RFIs, etc.).
    f. Address items that may require revising the QC plan.
    g. Review Accident Prevention Plan (APP).
    h. Review Definable Features of Work and Checklist.
    i. Review contractors risk analysis of documented issues, deficiencies, or NCR’s.
    j. Review issues, deficiencies, NCR’s, corrective actions.
    k. Review Code Inspections and make recommendations on how to prevent failed inspections.
    l. Quantities

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C. Phases of Control

1. Quality Control is how the Contractor ensures that the construction, including those of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control must be conducted by the QCA for each DFOW of the construction work. The QC Administrator will be required to schedule and conduct the following:
   a. Preparatory Phase
      1) This phase is performed at least 48 hours but not more than 72 hours prior to beginning work on each DFOW. It is mandatory for all required plans/documents/materials to be submitted to the OAR seven (7) days prior to the scheduling of the Prep Meeting, to be reviewed for approval/acceptance. This phase includes: The Contractor's Quality Control Program objectives and stated Documentation and records required for implementing the Quality Control Program.
      2) A review of each paragraph of applicable specifications, reference codes, and standards. Make available during the preparatory inspection a copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field. Maintain and make available in the field for use by DFW personnel until final acceptance of the work.
      3) Review of the contract drawings and approved shop drawings in detail for oversight of work to take place. Confirm code has had adequate time to update permits to be submitted.
      4) Check to assure that all materials and/or equipment have been tested, submitted, and approved. State how all materials delivered to the site will be checked to confirm compliance with the submittals.
      5) Review of provisions that have been made to provide required control inspection and testing.
      6) Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.
      7) Examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.
      8) Review of the appropriate Job Hazard Analysis (JHA) to assure safety requirements are met.
      9) Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that DFOW.
      10) Ensure that the portion of the plan for the work to be performed has been accepted by the OAR.
      11) Discussion of the initial control phase.
      12) The OAR must be notified at least 48 hours in advance of beginning the preparatory control phase. Include a meeting conducted by the QCA and attended by the superintendent, other QC personnel (as applicable), and the foreman responsible for the DFOW. Document the results of the preparatory phase actions by separate minutes prepared by the QCA and attach to the daily QC report. Instruct applicable workers as to the acceptable level of workmanship required to meet contract specifications.
   b. Initial Phase
      1) This phase is performed at the initial construction on the first day of work on site for each DFOW, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase includes:
         (a) Review minutes of the preparatory meeting.
         (b) Check preliminary work to ensure that it is in full compliance with contract requirements.

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(c) Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.
(d) Establish a level of workmanship and verify that it is acceptable. Compare with required sample panels as appropriate.
(e) Resolve all differences.
(f) Check safety to include compliance with and upgrading of the safety plan and JHA. Review the job analysis with each worker.
(g) The OAR must be notified at least 48 hours prior to the beginning the initial phase. Prepare separate minutes of this phase by the QCA and attach to the daily QC report. Indicate the exact location of initial phase for future reference.

2) The initial phase should be repeated for each work site, or any time acceptable specified quality standards are not being met.

c. Follow-Up Phase
1) Perform daily checks to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the feature of work. Record the checks in the QC documentation. Conduct final follow-up checks and correct all deficiencies prior to the start of additional features of work which may be affected by the deficient work. Do not build upon nor conceal non-conforming work.

d. Additional Preparatory and Initial Phase
1) Conduct additional preparatory and initial phases on the same definable features of work if: The quality of on-going work is unacceptable; if there are changes in the applicable QC staff, onsite production supervision or work crew; if work on a definable feature is resumed after a substantial period of inactivity; or if other problems develop.

D. Mutual Understanding Meetings

1. These meetings will take place before the QC plan is approved to outline the responsibilities and standards that will be met when implementing the program.
a. To achieve a mutual understanding with the contractor of their role in the quality control.
b. Entire contents of QC plan will be discussed, and acceptance of the plan may happen after the meeting.
c. To establish a good working relationship between the Owner and the Contractor.
d. Verify that the contractor fully understands contractual Lines of Authority and the processes, policies, and procedures for proper communication and documentation in place.

E. Sample Forms

1. As required per Technical and General Provisions.

F. Notification of Noncompliance

1. The OAR and or QCA will notify the Contractor of any noncompliance with the following requirements.
a. Take immediate corrective action after receipt of such notice. Any notice, when delivered by the Engineer or his/her authorized representative (OAR) at the site of the work, shall be considered sufficient notice.
b. If the Contractor fails or refuses to comply immediately, the OAR may issue an order stopping all or part of the work until satisfactory corrective action has been taken.
c. No part of the time lost due to such orders will be made the subject of the claim extension of time or for excess costs or damages by the Contractor.

3.06 QUALITY CONTROL PROGRAM MANUAL

A. Prepare a Project Specific Quality Control Program Manual that shall be neatly organized, typed, and shall include but not be limited to the following:

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1. The Contractor's Quality Control Program objectives and stated policy.
2. Organization and delegation of Quality Control authority to various Contractors' representatives.
3. Documentation and records required for implementing the Quality Control Program.
4. Reports and forms to be submitted.
5. Inspection requirements, arrangements, coordination, control and reporting.
6. Testing requirements by the Contractor and required coordination with the OAR's Materials Testing Agency.
7. Internal audits to ensure the personnel of the Contractor and subcontractors are completing tasks per Quality Control Program.
8. Procedures for training of employees.
9. Procedures for receiving and storage of permanent materials for the Quality Control Program.

B. Submit Project Quality Control Plan for each construction project. The Project Quality Control Plan is to:

1. Organization and delegation of Quality Control authority to various Contractors' representatives.
2. Tabulation of all tests and inspections anticipated for the Project, and the anticipated schedule for these tests.
3. Specific documentation and records that are required for implementing the Quality Control Plan for the Project.
4. Weekly activities schedule updates.

3.07 QUALITY CONTROL VALIDATION

A. Upload and maintain the following documents in OAR approved program management software application Unifier. These documents shall be readily available to the DFW's Quality Assurance Department during business hours and turned into DFW at the completion of the project.

1. All completed Preparatory, Initial Phase, and Final Checklists, arranged by specification section.
2. All milestone inspections arranged by Activity/Event Number.
3. A current up-to-date copy of the Testing and Plan Log with supporting field test reports, arranged by specification section.
4. Copies of all contract modifications arranged in numerical order. Including documentation that modified work was accomplished.
5. A current up-to-date copy of the Rework Items List with schedule showing completion dates.
6. Maintain up-to-date copies of all punch lists issued by the QC Staff on the Contractor and Sub-Contractors and all punch lists issued by DFW.

3.08 FAILURE TO PROVIDE QUALITY MANAGEMENT SERVICES

A. Lack of Personnel

1. The Contractors Quality Control Administrator shall provide the OAR a schedule to reflect the construction efforts (scheduled work activities) which will also include all personnel

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scheduled for the next two weeks of construction. Failure to provide this information shall result in a back charge to the Contractor for work to be completed on scheduled day. The OAR shall determine the amount to be back charged to the Contractor based upon personnel and work schedule changes. The contractor must notify the OAR immediately of any schedule and personnel changes.

B. Work Deficiencies

1. All work deficiencies shall be addressed by the Quality Control staff. Items that are deemed non-compliant will be documented in Unifier and uploaded at the end of each shift. Failure to properly identify and document Nonconforming items will result in a penalty which may include being removed from the project. The OAR shall determine what actions will take place if this and other requirements are not met by the Contractors appointed Quality Control staff.

C. NCR Dollar Assignments

1. The objective is to establish and validate the costs associated with NCR money held scenarios.
    a. The DFW Staff produces a Non-Conformance Report (NCR).
    b. The NCR must list a referenced Technical Specification, Contract Line-Item Number, and corresponding Quantity for the item.
    c. The OAR will assign a dollar value to the NCR using the Line-Item Unit Price and Quantity from the NCR to determine a Non-Conformance Contract value.
    d. The OAR will use the information to negotiate an agreement to have the NCR closed.
    e. The NCR will not be closed until a copy of such an agreement has been corrected or negotiated by the OAR.
    f. In addition to the dollar value withheld, the OAR with assistance from the QA Manager will negotiate an extended warranty or performance bond, with the contractor to cover any deficiencies that may arise from the deficient work for a period to be determined by the OAR, QA Manager and Contractor.
    g. A copy will be attached to the NCR for closure.
    h. The OAR will be responsible to tracking dollars held on tracking form.

D. Dollar Assignment Procedure

1. Acceptance of non-compliant work will be at the sole discretion of the owner.
2. Credits, warranty extensions, and other, will be determined by the OAR.
3. **Repeated failures to comply with the requirements herein shall result in the Owner's Authorized Representative implementing their own Quality Control Program. Such action will be at the sole discretion of the OAR. Cost implementing the Quality Control Program will be deducted from the contract.**
4. **Final determination of NCR Dollar Assignments will be assessed and determined by DCC Management, level AVP or above.**
5. **For additional information regarding NCR Dollar Assignments, please refer to the Owner’s Quality Assurance Manual.**

- END OF SECTION -

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SECTION: 01 45 20

NON-CONFORMANCE REPORT

PART 1 – GENERAL

1.01 SUMMARY

A. This Section covers the use of a Non-Conformance Report (NCR) to document Contractor deviations, deficiencies, and other Non-Conformance items noted by the Owner's personnel on the Project.

1.02 DOCUMENTATION

A. All notifications, documentation, and transmittals between the Contractor and the Owner's personnel for the NCR process shall utilize the Unifier software application, unless the Owner for the Project directs an alternate form of transmission.

B. If an alternate form of transmission is directed for the Project, all notifications, documentation, and transmittals shall utilize that form of transmission.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 INSPECTION

A. The OAR, Inspector, and other Owner's personnel will review, observe, and inspect the Work of the Project throughout construction.

B. When a deviation or Non-Conformance is observed or noted, the Non-Conformance will be documented by preparing an NCR. Identifying the Non-Conformance along with all pertinent information such as location, description, time/date identified, and the reference Specification Section.

C. The OAR will notify the Contractor of the NCR.

3.02 CORRECTIVE ACTION

A. The Contractor shall review the NCR and determine what type of Corrective Action is proposed to eliminate the deviation or Non-Conformance to the Contract Documents.

B. The Contractor shall notify the OAR of the proposed Corrective Action to resolve the deviation or Non-Conformance along with all supporting documentation for review and approval.

C. The OAR will review the Corrective Action proposed by the Contractor and may forward the Contractor's response to the Architect/Engineer and other Owner personnel for input and response.

D. If required, the OAR will incorporate the input from the Architect/Engineer or other Owner's personnel and will forward the response to the Contractor for approval or rejection with the Contractor's proposed Corrective Action.

E. If the proposed Corrective Action is rejected, the Contractor shall formulate a revised Corrective Action and return the NCR to the OAR. Identifying the revised Corrective Action and all supporting documentation for review and approval.

F. If the proposed Corrective Action is approved, the Contractor shall diligently move forward in incorporating the Corrective Action into the Work. Notify the OAR when the Corrective Action is complete, and the Work area is ready for follow-up observation, testing, or inspection.

3.03 REINSPECTION

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A. Upon notification by the Contractor that the Work is ready for a follow-up observation, testing, or inspection. The OAR will schedule the follow-up services to verify the completeness of the Corrective Action and confirmation that the condition is in conformance with the Contract Documents.

B. After the follow-up observation, testing, or inspection is reported to the OAR. The OAR will close the NCR if the Corrective Action, as implemented by the Contractor, is approved. Otherwise notify the Contractor that the end result of the Corrective Action is not in accordance with the Contract Documents.

C. If the Contractor is notified the end result of the Corrective Action is not in accordance with the Contract Documents, the Contractor shall diligently pursue resolution of the NCR through coordination with the OAR. To determine the cause(s) of non-approval and to repair or reconstruct the Work to remove the Non-Conformance.

D. Upon completion of the revised Corrective Action, the Contractor shall notify the OAR when another follow-up observation, test, or inspection can be performed.

3.04 CLOSURE

A. When the Inspector or other Owner's personnel inform the OAR that the revised Corrective Action is complete, or that the end result of the Corrective Action has removed. The deviation or Non-Conformance, the OAR will close the NCR.

B. The OAR will sign and date the NCR and notify the Contractor that the NCR has been closed.

- END OF SECTION -

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SECTION: 01 45 29

OWNERS TESTING LABORATORY

PART 1 – GENERAL

1.01 SUMMARY

A. This Section covers the Contractor's coordination with the Owner and the Testing Laboratory provided for the Project.

1.02 RELATED REQUIREMENTS

A. Section 01 25 13, Product Substitution Procedures

1.03 GENERAL

A. A Testing Laboratory will be provided for the Project at the Owner's expense. The Owner will contract with an independent entity or consultant to provide the necessary equipment and provide the services to perform the Quality Assurance testing for the Owner as required by the Contract Documents.

B. The Contractor shall coordinate with the Owner's Authorized Representative (OAR) and the Testing Laboratory in collecting or providing the required samples for testing on the Project.

C. The Contractor shall be responsible for all communication between, his employees, Subcontractors, and the Owner's personnel. Including the OAR, Inspector, and Testing Laboratory personnel in scheduling times for inspections, tests, obtaining samples and similar activities.

D. The services of the Testing Laboratory shall in no way relieve the Contractor of the obligation to perform the Work in accordance with requirements of the Contract Documents, including providing Quality Control testing and monitoring of the Project components.

E. All portions of the Work shall be subject to Quality Assurance inspection in accordance with the Contract Documents and shall remain accessible and exposed for inspection purposes until otherwise approved by the OAR.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 TESTING COORDINATION

A. The Contractor shall provide on a weekly basis, an anticipated inspection schedule, coordinated with the Construction Schedule. Showing the anticipated Quality Assurance inspection needs for the following one (1) week to facilitate appropriate coordination and mobilization of required personnel.

B. The Contractor shall provide notice to each party at least two (2) Calendar Days prior to any Quality Assurance inspection or testing obligation for modifications from the provided schedule.

C. The Contractor shall coordinate the sequence of activities to accommodate required Quality Assurance observation and testing services with a minimum of delay.

D. The Contractor shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate for any inspections and tests.

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E. The Contractor shall provide adequate access of the Owner's personnel and the Testing Laboratory personnel to the Work so that any Quality Assurance inspection, observation, and/or sample may be obtained from the Work area.

F. The Contractor shall cooperate with the OAR, the Testing Laboratory, and any other Owner's personnel to perform any required Quality Assurance inspection, observation, test, or similar service, and shall provide reasonable auxiliary service to such parties as requested.

3.02 OWNER TESTING COST

A. The Owner will be responsible for the costs of initial Quality Assurance inspections and tests required by the Contract Documents.

3.03 CONTRACTOR TESTING COST

A. The Contractor shall be responsible for the costs of any repeat Quality Assurance inspection, observation, or test due to:

1. Inadequate access existed at the time of the scheduled inspection, observation, or test.
2. The subject Work area was incomplete or otherwise not prepared or ready when Owner's personnel, Inspector, or Testing Laboratory personnel arrive.
3. Failure of the Contractor or a Subcontractor to properly schedule or notify the OAR, Inspector, the Testing Laboratory, or any other Owner's personnel responsible for the Work area or product.
4. Any change in sources, lots, or suppliers of products after the original test(s) or inspection(s) were completed.
5. Any changes in the means, methods, techniques, sequences, and procedures of construction that necessitate additional testing, inspection, and related services.
6. Changes in mix designs for concrete and mortar after review and acceptance of the submitted mix design.
7. Any Contractor, Subcontractor, installation errors, or fabrication errors.
8. Any inefficient, sporadic, or poorly organized manufacturing that causes additional testing cost to be incurred by the Owner or Owner's contracted personnel or firm.

B. The Contractor shall be responsible for the costs of all Quality Control testing.

3.04 CONTRACTOR ADDITIONAL TESTING

A. Any additional testing required by the Contractor for determination of construction timing, scheduling, or justification of any discrepancy shall be the sole responsibility of the Contractor.

B. The Contractor shall provide test data to an independent testing laboratory to verify materials proposed by the Contractor for a Substitution as stated in Section 01 25 13 Product Substitution Procedures.

C. The independent testing laboratory shall not be the same entity contracted with the Owner for the Testing Laboratory, inspections, or testing services on the Project.

3.05 LIMITS ON TESTING LABORATORY AUTHORITY

A. The Testing Laboratory may not:

1. Release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Approve or accept any portion of the Work.
3. Assume any duties of Contractor.

B. The Testing Laboratory shall have no authority to stop Work.

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3.06 REPAIR AND PROTECTION

A. Upon completion of all inspection, testing, obtaining samples, and similar services, the Contractor shall repair any damaged area and restore substrates and finishes to eliminate any deficiency, including visual qualities of exposed finishes.

B. The Contractor shall protect any Work areas exposed for inspection, observation, or testing activities and protect any repaired areas.

- END OF SECTION -

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SECTION: 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes the requirements of the Temporary Facilities and Controls required on the project.

1.02 TEMPORARY UTILITIES

A. The temporary utilities include providing electrical service, lighting, heating, cooling and ventilation, water, and sanitary facilities for the Project.

B. The Temporary facilities may include the use of existing systems as applicable.

C. The Contractor shall be responsible for installation, operation, and maintenance throughout the Project period and removal of the systems at the end of the Project.

D. The Contractor shall install, remove, and replace temporary construction barricades per required as part of the Work in accordance with the Contract documents.

E. The Contractor shall be responsible for the control of dust on the Project site, as well as temporary erosion, and pollution controls.

1.03 TEMPORARY UTILITY SERVICE REQUIREMENTS

A. The Contractor shall provide all the temporary utilities including the following services:

1. Electrical Power Source
   a. Current Owner approved Electrical Service provider, Oncor Electric Delivery.
2. Provide temporary lighting for field offices, storage facilities, shops, Work areas, circulation areas for personnel and other construction areas.
3. Provide heating, ventilation, and cooling
   a. Maintain temperature, humidity, and ventilation in enclosed areas to provide ambient conditions for storage, preparation, and Work; to cure installed materials, to prevent condensation, and to prevent accumulations of dust, fumes and gases.
   b. During non-working hours, maintain temperature in enclosed areas at a minimum of 50 degrees F or higher as specified in the individual Sections.
4. Arrange with local telephone service companies to provide and install direct line service to field offices.
5. Provide water acceptable for use in its intended purpose.
   a. Potable water may be obtained from the Owner's existing service water facilities. Obtain water at locations approved by Owner’s Authorized Representative (OAR).
   b. Provide the meter(s) required to record amount of water used.
   c. Complete and submit the Water Request Form included in Section 01 50 00.01 Temporary Facilities and Controls.
6. Provide all utilities and associated facilities at time of Mobilization.

1.04 TEMPORARY UTILITY DISTRIBUTION

A. Provide weatherproof distribution boxes with required outlets, fused switches, and equipment grounds.

B. Provide wiring, connections, and protection for temporary lighting.

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C. Provide wiring, connections, and protection for temporary and permanent equipment for environmental control, for temporary use of electrically operated equipment, and for testing.

D. Provide valve-controlled outlets located so that water is available under adequate pressure by means of hoses.

1.05 USE OF EXISTING SYSTEMS

A. The Contractor may use the existing mechanical and electrical systems temporarily and shall coordinate such use with the OAR for terms and conditions for use of systems in Owner occupied areas.

B. The Contractor shall monitor utilities usage to prevent any interference with Owner's normal requirements and notify the OAR of any abnormal usage (volume, pressure, or duration).

1.06 USE OF PERMANENT SYSTEMS

A. If the Contractor wishes to use any Owner permanent system, the Contractor shall obtain written authorization from the Owner for such use and establishing the start of warranty and conditions of use for:

1. Completed systems with all utility connections and safety devices installed and operational.
2. Completed systems that operate using automatic controls as required by the Contract Documents.
3. Filters and other protective devices for the equipment are in place and operational.

B. Submit an Indoor Air Quality Plan to the OAR for review and approval to ensure the use of any Owner permanent system will not negatively impact the Owner’s use of the facility. The Contractor shall continuously monitor conditions to ensure air and water system cleanliness throughout the construction period.

C. Use of Fire Hydrants:

1. No person shall open, turn off, interfere with, attach any pipe or hose to, or connect anything to any fire hydrant, stop valve, or stop cock, or tap any water main belonging to the Owner. Unless authorized to do so by the DFW Central Utilities Plant and Water Services Section, coordinated through the OAR and have an approved Water Request Form on file.

1.07 COST OF TEMPORARY FACILITIES

A. The Contractor shall pay for the cost of the following:

1. Permits and inspections, unless otherwise provided for in the Contract.
2. Installation of temporary utilities, materials, operation, maintenance and removal.
3. Energy consumed until beneficial occupancy, unless provided for in Contract.
4. Fuel consumed by portable units.
5. Water used throughout the Contract.
6. **NOTE: Water will be billed to Contractor at the rate of $ X.XX per 1,000 gallons used. To be defined by DFW Central Utilities Plant and Water Services Section.**

B. The Owner will pay the cost for the following:

1. Fuel consumed in use of existing systems, except for fuel consumed by portable units.
2. Temporary easements required across property or outside the Owner’s property.

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1.08 VENDING MACHINES

A. The Owner has exclusive vending contracts in place within the Airport for food, snacks, and beverages that pay a substantial sum of money to the Owner on an annual basis. If the Contractor desires to place vending machines on their Project site, the Contractor shall coordinate all requests for placement of vending machines with the Airport Concessions Department through the OAR.

B. Prior to submitting an application to add any other vending source, the Contractor shall first receive a turndown in writing from the primary vending source(s). After receiving a turndown, the Contractor may ask for approval to place other vendor's equipment on the Project site.

C. No vending equipment may be set-up on the Project site or elsewhere on the Airport prior to receiving the Airport Concessions Department's written approval from the OAR.

PART 2 – PRODUCTS

2.01 MATERIALS FOR TEMPORARY FACILITIES

A. The Contractor shall provide the following:

1. New or used materials which are adequate to the intended purpose.
2. All devices and equipment shall meet Underwriter's Laboratory (UL) requirements.
3. Telephone Equipment: Products of the local service company or specialty devices compatible with service company requirements.
4. Drinking water dispensers, the size and number sufficient to service the Contractor and Owner's staff. The OAR will approve the number and locations of dispensers.
5. Water meter(s) as shown on the Plans which remote reading indicators can be added as a standard option and be equal to those manufactured by Hersey Products, Inc. Only water meter(s) designed to be installed on fire hydrants will be approved for such use.
6. Backflow preventer on all temporary construction water services with a line sized backflow preventer equal to Beeco Model 6-C as shown on the Plans. The Contractor shall install a test valve for facilitating a backflow prevention test.
7. Enclosed portable toilet facilities, self-contained units, secluded from public view meeting the requirements of State and local health regulations and ordinances.

PART 3 – EXECUTION

3.01 TEMPORARY FACILITIES INSTALLATION

A. The Contractor shall provide the services and facilities as follows:

1. Install initial services and facilities at time of Mobilization.
2. Modify and extend systems as work progresses.
3. Size piping to supply construction needs.
4. Disinfect piping used for drinking water.
5. Test backflow preventer assembly in conformance with Airport Construction and Fire Prevention Standards Resolution (Section 312.9 of the Plumbing Code).

3.02 OPERATION AND MAINTENANCE

A. The Contractor shall operate and maintain the temporary systems to provide continuous service throughout the Project and promptly replace worn or defective parts.

B. Permanent heating, ventilation and cooling:

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1. Clean or replace filters and install in duct extensions as necessary to maintain the work areas and finished areas in a condition meeting the requirements of the Contract.
2. Prior to operation of permanent equipment, the Contractor shall verify that controls and safety devices are complete. Equipment has been tested; inspection has been made by authorities and been approved for operation.
3. Place zones of permanent HVAC system in operation sequentially as work progresses.
4. Install temporary filters in air handling units and ducts, replace as necessary to prevent dust in equipment and ducts, to avoid contaminates in work of finished areas as set forth in the approved Indoor Air Quality Plan.

C. Clean sanitary facilities twice per week to maintain a sanitary condition. Provide all supplies such as toilet paper, paper towels, and soap in suitable dispensers.

D. Dispose of water or sewage in a satisfactory manner so that no nuisance is created, and that the Work under construction will be adequately protected.

3.03 DUST CONTROL

A. The Contractor shall provide positive methods and apply dust control materials to minimize rising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

B. The Contractor shall maintain dust control measures including, but not limited to, watering down materials to prevent blowing dust/materials and taking necessary actions to abate any nuisance related to excessive dust caused or brought about by the Work, to the satisfaction of the OAR.

3.04 EROSION CONTROL

A. The Contractor shall plan and execute construction and earthwork by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation.

B. Hold areas of bare soil exposed at one time to a minimum. Provide temporary control measures such as berms, dikes, and drains.

C. Construct fills and waste areas by selective placement to eliminate surface silts or clays, which will erode.

D. Periodically examine earthwork to detect any evidence of erosion, apply corrective measures as required by pollution control in accordance with Section 01 57 13, Temporary Erosion and Sediment Control.

3.05 POLLUTION CONTROL

A. The Contractor shall provide methods, means and facilities required to prevent contamination of soil, water or atmosphere by discharge of noxious substances from construction operations.

B. Perform emergency measures required to contain any spillage, and to remove contaminated soil or liquids. Excavate and dispose of contaminated earth offsite and replace with suitable compacted fill and topsoil.

C. Prevent harmful substances from entering public waters and the disposal of wastes, effluence, chemicals or other substances adjacent to streams, or in sanitary or storm sewers.

D. Provide systems for control of atmospheric pollutants, prevent toxic concentrations of chemicals, and harmful dispersal of pollutants into atmosphere.

E. Comply with the Storm Water Pollution Prevention Plan (SWPPP) included in the Plans.

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3.06 WASTE DISPOSAL

A. The Contractor shall dispose of waste throughout the Project in accordance with Section 01 74 19, Construction Waste.

3.07 REMOVAL OF TEMPORARY FACILITIES AND CONTROLS

A. The Contractor shall perform the following:

1. Remove the temporary materials and equipment at Substantial Completion of the Project.
2. Restore existing and permanent equipment, when used for temporary service, to original condition at Substantial Completion.
3. Remove any temporary underground installations to a depth of two (2) feet and grade site as indicated in the Plans.
4. Replace temporary filters with new, clean, or reusable filters at Substantial Completion.
5. Remove each water meter at Substantial Completion and leave the water valve in place when the temporary service has been supplied through a water main. Install coat valve and piping remaining with coal tar coating system in accordance with NAPCA (National Association of Pipe Coating Applicators) TF-2, TF-3, TG-2 or TG-3 specifications.
6. Remove portable toilets when no longer required for the Contractor or Owner's staff.

- END OF SECTION -

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SECTION: 01 50 00.01

TEMPORARY FACILITIES AND CONTROLS – WATER REQUEST FORM

DALLAS FORT WORTH INTERNATIONAL AIRPORT

P. O. Drawer 619428, Dallas Fort Worth Airport, Texas, 75261-9428,

REQUEST FOR WATER SERVICE

PART I - TO BE COMPLETED BY THE APPLICANT:

Contract No._____ Building Permit No. _____

Contract Title _____

Applicant's Name _____

Billing Address _____

Telephone Number (____) _____- _____ Fax Number (____) _____-_____

Authorized Signature of Applicant's Representative: _____

Date _____

Meter Location _____

Size Meter _____

Service Starting Date _____ Water Line No. _____

Station No. _____ Fire Hydrant No. _____

Equipment or Parts Needed _____

_____

PART II - TO BE COMPLETED BY THE OWNER:

Date Service: Initiated _____ Terminated _____

Water Mfg. _____ Serial No. _____

Register Capacity _____ , _____ , _____ Gallons (_____) Cu. Ft. (_____)

Extra Equipment _____

PART III – INSTRUCTIONS TO APPLICANT

A. Part I of this request should be completed by any party desiring water service from the Owner's water distribution system or who is entitled to the use of the same by contract. Request forms may be obtained by calling Airport utility personnel at (972) 973 3600. Copies of Applicant Instructions and Obligations relative to such services are available upon request at the Central Utilities Plant, Water Services Section.

B. This request shall be returned, with a cashier's check for the amount of $4,500 (Four Thousand and Five Hundred Dollars), to the Central Utilities Plant, Water Services Section between the hours of 7:00 a.m. - 3:30 p.m.; the check shall be made out to the DFW International Airport Board. The check shall be held until such time as the applicant has completed the use of the Dallas Fort Worth Airport Utilities Section facilities and turned over to the Utilities Section all equipment used in good condition. At such time, the applicant's check shall be returned to the applicant by the Owner. If any equipment belonging to the D-FW Utilities Section is found to have been damaged while on loan to the applicant, the amount of damages shall be deducted from the check.

- END OF SECTION -

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SECTION: 01 52 00.01

CONSTRUCTION SIGNAGE

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes the requirements for the Construction Signage on the Project Site including Project identification signs, temporary informational signs, regulatory signs, and warning signs as required for the Project.

1.02 REQUIREMENTS

A. The Contractor shall provide the Construction Signage on the Project in accordance with the following:

1. Provide and install the Project identification signs shown in the Plans. Provide additional information signs at locations as required to direct traffic, and control access to the Project site as directed by the Owner's Authorized Representative (OAR).
2. Provide and install the regulation and warning signs as shown in the Plans. Provide any additional signs at locations required in accordance with the Texas Manual of Uniform Traffic Control Devices (TMUTCD) or as directed by the OAR.
3. Design the sign panel and support structure to withstand seventy (70) miles per hour wind velocity.
4. If the Project site includes a corner intersection, one (1) Project identification sign shall be installed on each street of the Project site.
5. All sign installation shall meet the intersection sight distances (within the sight triangle) requirements, in accordance with the Policy on Geometric Design of Highways and Streets published by the American Association of State Highway Transportation Officials (AASHTO) and shall not block or cover any existing sign in same area.
6. The AASHTO Policy on Geometric Design of Highways and Streets provides information on stopping sight distances and roadway approach sight distances along a roadway and at intersections. If inadequate sight distance exists at these intersections due to monuments, signage and landscaping mitigation will be necessary to eliminate any safety hazards. Any potential hazards within the sight triangles shall be removed by the Contractor.
7. The AASHTO Roadside Design Guide shall be referenced for general "clear zone" information and requirements that affect roadside safety. The AASHTO Roadside Design Guide covers items such as landscaping, fire hydrants, guardrails, utility poles, drainage features, signage, and "clear zone" requirements for non-breakaway barriers.
8. Any sign installed within the clear zone shall incorporate "break-away" post design installation.

1.03 SUBMITTALS

A. The Contractor shall submit shop drawings of the proposed signs to the OAR within 15 Calendar Days of receiving the Notice to Proceed (NTP) showing content, layout, lettering font/size, color, foundation details, structural materials, sizes and grades of members.

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1.04 QUALITY ASSURANCE

A. The Contractor shall provide sign panels painted by a professional sign painter with a minimum of three (3) years' experience in painting specified types of signs or manufactured sign faces from an approved supplier.

PART 2 – PRODUCTS

2.01 MATERIALS, DIMENSIONS, AND LAYOUT

A. The Project identification sign shall meet the following requirements:

1. The sign size shall be ninety-six (96) inches x 48 inches on a panel consisting of 5/8-inch-thick medium density overlay (MDO) board.
2. The sign panel shall be mounted to at least two (2) 4-inch x 4 inch treated lumber posts.
3. The sign shall be painted white and mounted thirty (30) inches to thirty-six (36) inches above grade unless otherwise directed by the OAR or specified in the Contract Documents.
4. The Contractor shall use the sign template in Figure 1 unless otherwise directed by the OAR or otherwise specified in the Contract Documents.

Figure 1

B. All other signs shall meet the following requirements:

1. Size of signs, height, and lettering font/size shall meet the requirements of the TMUTCD for the intended roadway type and design speed.
2. Colors shall meet the requirements of the TMUTCD using uniform colors throughout the Project as approved by OAR.
3. Install sign panel at height for optimum visibility, on ground-mounted poles or as attached to temporary structural surfaces.
4. Contact should include name of project and phone number in-case of emergency.

C. Finishes and Paint:

1. The Contractor shall provide finishes/painting on the signs adequate to withstand weathering, fading and chipping for duration of the Project.

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2. If a manufactured sign panel is not provided, the Contractor shall paint the sign panel with two (2) coats of exterior grade paint. Paint may be one coat of primer and one finish coat or two coats of self-priming finish paint.
3. Paint lettering on sign using one (1) coat of exterior grade paint.

PART 3 – EXECUTION

3.01 GENERAL

A. Utility location shall be required and approved before digging the sign foundation.

B. Existing landscaping and proposed landscaping may lower safety standards with respect to maturity or seasonal growth with respect to line of sight and stopping sight distances. The Contractor shall contact the OAR for consultation and input on any potential areas of concern regarding sight lines and stopping sight distances.

3.02 INSTALLATION

A. Install signs within 30 Calendar Days of receiving the NTP.

B. Relocate informational signs as required by progress of work.

3.03 MAINTENANCE

A. The Contractor shall maintain all construction signs throughout the Project in a neat, clean condition, and repair any damage to sign panel finish or support structure framing.

3.04 REMOVAL

A. The Contractor shall remove all the signs and foundations completely at Final Completion. All holes from foundation removal shall be filled with sand or other properly compacted material as approved by the OAR and the impacted area regraded to its original condition as directed by the OAR.

- END OF SECTION -

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SECTION: 01 52 13

DUST CONTROL

PART 1 – GENERAL

1.01 SUMMARY

A. This Section covers control of dust resulting from construction operations of the Project.

PART 2 – PRODUCTS

2.01 GENERAL

A. Water to be used for dust control on the Project shall be potable or non-potable water obtained from a source approved by the Owner or as directed by the Owner's Authorized Representative (OAR) in accordance with the applicable requirements.

PART 3 – EXECUTION

3.01 GENERAL

A. Prior to the start of construction, the Contractor must submit a Dust Control Plan which will describe the means and methods to alleviate and prevent dust nuisance originating from construction operations including but not limited to demolition, earthwork, crushing, hauling and stockpiling operations within the Project limits inclusive of the staging yard. Work shall not commence until the Dust Control Plan has been approved by the OAR.

B. The Contractor will investigate the availability of an adequate supply of suitable water, make all arrangements (including permit if required) for the purchase of the water and provide necessary facilities to furnish water for use during construction, solely at the Contractor's expense. Water may be obtained from the fire hydrants on Airport property. The availability and quality of the water obtained from these sources is not guaranteed.

C. Any dust control complaints received from tenants, airport users, and or the Airport Operations Department shall require the Contractor to cease dust creating tasks until such time that the dust control measures have been implemented and the issue resolved.

- END OF SECTION -

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SECTION: 01 52 16

HAUL ROAD

PART 1 – GENERAL

1.01 SUMMARY

A. This Section covers the requirements for the construction, maintenance, and removal of a Haul Road required for the Project.

1.02 RELATED DOCUMENTS

A. The Plans and General Provisions of the Contract, apply to the Work of this Section.

1.03 DESCRIPTION

A. The Contractor shall perform all Work required to complete the Project as indicated by the Contract Documents and furnish all items necessary for the completion of all work specified in this Section.

B. The Contractor shall complete all the Work included in this Section including furnishing all labor, tools, materials and incidentals required for installation, maintenance, and removal of a temporary all-weather Haul Road including the restoration of the area to its original condition at the completion of the Project.

1.04 SUBMITTALS

A. The proposed plans and specifications for the all-weather Haul Road and Contractor's Stormwater Pollution Prevention Plans (SWPPP) shall be submitted for review and acceptance by the OAR.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 NEW HAUL ROAD

A. The temporary all-weather Haul Road shall be constructed as shown on the Plans, including construction entrances at egresses to public access roads and the Air Operation Area (AOA), curb cuts at egresses onto public access roads, ditches, and erosion control measures along the Haul Road.

B. The Contractor shall reconstruct the curbs at the curb-cuts when the Haul Road is removed.

3.02 EXISTING HAUL ROAD

A. If an existing Haul Road(s) will be used as a part of the Project, prior to the start of the Work, the Contractor shall take photos or video documentation of the existing Haul Road.

B. The Contractor shall maintain the existing Haul Road(s) throughout the Project and shall return the existing Haul Road(s) to the condition prior to the Contractor's use of such road(s).

C. The restoration of the existing Haul Road shall be performed at the end of use by the Contractor or when directed by the Owner's Authorized Representative (OAR).

- END OF SECTION -

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SECTION: 01 55 20

CONTRACTOR BADGING, AOA ACCESS AND REVENUE AREA ACCESS

PART 1 – GENERAL

1.01 SUMMARY

A. This section covers the requirements for Contractor Badging, Air Operations Area (AOA) and Revenue Area (RA) Access, as identified in Section 01 11 00.

1.02 RELATED SECTIONS

A. 01 35 13.13, Minimum Standards for Construction and Maintenance on the AOA

1.03 IDENTIFICATION/ACCESS BADGES

A. The Contractor and all Subcontractors must obtain and pay for all Airport Identification/Access Badges and Access Permits as required by DFW Airport. (A list of 'Fees & Charges' can be found on Access DFW's website: www.dfwairport.com/accessdfw under Fees & Charges.)

1. These fees are subject to change at any time. For a complete list and restrictions that apply, visit DFW International Airport | Official Website click on the Financials tab, then click on Schedule of Charges.

B. All appropriate forms and applications must be obtained, completed and submitted to Access DFW. Badging and AOA Vehicle Permits: The Contractor and all Subcontractors must be onboarded with the Access DFW and an Authorized Signatory must be assigned to request badging privileges and AOA permits. For further information contact ACCESS DFW at 972-973-5100.

1.04 TERMINATED EMPLOYEES

A. When an employee is terminated, the Authorized Signatory must immediately log into SAFE and terminate the Occupation (on the Occupation tab) and return the Airport ID Badge to Access DFW. Badges can be returned 24 hours a day, 7 days a week by using the Airport ID drop box located outside the entrance of Access DFW. This is a TSA requirement and is especially important to ensure that all Airport ID Badges at DFW Airport are properly accounted for. Additionally, the Government could hold your company liable for up to a $14,950 Civil Penalty for airport operators and $37,377 for air carriers if you do not collect or make a reasonable effort to collect the badge from the employee on the day of termination and do not terminate the employee in SAFE within 24 hours. Failure to return a badge within 5 days after termination will result in a non-refundable unreturned badge fee (refer to Schedule of Charges), billed to the company by DFW Airport. You can find detailed instructions for terminating an employee in the Authorized Signatory Manual and SAFE Manual.

1.05 UNACCOUNTED FOR BADGES

A. An Unaccountable ID Badge is one that has been lost, stolen, or is missing with an unexpired date on the front of the badge.

B. Access DFW monitors unaccountability percentages for each company. Access DFW may suspend new badge issuance and renewals, until the company regains control of the badges issued to the company. Additionally, you may also be required to meet with Access DFW and DFW Management if Unaccountable ID Badges remain high. It is a key requirement of your Authorized Signatory job duties to run the Unreturned Badge Report (in the Reports tab in SAFE) each week and proactively recover all Unaccounted-for Badges, unless they have been lost or stolen. Failure to comply could result in the above consequences. For additional

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requirements and information have your company's designated Authorized Signatory refer to the "Authorized Signatory Manual and SAFE Manual."

1.06 UNBADGED INDIVIDUALS

A. Individuals requiring an escort into the Secured Area, Security Identification Display Area (SIDA) or Sterile Area must be for official business only and cannot exceed 14 calendar days total within one calendar year. Each day an individual is escorted will count as 1 day. Once an individual reaches 14 days (Calendar Year: January to December), they will be required to have a valid Airport issued ID Badge to enter the Secured, SIDA or Sterile Areas again.

1.07 VEHICLE AND EQUIPMENT ACCESS PERMITS

A. Air Operations Area (AOA) Permits, including AOA Vehicle Access Permits, Temporary AOA Vehicle Access Permits, and AOA Equipment Permits, are the means by which motor vehicles and ground handling equipment signify that they are properly insured and authorized to enter and/or operate on the SIDA.

B. All vehicles and ground handling equipment entering security gates, commonly referred to as "AOA gates":

1. Must display valid, unexpired AOA Permits or be under escort by an agent of the Airport Board, a representative of the airlines, or a tenant responsible for the AOA gate through which the vehicle or ground handling equipment is entering.
2. Must be marked with the company name and/or logo for identification purposes.
3. Are subject to inspection by security personnel. Ground handling equipment being brought into the SIDA for the first time must be inspected by DPS Security personnel at the AOA gate.
4. Must Affix the Permit to the vehicle to which the AOA Permit was issued on the driver's side front and rear bumper of the vehicle, or for tractor trailers, the AOA Permits must be affixed to the driver's side front and driver's side rear of the tractor.

C. The Authorized Signatory is required to request vehicle permits on behalf of their company and ensure all permits are properly displayed on the vehicle. For up-to-date procedures please reference the Authorized Signatory Manual and the SAFE Manual.

1.08 VEHICLE AND EQUIPMENT PERMIT ISSUANCE

A. The following will help you determine which AOA permit application is needed.

1. Select "Annual Vehicle Permit" for Permit Type when the following conditions apply:
   a. Your company is an airline tenant, government agency, Airport concessionaire, or the Airport Board; or
   b. Your company is a contractor or vendor for an airline tenant, government agency, Airport concessionaire, or the Airport Board whose contract/agreement expires on the last day of the calendar year (ex: contract term begins on 05/15/2024 and expires on 12/31/2024).
2. Select "Temporary" for Permit Type when the following condition applies:
   a. Your company is a contractor or vendor for an airline tenant, government agency, Airport concessionaire, or the Airport Board whose contract/agreement expires prior to the end of the last day of the calendar year (ex: contract term begins on 01/01/2024 and expires on 09/30/2024).
3. Select "Equipment" for Permit Type when the following condition applies:
   a. Your company is an airline tenant, government agency, the Airport Board, or an Airport Board contractor that has ground handling equipment that will remain in the

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SIDA and the ground handling equipment does not traverse through AOA gates after being brought into the SIDA.

B. Please make sure you allow two to three business days for application processing and permit issuance. Failure to include all the information will delay the issuance of your permits. You will receive an email from Access DFW when the permits are ready to be picked up. You have 30 business days after this email is sent to pick up your permits (new and renewal). If they are not picked up in that time frame, your permits will be marked “Invalid,” and you will need to re-submit the request. If you would like to know the status of your permits, you can find that information in SAFE under the Employer → Vehicle Permits tab. For detailed instructions on adding or updating vehicle information, please reference the SAFE Manual.

1.09 VEHICLE AND EQUIPMENT PERMIT INSURANCE REQUIREMENTS

A. All policies must be written through a licensed company authorized by the Texas State Board of Insurance to transact that class of insurance business in the State of Texas, with a minimum rating of ‘A-‘‘VII’ by A. M. Best Company. If the rating of any insurer should fall below this standard, you shall cause the policy to be replaced promptly by an acceptable insurer.

B. It is important to note that Dallas Fort Worth International Airport must be listed as the certificate holder on the insurance policy.

C. Coverage must apply in excess of all required primary Liability insurance and must be at least as broad as the underlying Liability insurance.

D. Permit Fees must be paid within one week of the invoice. If they are not paid within that time frame, your permits will be marked “Invalid,” and you will need to re-submit the request.

E. Please refer to the Contract Insurance Provisions, Exhibit A for complete requirements, coverages and guidance.

1.10 SECURITY

A. Security Violations:

1. If an employee with your company receives a Violation Notice, the Authorized Signatory will also receive the notice and are responsible for ensuring that the proper follow-up and response to the Airport is provided by your employee. This may mean turning the responsibility over to the employee’s supervisor and then receiving the corrective information from the supervisor and reporting or responding back to the Airport. In all circumstances, DFW Airport reserves the right to penalize an individual for security violations. Penalties/fees may be assessed based on consultation and coordination with TSA.

2. You must ensure your employees are aware of all violations and the penalties involved. This is a preventative step that you can take to help keep your company’s employees in compliance with the TSA Regulations and the Airport Rules and Regulations. A copy of DFW’s Rules and Regulations (Chapter 9) can be found at Chapter 9 Security Violations.

B. Pedestrian Traffic at AOA Vehicle gates:

1. TSA Regulations prohibit pedestrian traffic through Secured Area vehicle gates. Violators may receive a Violation Notice.

C. DFW Violation Appeal Process:

1. If your company’s employee receives a Violation Notice, they have the ability to appeal it. Details explaining the violation appeal process are included with the original security Violation Notice letter.

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1.11 REVENUE AREA ACCESS

A. It is the Owner's policy to promote adequate and efficient vehicle services and operations at the Airport. To achieve this goal, Rules and Regulations for RA use have been developed to safeguard public health and safety and to enhance public convenience and necessity while minimizing adverse effects on public parking capacity and revenue protection. Specifically, the Owner's policy dictates that all vehicles, including private vehicles, must enter and exit the RA through the North and South Control Plazas or via crossover gates as specified by the contract, unless otherwise specified in Section 01 11 00 - Summary of Work.

1.12 AUTHORITY FOR ENFORCEMENT

A. The Employee Parking Office (EPO) is designated to administer the Airport Vehicle Rules and Regulations to control RA use. The EPO may establish procedures consistent with the Rules and Regulations which EPO determines necessary. The Airport Department of Public Safety (DPS) shall be responsible for the enforcement of the Rules and Regulations.

1.13 PARKING PRIVILEGES

A. Contractor/Consultant are granted 24-hour parking access with crossover privileges. Contractor/Consultant vehicles shall be granted no cost access to DFW Airport Terminal Parking Locations (excluding Valet Parking). This only applies to parking privileges in accordance with the Contract/Delivery Order Scope of Work. Personal use or professional use outside of the contractual scope will require use of the “Ticket Only” lanes at the Control Plazas. Vehicles that have been granted permission to park and/or enter the Central Terminal Area (CTA) for a predetermined period (24 hours) will be charged the appropriate rate thereafter. All privileges associated with Vehicular Access require the Contractor/Consultant to obtain and use a NTTA Toll Tag (backed by a credit card) for each vehicle. Any costs incurred to maintain a NTTA Toll Tag are the responsibility of the Contractor/Consultant. This contract allows for [N/A]vehicles to be granted access. For contracts requiring more than 10 vehicles, Coordination with DFW Transportation Business Unit (TBU) is required prior to accessing the Terminal Parking environment. Contact the Employee Parking Office (EPO) at prkpri@dfwairport.com or (972) 973-8040 to start a request. Required documentation includes but is not limited to: Notice to Proceed (NTP) Letter, Executed Contract Agreement, and Scope of Services. All other terms and conditions of this Contract remain unchanged.

1.14 OPERATING AUTHORITY

A. The EPO administers and the Transportation Business Unit (TBU) approves all requests for access to the RA. The Contractor and their Subcontractors must request approval for 24-hour access in designated RAs. Approval will be only for contract work for the duration of this contract.

B. Once all required documentation is received by the EPO, the Parking Guest Relations Manager will schedule a meeting to instruct the Authorized Signatory on how to input vehicles into the system.

C. If at any point a Change Order (CO) is issued that affects this access, including any extensions to the contract, the Contractor must email the CO to the EPO for modification to the approved access. Failure to inform the EPO in a timely manner will result in termination of access.

D. Any violations of policies and procedures presented by the TBU and/or EPO could result in the termination of access to one or more vehicles associated with this contract.

E. The Prime Contractor will be responsible for processing and access to all subcontractors and will assume all responsibilities for their actions.

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F. If access to the Revenue Area is required as defined by the Summary of Work, daily fees will be waived.

1.15 ENFORCEMENT

A. Violations

1. If TBU and/or EPO determines that the Contractor violates the terms of its Operating Authority or the Code of Rules and Regulations, TBU and/or EPO may notify the Contractor of the violation and may either deny or terminate access to the RA based on the nature of violation.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

- END OF SECTION -

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SECTION: 01 55 29

STAGING AREA

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes all the requirements for the staging areas to be required for the Project.

1. The staging area(s) for the Project shall be assigned by the Airport Environmental Affairs Department (EAD) if shown on the Plans.
2. The staging area on the Airport shall not be used for the storage of chemicals, materials, and equipment related to any Contractor's off-site work.
3. The Contractor shall submit an Erosion Control Plan (ECP) and a Storm Water Pollution Prevention Plan (SWPPP) to the Owner's Authorized Representative (OAR) if the staging area(s) is/are not already included in the Plans ECP or SWPPP.
4. The Contractor shall comply with the EAD Administrative Policy Staging Yard Authorization and Utilization procedures, the International Building Code 2009 (IBC), and the International Fire Code 2009 (IFC) and Local Amendments.

1.02 DEFINITIONS

A. Final Stabilization: A construction site status where all soil disturbing activities at the site have been completed and a uniform (e.g., evenly distributed, without large bare areas). Perennial vegetative cover with a density of 70% of the native background vegetative cover for the area has been established on all unpaved areas, and areas not covered by permanent structures, or equivalent permanent stabilization measures (such as crushed stone, riprap, gabions, or geotextiles) have been employed.

B. Temporary Structure: A portable building, Conex container, or shade structure that will be on-site less than ninety-one (91) Calendar Days from the date of the letter of authorization to construct, deliver, or erect such a structure.

1.03 SUBMITTALS

A. Site Plan- The Contractor shall submit a proposed site plan to the OAR for review and approval, after coordinating the site with the EAD. The site plan shall at a minimum, include the following:

1. Proposed location(s) and dimensions of any area to be fenced and used by Contractor for staging.
2. Location and dimensions of each temporary and permanent structures.
3. Avenues of ingress and egress.
4. Details of the fence and gate installation. Comply with IFC Chapter 506 which requires a Knox Lock at all gates to grant access to Emergency Personnel.
5. Methods or devices to be used at exits to prevent the tracking of mud.
6. Location of material storage areas.
7. Location of equipment storage, and vehicle parking.
8. Location of areas for fuel storage, fueling operations.
9. Locations for vehicle or equipment maintenance, including areas for washing of equipment.

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10. Location of storm drains and drainage channels that could receive runoff from the staging area.
11. Identify the Subcontractors or others that will share the staging area.
12. Location and methods of containment for any flammables, chemicals, or hazmat materials that will be stored in the staging area. Include a Material Safety Data Sheet (MSDS) for all such materials.

B. The Contractor shall obtain the approval of the OAR for the Subcontractors or others that will share the staging area.

C. A structure over 1,000 square feet shall be provided with a fire alarm system. For a structure with less than 1,000 square feet, the Contractor shall obtain a determination through the OAR from the Airport Fire Marshal and Design, Code, and Construction Department (DCC) whether a fire alarm or other measures must be incorporated to ensure life safety.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 STAGING AREA

A. The Contractor shall obtain an EAD Construction Staging Yard Checklist from the OAR.

B. The entrance to the staging area shall be provided with signs including:
   1. The name of the Contractor and all Subcontractors.
   2. Address – To be provided by the OAR
   3. The Contractor's 24-hour emergency contact number.

C. Project(s) Identifiers: Permit Number, Project Name, Contract Number, SWPPP and NOI notices.

D. A copy of the Contractor material and chemicals list and the Construction Staging Yard Application (which includes a list of material and chemicals to be stored) shall always be available at the staging area.

E. Implement erosion control measures in accordance with Section 01 57 13, Temporary Erosion and Sediment Control.

F. Arrange for a Life Safety Inspection by the Design, Code, and Construction Department (DCC) after setup after tear down, and annually while the Staging Area is in operation.

G. The Contractor is responsible for the security of Contractor equipment and materials, and associated security appurtenances. Security measures deemed necessary by the Contractor in the protection of equipment and materials are incidental to the overall performance of the work associated with the project. DFW will not be held accountable for any theft issue of stored material and will not be responsible for any impact on schedule or costs resulting from such incident. Staging area must be enclosed with a security fence.

H. Establish an all-weather access road to ensure emergency equipment access to structures, and material and equipment storage areas in accordance with IFC Chapter 5. Obtain approval of the temporary access road from OAR for the Design, Code, and Construction Department (DCC) and the Airport Fire Marshal.

I. Install construction exits in areas of ingress/egress, equipment service areas, and in parking areas to prevent rutting and the tracking of mud, in accordance with Section 01 57 13.

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J. Obtain approval of separate and distinct storage areas, including employee parking from the OAR and the EAD.

K. Design and construct temporary and permanent structures in accordance with the IBC, IFC, and Local Amendments.

L. Obtain General Work Permits in accordance with IFC Chapter 105 from the OAR.

M. Stockpile all materials inside the Contractor staging area.

N. Provide each entrance to the primary staging area or all separate or distinct storage areas with an appropriate Knox Box in a location approved by the Fire Marshal in accordance with IFC Chapter 506. Provide a key to each structure inside the staging area in the Knox Box. Order boxes through the Fire Marshal's office.

O. Park all mobile construction equipment within the staging area, at the end of each Working Day.

P. Store salvageable materials resulting from demolition activities within the staging area, or at a supplemental storage area approved by the EAD, in accordance with the ECP and SWPPP.

Q. Stack stored materials and products off the ground within the staging area. Maintain stored materials and products in a neat and orderly method that allows ready access to materials and products.

R. Follow the IFC guidelines when using or storing hazardous, flammable or combustible materials. Specifically reference Chapter 34 which requires the NFPA 704 placard and proper labeling of all products. Store drums and containers off the ground and on pallets and properly seal containers and label each container. Provide any secondary containment as appropriate.

3.02 MAINTENANCE OF STAGING AREA

A. The Contractor shall maintain the staging area throughout the Project including, but not limited to the following:

1. Maintain the perimeter fence is in good repair and proper alignment.
2. Comply with IFC Chapter 3 which includes the following general precautions against fire: maintain vegetation, establish designated Smoking Areas, post No Smoking signs, provide orderly storage, and remove construction debris, waste, and packing materials from the staging area before it becomes a nuisance/ fire hazard.
3. Check the staging area daily for spills, standing water, and other sources of contamination. Immediately implement reporting and removal procedures when found in accordance with Section 01 57 19.13, Spill Response Plan.
4. Thoroughly clean dirt or mud that becomes tracked out of staging area, onto paved or surfaced roadways, as soon as possible and no later than the same Working Day to eliminate the source of the tracking material.
5. Maintain all-weather roads to ensure emergency equipment access to structures, equipment, and material storage areas. Repair potholes and ruts as they are identified and no later than [24] hours after identification.

3.03 RESTORATION OF STAGING AREA

A. At the end of the Project, the Contractor shall restore the staging area at Substantial Completion to its pre-existing condition, or as otherwise directed by the OAR, by performing the following:

1. Remove all structures, materials and equipment from within the staging area.
2. Remove all fencing and fence posts completely or as otherwise directed by the OAR.

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3. Fill in all holes and depressions.
4. Remove all gravel and apply [2] inches of clean topsoil and seeding as needed to restore the site to a stabilized condition or as otherwise directed by the OAR.

3.04 CLOSURE

A. The OAR will perform a Final Stabilization inspection, and OAR approval is required prior to being approved for Construction Permit Closure.

B. A final fire and life safety inspection will be conducted by the DCC and Fire Marshal to determine if the site meets all relevant codes.

C. The Owner may, at their discretion, not require the staging area to be demobilized and restored if the staging area will subsequently be utilized to support in-progress Airport projects.

1. In such case, the later contractor will be required to fulfill all the guidelines to ensure the staging area is maintained and updated if the current Contractor is requested to turn over the staging area.

D. If the Contractor is involved in more than one contract on the Airport that warrants a staging area, the Contractor may transfer the staging area responsibilities into the most current SWPPP when the Contractor has completed the Project.

E. The OAR will be solely responsible for all interpretations of codes and guidelines and will make the final determination. The Construction Permit Closure shall not be granted until all OAR approvals have been obtained.

- END OF SECTION -

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SECTION: 01 56 23

TEMPORARY BARRICADES

PART 1 – GENERAL

1.01 SUMMARY

A. The terms "barricade" and "barrier" are used throughout the Drawings and specifications to universally indicate low-profile barricades, traffic cones/ barrels, construction signs, danger signals, hazard lighting, and / or any other safety measures to be installed by the Contractor prior to commencing work in an area. The terms "barricade" and "barrier" should be considered synonymous with each other. The Contractor is responsible for furnishing, installing, relocating, operating, maintaining (including replacement parts), and removing, as applicable, the necessary barricades for the protection of the work and safety of the air traffic.

B. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

C. Provide barricades required by governing authorities for public rights-of-way and for public access to adjacent building.

D. Provide protection for plant life designated to remain. Replace damaged plant life in kind.

E. Protect non-owned vehicular traffic, site and structures from damage.

1.02 DESCRIPTION

A. Furnish, install and maintain suitable barriers and signs as required to prevent public entry, and to protect the work, existing facilities, trees and plants from construction operations; remove when no longer needed, or at completion of Work.

1.03 QUALITY ASSURANCE

A. Barriers and construction signs must comply with federal, state and local codes and all regulations pertaining to traffic control devices and construction sign regulations.

PART 2 – PRODUCTS

2.01 MATERIALS AND GENERAL

A. For landside barricades, provide fixed signs as shown on the Traffic Control Plan Drawings and conforming to the latest edition of the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

B. For airfield barricades, provide materials as shown on the Drawings or as deemed necessary by the Owner's Authorized Representative (OAR).

PART 3 – EXECUTION

3.01 PROCUREMENT AND IMPLEMENTATION

A. Furnish and implement in an orderly manner all temporary barricades to be used for facilitating safe mobility for all aircraft and safeguarding of workers in a work zone.

B. For landside operations, provide barriers and construction signs consistent with those approved in the Contractor's Traffic Control Plan to protect the work area and traveling public, as indicated on the Drawings, during construction of this project.

C. For airside operations, provide barriers and construction signs as required on the Drawings or deemed necessary by the OAR, to protect the work area, aircraft, airline personnel, and other assets in the active airfield during construction of this project.

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3.02 INSTALLATION

A. Install barriers and controls to a uniform appearance, structurally sound and adequate for the purpose intended. Barriers must be weighted or sturdily attached to the ground surface to prevent displacement from prop wash, jet blast, wing vortex, or other surface wind currents.

B. Maintain barriers during entire construction period as required for each area.

C. Relocate barriers during entire construction period as required for each area.

D. Cover tranches and holes when not in use. Erect barriers at sharp changes in plane compliance with OSHA Regulations.

3.03 REMOVAL

A. Completely remove barricades when construction has progressed to the point that they are no longer needed, after approval by the OAR.

B. Clean and repair damage caused by installation if any, fill and grade the areas of the site to required elevations and slopes, revegetate, and clean the area. There will be no additional payment associated with this work.

3.04 MEASUREMENT AND PAYMENT

A. This item will not be measured for separate payment but instead all costs associated with the furnishment, installation, maintenance, repair, and removal of temporary barricades including labor, equipment, materials, and incidentals will be considered incidental to other work items of the project.

- END OF SECTION -

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SECTION: 01 56 26

TEMPORARY FENCING

PART 1 – GENERAL

1.01 SUMMARY

A. This section includes the following:

1. Chain-Link Fences: Used for temporary storage, security, job site access, moveable temporary AOA fence (precast base), etc.
2. Gates: Lockable and manually operated.

1.02 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide chain-link fences and gates capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Minimum Post Size and Maximum Spacing for Wind Velocity Pressure: Determine based on mesh size and pattern specified, and on the following minimum design wind pressures and according to CLFMI WLG 2445:
   a. Wind Speed: 80 MPH.
   b. Fence Height: 8 ft minimum fence height.
   c. Line Post Group: ASTM F 1043.
   d. Wind Exposure Category: B
2. Determine minimum post size, group, and section according to ASTM F 1043 for framework up to twelve (12) feet high, and post spacing not to exceed ten (10) feet.

B. Lightning Protection System: Maximum grounding-resistance value of 25 ohms under normal dry conditions.

1.03 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates, if stated in the project requirements.

1. Fence and gate posts, rails, and fittings.
2. Chain-link fabric, reinforcements, and attachments.
3. Gates and hardware.
4. Powered Gates.
5. Accessories: Refer to the Plans.

B. Product Certificates: For each type of chain-link fence and gate, signed by product manufacturer.

1. Strength test results for framing according to ASTM F 1043.

C. Qualification Data: For Installer.

D. Field quality-control test reports.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed chain- link fences and gates similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

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1.05 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work

2.02 FITTINGS

A. General: Comply with ASTM F 626.

B. Post and Line Caps: Provide for each post.

1. Line post caps with loop to receive tension wire or top rail.

C. Rail and Brace Ends: Attach rails securely to each gate, corner, pull, and end post.

D. Finish:

1. Galvanized Steel.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for conditions affecting performance.

3.02 INSTALLATION AND GENERAL

A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.

1. Install fencing on established boundary lines inside the project boundary and/or designated area.

3.03 CHAIN-LINK FENCE INSTALLATION

A. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

B. Post Setting: Set posts to provide a stable and safe upright position.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.

2. Concrete Fill: Place P-610 concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
   a. Exposed Concrete: Extend 2 inches above grade; shape and smooth to shed water.
   b. Concealed Concrete: Set posts below grade as indicated on Drawings to allow covering with surface material.
   c. Posts Set into Concrete in Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, and finished sloped to drain water away from post.

3. Mechanically Driven Posts: Drive into soil to depth of forty-two (42) inches. Protect post top to prevent distortion.

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C. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment as indicated on the drawings.

D. Line Posts: Space line posts uniformly at 8 feet o.c. (on center)

E. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts.

1. Locate horizontal braces at mid-height of fabric six (6) feet or higher, on fences with top rail and at two-thirds (2/3) fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

F. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch diameter hog rings of same material and finish as fabric wire, spaced a maximum of twenty-four (24) inches o.c. Install tension wire in locations indicated before stretching fabric.

1. Top Tension Wire: Install tension wire through post cap loops.
2. Bottom Tension Wire: Install tension wire within six (6) inches (150 mm) of bottom of fabric and tie to each post with not less than same diameter and type of wire.

G. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.

H. Bottom Rails: Install, spanning between posts.

I. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave one (1) inch between finish grade or surface and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

J. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than fifteen (15) inches o.c.

K. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at 1 end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.

1. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.

L. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side.

M. Privacy Slats: Install slats in direction indicated, securely locked in place.

N. Barbed Wire: Install barbed wire uniformly spaced as indicated on Drawings. Pull wire taut and install securely to extension arms and secure to end post or terminal arms.

O. Steel Barbed-Tape Concertina Wire: install concertina wire uniformly spaced as indicated on Drawings. Pull wire taut and install securely to extension arms and secure to end post or terminal arms.

3.04 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-

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resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.05 GATE OPERATOR INSTALLATION

A. General: Install gate operators according to manufacturer's written instructions, aligned and true to fence line and grade.

3.06 MEASUREMENT AND PAYMENT

A. This item will not be measured for separate payment but instead all costs associated with the furnishment, installation, maintenance, repair, and removal of temporary barricades including labor, equipment, materials, and incidentals will be considered incidental to other work items of the project.

- END OF SECTION -

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SECTION: 01 56 40

TREE CONSERVATION PLAN

PART 1 – GENERAL

1.01 SUMMARY

A. The purpose of the Tree Conservation Plan is to establish tree conservation requirements for all tree-disturbing activities. This Section outlines general procedures and requirements for a project to comply with the DFW Tree Conservation Plan (Plan).

1.02 REFERENCES

A. Tree Conservation Plan

B. DFW Approved Plant List

C. ISA Basic Tree Risk Assessment Form and Instructions

D. DFW Development Design Guidelines (DFW DDG)

E. DFW Off-site Planting Locations

F. Tree Conservation Plan Worksheet

1.03 DEFINITIONS

A. Canopy Cover: A measure of the percentage of ground covered by the projection of the tree crowns.

B. Critical Root Zone: The area of soil extending from the trunk to the extension of the essential root mass required for a tree's survival. The CRZ is measured as a circle with a minimum radius of one foot for every inch of DBH.

C. Diameter at Breast Height (DBH): A standard method of measuring the diameter of the trunk or bole of a standing tree.

D. Exempt Species: Trees that are nonnative or may potentially attract hazardous wildlife to the airport property are exempt from protection. Exempt species include chinaberry (Melia azedarach), honey locust (Gleditsia triacanthos), and red mulberry (Morus rubra).

E. Land Use Factor: Percentage of existing tree cover (measured in diameter inches) that must be attained post-construction through preservation and/or planting.

F. Mitigation Planting: Planting that is required if the Tree Review finds the actual Tree Credit value to be insufficient to meet the Tree Requirement. Mitigation planting must adhere to the Replacement Tree guidelines.

G. Preserved Tree: Any protected tree retained for the purpose of meeting the requirements of the Tree Conservation Plan.

H. Preservation Requirement: All projects, except for Roadways and New Utilities, are required to preserve a minimum of 25% existing DBH inches. The Preservation Requirements is calculated by multiplying the existing tree cover (in DBH inches) by 0.25. Roadways and New Utilities do not have a minimum onsite preservation requirement.

I. Project Area: For new facilities, the project area includes the entire lease area and any additional construction support and staging areas. For existing facilities, the project area includes the limits of disturbance for all construction activities, and any additional construction support and staging areas. The project area cannot be increased to help meet tree requirements. EAD has the final authority in identifying the project area boundaries in the event there is a disagreement.

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J. Protected Tree: Any living tree with a DBH of six (6) inches or greater and which is not on the Exempt Tree List. Protected trees are subject to the preservation, protection, and replanting requirements outlined in the Tree Conservation Plan.

K. Replacement Trees: Trees at minimum of four (4) inches that are planted post- construction that allow the project to achieve the required Tree Credit value.

L. Tree Review: Occurs during the Review Phase and is to be conducted after substantial project completion and prior to closing the building permit.

M. Tree Credit: A specific value (DBH inches) that is calculated by adding the protected trees (in DBH inches per tree) and the replacement trees (in inches per tree planted weighted based on the tree size at maturity) of a given project area.

N. Tree Protection Measures: Methods to preserve protected trees during construction, such as the addition of tree protection fencing and the restriction of root pruning and soil grade changes within the CRZ.

O. Tree Protection Fencing: Fencing constructed around the Tree Protection Zone to restrict access. The fencing will be a minimum of four (4) feet high, constructed with durable material (e.g., orange plastic construction fencing), and supported by durable posts (e.g., steel posts or similar).

P. Tree Protection Zone: The designated area that is used for preserving a protected tree or a group of trees, where no activities shall take place. The Tree Protection Zone is delineated using the Critical Root Zone of the protected trees.

Q. Tree Requirement: A specific value that is calculated on a per-project basis that determines how many DBH inches must be maintained through preservation and/or planting for a given project. The Tree Requirement at a given site is determined by multiplying the total DBH of existing trees six (6) DBH inches or larger prior to the start of construction by the Land Use Factor.

R. Tree Survey: A survey of all trees six (6) DBH inches or larger, excluding exempt species across the project area that occurs in the Planning Phase of the Tree Conservation Plan.

S. Utility Right of Way (ROW): Land controlled by a utility through contractual agreements (i.e., license agreements, easements, etc.) to place utility poles, conduits, cables, other structures and equipment, or to provide passage to access such structures and equipment.

1.04 EXEMPTIONS

A. There are several instances where trees equal to or over six (6) inches DBH are exempt from protection and are not counted in the Tree Requirement or Tree Credit values.

1. Any tree that is one of the following exempt species: chinaberry (Melia azedarach), honey locust (Gleditsia triacanthos), and red mulberry (Morus rubra).
2. Any tree with trunk or significant canopy falling within an Air Operations Area (AOA), within twenty (20) feet (609.6 cm) of an AOA fence, or within the Runway Protection Zones (RPZs) is exempt.
3. Any tree within an existing utility right of way is exempt.
4. Any tree that must be removed in a period of emergency (i.e., natural disaster) is exempt.
5. Any tree presenting hazards to personnel, guests, or airport structures, or that otherwise endangers public health and welfare is exempt.
6. Dead trees, those that are significantly diseased, or those in otherwise extremely poor condition are exempt.

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1.05 SUBMITTALS

A. A formal Tree Survey Report shall be completed and submitted to DFW's Environmental Affairs Department (EAD) for review and approval prior to conducting tree-disturbing activities.

B. Within the Design Phase, the Design Team shall develop a plan sheet that meets the Tree Conservation Plan requirements. The plan sheet shall be submitted to EAD for review and approval.

C. Within the Design Phase, the Design Team shall complete the Tree Conservation Plan Worksheet. The worksheet shall be submitted to EAD for review and approval.

D. Within the Review Phase, the Construction Team shall submit As-built drawings. EAD shall evaluate this information alongside the Preservation Requirement, Tree Requirement, and plan sheet to determine compliance. In addition, OAR and the Construction Team shall conduct a Tree Review to gauge compliance and identify any mitigation action.

PART 2 – PRODUCTS

2.01 TREES

A. Trees that are planted onsite, either as replacement trees during the Construction Phase or planted during mitigation, must meet the following requirements:

1. Trees must be planted at a minimum size of four (4) inches.
2. Tree species must be included on DFW's Approved Plant List.
3. Trees must be planted on the project area; or, with approval from DFW, trees may be planted on a DFW designated Off-site Planting Area.

2.02 FENCING

A. Fencing shall be constructed around Tree Protection Zones prior to the start of vegetation-disturbing activities (see Section 3.3.B). Fencing must meet the following requirements:

1. Fencing shall be constructed with durable materials (e.g., orange plastic construction fencing and steel posts).
2. Fencing shall reach a minimum of four (4) feet in height.
3. Fencing shall include, at a minimum, silt fence along the edge of higher elevation in areas that risk soil migration into the Tree Protection Zone.

PART 3 – EXECUTION

3.01 TREE SURVEY REQUIREMENTS

A. A Tree Survey shall be completed for the entire project area. Additions to the project area may require additional Tree Surveys to be completed. The Tree Survey will be used to determine the Preservation Requirement, Tree Requirement, and inform the Design Phase. All data collected in the Tree Survey will be compiled into a Tree Survey Report and submitted to DFW's Environmental Affairs Department (EAD) for approval.

B. Tree Survey

1. The Tree Survey shall identify tree location, CRZ, size in DBH-inches, species, and nativity of all trees with a minimum DBH of six (6) inches or larger in the survey area (protected trees), as well as gather data on existing tree cover. For trees claiming an exemption for showing signs of poor health, an ISA Basic tree Risk Assessment must be completed. All trees are assumed to be healthy unless noted. Exempt species do not need to be included in the Tree Survey. The Tree Survey must be conducted within 24 months prior to the start of construction, or any plan for alterations of airport property with

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the potential to affect tree canopy, and prior to any vegetation disturbance. The Tree Survey shall include trees on the entire project area.

2. Tree Survey Data Requirements: The Tree Survey shall include the following details for all trees with a minimum DBH of six (6) inches or larger in the survey area: size in DBH; location; critical root zone (CRZ); species; and nativity. Condition must only be collected for all trees six (6) inches DBH or larger exhibiting symptoms of diseases or damage.
    a. Tree Size: Diameter at Breast Height (DBH) must be measured on each tree. Breast height is typically measured at 4.5 feet (137.16 cm) above ground level. For trees on slopes, breast height is 4.5 feet above mid-slope of the tree's base. For leaning trunks, the tape is wrapped at 90 degrees to the axis of the lean. Trees with bumps or small branches at 4.5 feet are measured slightly above or below the branch or bump. Trees growing close together or from a common root stock that do not have trunks connected above the ground are considered separate trees. Single trees which split below 4.5 feet are measured at the narrowest point between the split and the ground. Single trees which split above 4.5 feet are measured at 4.5 feet. For forms determined to be two or more trees pressed closely together, the largest trunk is measured. Multi-trunked, also referred to as multi- stem, trees have trunks that are connected above the ground. The diameter of each trunk should be measured at 4.5 feet above ground level. The total DBH is equal to the sum of the diameter of the largest trunk plus one-half the diameter of each additional trunk.
    b. Tree Location: For each protected tree noted to be six (6) or more inches DBH, the location of the trunk shall be logged in GPS and included in tabular format in decimal degrees within the Tree Survey Report. All trees greater than or equal to 6-inch DBH, excluding exempt species, within the project area must be surveyed.
    c. Critical Root Zone: The CRZ of each tree must be calculated in feet and included in tabular format within the Tree Survey Report. The CRZ is measured as a circle with a minimum radius of one foot for every inch of DBH. This radius is measured out from the base of the trunk to create a circle centered around the tree.
    d. Species and Nativity: All trees over six (6) inches DBH must be properly identified by their common and Latin names. Additionally, the nativity of the species shall be noted (native, introduced/non-native, invasive). Tree name and nativity shall be included in tabular format within the Tree Survey Report.
    e. Condition: If a tree of six (6) or more inches DBH is intended to be claimed as exempt from the tree requirement due to condition then an ISA Basic Tree Risk Assessment should be conducted and included in the tree survey report. If a form is not completed during the initial Tree Survey, the tree is presumed to have been healthy at the start of construction. The surveyor shall review the ISA forms to rank each tree risk on a scale from 1 (low risk) through 4 (extreme risk). In the event that a protected tree dies during construction, the condition survey sheets may be referenced to understand the potential cause of death prior to assigning a penalty.
    f. Canopy cover: The percentage of the site covered by tree canopy must be calculated and noted on the Tree Survey Report. Tree-specific canopy cover is not necessary to collect.
3. Individual trees shall be labeled with a unique ID number corresponding to the Tree Survey results. The labels shall be weather-resistant and attached in a manner which does not damage the tree.
4. Surveyor: The Tree Survey shall be performed by qualified personnel. Minimum qualification must be one of the following: International Society of Arboriculture Certified Arborist, Texas Association of Nurserymen member, or a professional with a degree in a

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related field (i.e., forestry, landscape architecture, botany, ecology, environmental science, horticulture) with five years of related field experience.

a. The following pledge shall be included in the Tree Survey Report:
"I _____ , being a landscape architect, certified arborist, certified forester, certified ecologist, or professional with a degree in a related field and the required experience, attest that the identification, size, and location of trees noted on this survey are correct and that all trees six (6) or more inches in diameter at breast height have been shown.
Signature: _____ Date: _____"

5. Deliverable: The Tree Survey shall be summarized in a formal Tree Survey Report. All collected information shall be compiled in a tabular format with each tree identified by a number.

3.02 DESIGN PHASE

A. During the Design Phase, the Design Team shall (1) develop a tree conservation plan that achieves the project's Preservation Requirement and Tree Requirement through preservation and/or planting (2) develop a landscape plan that has sufficient Tree Credit value to meet the landscaping requirements stated in the DFW DDG, and (3) detail the requirements outlined in Section 3.2.B onto a plan sheet. The plan sheet shall be submitted to EAD for review and approval.

B. Plan Sheet:

1. Purpose: The plan sheet is a construction document that outlines the locations and CRZ of the protected trees, impacted trees, and replacement trees in respect to the existing conditions and proposed development. The plan sheet also outlines the tree protection measures that will be used during construction. Prior to its approval, the plan sheet must have a Tree Credit value that meets or exceeds the site's Preservation Requirement and Tree Requirement.

2. The Design Team will take the Tree Survey Report and develop a plan sheet. The following additional details shall be included in the plan sheet:
   a. Location of all existing or proposed structures, including improvements such as streets.
   b. Location of property lines and lot lines.
   c. Date, north arrow, scale, legend.
   d. Existing and proposed site elevations, grades, and major contours.
   e. Locations of existing or proposed utility easements, public access easements, and drainage easements.
   f. Locations of underground and overhead utilities.
   g. Delineated CRZs of protected trees to remain as shown by a □ to scale, protected trees to be removed as shown by a Δ, and replacement tree locations as shown by a □.
   h. Each tree shown on the plan sheet shall be identified by a number that corresponds to a numbered tree on the Tree Survey Report.
   i. Landscape Plan Summary outlining scientific tree name, common tree name, quantity being planted of each species, inches at the time of planting, and the total planting credit per species in inches.
   j. Preservation Requirement (see Section 3.2.D)
   k. Preserved Tree Value (see Section 3.2.E.2.a)
   l. Tree Requirement (see Section 3.2.C).
   m. Tree Credit (see Section 3.2.E).

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n. Tree Protection Measures such as tree protection details and locations (see Section 3.3).
o. Off-site Planting as applicable.

C. Preservation Requirement

1. All projects, except for Roadways and New Utilities, are required to preserve a minimum of 25% existing DBH inches. The preservation requirement is calculated by multiplying the existing tree cover (in DBH inches) by 0.25.
2. Roadways and New Utilities do not have a minimum onsite preservation requirement. Roadways and New Utility projects can achieve the tree requirement through planting alone.

D. Tree Requirement

1. Purpose: The Tree Requirement is a specific value that is calculated on a per-project basis that determines how many DBH inches must be maintained through a combination of preservation and/or planting. It is calculated by multiplying the existing tree cover (in DBH inches) by the Land Use Factor. The Tree Requirement is calculated from the following variables:
   a. The initial protected tree cover within the project area in total inches DBH. This is informed by the Tree Survey.
   b. The Land Use Factor. This is the percentage of initial tree cover that must be onsite post-construction, as dictated by the intended use of the land: Mixed Use Commercial (60% of initial DBH); Office/Corporate (50%); Industrial/Flex (40%); Roadway & New Utilities (40% - no preservation required). If the site does not fall under one of these three land uses, it shall be assigned a Land Use Factor of 60%.
2. The Tree Requirement is calculated in the following manner:
   a. Sum the DBH of all trees within the project site prior to construction that are greater than or equal to six (6) inches DBH (protected trees) to obtain total inches DBH.
   b. Multiply the total DBH of existing protected trees by the Land Use Factor to determine the Tree Requirement.
3. In addition to the overall Tree Requirement, the DFW DDG landscaping requirements must be observed, regardless of Tree Survey results.

E. Tree Credit

1. Purpose: The Tree Credit value is the amount of DBH inches that shall be preserved within the project area and/or planted to replace removed protected trees (trees six (6) or more inches DBH in size), as dictated by the plan sheet.
2. Tree Credit is earned by preserving existing trees and planting new replacement trees. It is calculated for the project site on a per-tree basis in DBH inches. The tree credit is calculated by adding the Preserved Tree Value and the Replacement Tree Value for the project.
   a. Preserved Tree Value: The Preserved Value is the total DBH inches of existing trees to remain on site post-construction. The Preserved Tree Value equals the DBH in inches of the preserved trees. The preserved tree value shall meet the project's Tree Preservation Requirement of 25% on-site DBH preservation. In addition, the preserved tree value will be used in calculating the project's Tree Credit.
   b. Replacement Tree Value: The Replacement Tree Value is a weighted value based on tree size at maturity, with larger trees receiving greater credit. The tree size aligns with the categories assigned in the DFW DDG landscape section. Replacement trees shall be at least 4 inches (101.6 mm) at the time of planting. Large trees are given a

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value at a 2:1 ratio. Medium trees are given a value at a 1.5:1 ratio. Small trees are given a value at a 1:1 ratio. Replacement trees must meet certain requirements to obtain tree credit (see Section 2.1).

Tree Size*	Planting Credit
Large	2:1
Medium	1.5:1
Small	1:1

F. Determination of Compliance

1. The plan sheet is compliant when the Preserved Tree Value meets or exceeds the Preservation Requirement, and the Tree Credit value meets or exceeds Tree Requirement.
2. If the plan sheet is found to be non-compliant at any time during construction and cannot be adjusted to reach compliance, mitigation planting shall be required.

G. Off-Site Planting

1. Purpose: Projects unable to achieve the Tree Requirement through onsite preservation and planting, may conduct off-site planting to meet the Tree Requirement.
2. Trees planted on DFW property but outside the project area may be included in calculating the Replacement Tree Value. Off-site plantings are given the same credit value as trees planted within the project area. Off- site planting requests will be coordinated during the design phase and reflected on the design sheets prior to plan approval.

3.03 CONSTRUCTION PHASE

A. The Construction Phase is conducted by the Construction Team, who is responsible for installing protective fencing and otherwise remaining in compliance with the specifications of the plan. Protective measures must be put in place prior to disturbing vegetation at the site.

B. Installation of Tree Protection Fencing

1. Purpose: Tree Protection Fencing shall be installed around all preserved trees to protect trunks and roots from construction-related damage, and to preserve the understory and forest floor from disturbance.
2. Tree Protective Fencing shall be installed around all protected trees at the perimeter of their CRZs.
3. The fencing shall meet the specifications outlined in Section 2.2.
4. All areas within fencing are established as Tree Protection Zones.
5. The Tree Protection Zone is the designated exclusion area that is used for preserving a protected tree or a group of trees, where construction and equipment use is prohibited.
6. Fencing is not required for trees exempt from protection under Tree Conservation Plan Exemptions (see Section 3.5).
7. Fences shall be installed prior to the start date of planned activities and shall remain in place until construction is complete, and the building permit has closed after which it shall be removed without undue disturbance to Tree Protection Zones.
8. Fallen or slumped fencing must be corrected immediately to prevent death of underlying vegetation and access to Tree Protection Zones.

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9. Tree protection signs notifying workers of the Tree Protection Zones must be posted and maintained on the fencing until construction is complete and the building permit has closed.
10. Prohibitions within Tree Protection Zones:
    a. Personnel shall not access Tree Protection Zones onsite, and no construction activities, parking, or equipment and material storage shall occur. Existing underground utilities may be accessed if necessary. Soil can be added within Tree Protection Zones for landscaping purposes only, not to exceed 6 inches (152.4 mm).
    b. Excavation, paving, and other disturbances shall be prohibited.
    c. Roots shall not be cut.
    d. Soil shall not be regraded.

C. Root Pruning Limitations

1. Purpose: Root damage can significantly affect tree health, and many of these symptoms may take years to manifest. Limiting root pruning is an important factor in preserving tree health.
2. Within the Tree Protection Zone, roots may not be disturbed.
3. Outside of the Tree Protection Zone, use best practices for root pruning:
    a. Avoid severing roots when possible
    b. For roots that must be cut, unearth and cleanly cut with a sharp hand tool (e.g., sharp loppers or handsaw). Make a clean cut that severs the roots perpendicular to the length. Do not be pull or tear roots with excavation equipment

D. Grading Limitations

1. Purpose: Regrading soil can damage roots by either smothering or exposing them, significantly affecting tree health. Root protection is an important factor in preserving tree health.
2. Within the Tree Protection Zone, soil may not be regraded or disturbed in any way. Soil can be added for landscaping purposes, not to exceed six (6) inches.
3. Outside of the Tree Protection Zone, avoid regrading, when possible, as roots outside the CRZ are also subject to damage.

E. Replacement Tree Planting

1. Trees planted in replacement of those removed in order to meet the Tree Requirement are planted in the Construction Phase. Trees must be planted according to specifications in order to obtain Tree Credit (see Section 2.1).

3.04 REVIEW PHASE

A. The Review Phase will be conducted once construction is complete and prior to closing the building permit. During the Review Phase, the Construction Team will submit as-built drawings to EAD. To confirm, OAR and the contractor will walk through the site for the Tree Review to evaluate installation procedures for replacement trees and review protected trees for damage. EAD shall evaluate the documentation and the Tree Review alongside the Tree Requirement and plan sheet to gauge compliance with the Plan and identify any mitigation that shall apply in the form of mitigation planting and additional penalties.

B. Tree Review

1. Purpose: The Tree Review is intended to ensure that constructed conditions match proposed conditions, including assurance that protected trees intended for preservation

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were not removed, killed, or damaged, and that replacement trees of four (4) inches or larger have been planted as planned and have established.

C. Determination of Actual Tree Credit Value

1. The Tree Review and the As-built drawings shall be referenced to identify any differences between the proposed and actual Tree Credit values of the construction project, and to calculate the actual Tree Credit value of the project.
2. Any replacement tree that dies within one year of installation shall be replaced with another tree that complies with the Plan under the existing 1-year DFW DDG landscape warranty.
3. Dead and damaged trees do not count toward the actual Tree Credit value. Trees preserved throughout construction that are found to be dead, damaged, or missing shall incur charges, as assigned by EAD.
4. If the actual Tree Credit value is determined to be insufficient to meet the Tree Requirement, mitigation shall be imposed in the form of mitigation planting (see Section 3.4.D).

D. Mitigation Planting

1. Purpose: In the event that the Tree Review finds the actual Tree Credit value to be insufficient to meet the Tree Requirement, mitigation shall apply in the form of mitigation tree planting.
2. Mitigation shall consist of planting additional trees to amend the Tree Credit Value. Mitigation planting must follow replacement tree requirements (see Section 2.1). As with replacement Tree Credits, Tree Credits earned from mitigation planting are equal to the inches of trees at the time of planting and are weighted based on the tree size at maturity. With approval from DFW, trees planted for mitigation purposes may be placed on another designated Off-site Planting Area on DFW property.

- END OF SECTION -

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SECTION: 01 57 13

TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 – GENERAL

1.01 SUMMARY

A. This Section covers all the temporary erosion controls required by the Contractor during the construction of the Project.

1.02 DEFINITIONS

A. Minimize Pollutant: To reduce or eliminate a pollutant to the extent achievable using storm water controls that are technologically available and economically practicable and achievable based on best industry practices.

1.03 SUBMITTALS

A. All documents that require mailing to the Texas Commission on Environmental Quality (TCEQ) shall be submitted to the OAR for forwarding to EAD to perform the mailing.

B. If the Project is subject to the TPDES Construction General Permit (CGP), the Contractor shall prepare a site-specific Storm Water Pollution Prevention Plan (SWPPP). A copy of the SWPPP, the original Construction Site Notice (CSN), Delegation of Authority Letter, and Notice of Intent (NOI) shall be submitted to the OAR for forwarding to the EAD, prior to obtaining a construction permit and prior to beginning any construction activities.

C. If the Project disturbs less than one (1) acre of soil and is not part of a SWPPP a site-specific Erosion Control Plan (ECP) shall be submitted to the OAR for review and approval of the EAD.

D. Submit copies of ECP and SWPPP Inspection Reports within 48 hours after completing the inspection. Reports are to be signed and certified by the Contractor's Superintendent, or the delegated inspector, and submitted to the OAR.

E. Submit the following close-out documentation to the OAR, prior to demobilizing or when Final Stabilization is achieved whichever comes first.

1. If the Project required an ECP, submit copies of all inspection reports.
2. If the Project required an SWPPP, one copy of the final SWPPP that includes all inspection reports, maintenance records, date tracking records, amendments, and any additional recordkeeping required by the CGP.
3. If the Project required a NOI, a completed, signed Notice of Termination (NOT) of coverage.

1.04 EROSION CONTROL PLANS

A. If the Project disturbs less than one (1) acre of soil and that is not covered under an SWPPP, then the Project must submit a project specific ECP.

B. An ECP template has been prepared by the Owner and is available at 2018 ECP Template FORM.pdf. The Contractor shall complete the ECP template and submit to the OAR for EAD approval prior to obtaining a construction permit.

C. The ECP addresses the following topics:

1. Detailed site description
2. Names of the Contractor and all Subcontractors
3. Sequence of construction activities

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4. Detailed project maps
5. Erosion and sediment controls
6. Good housekeeping controls
7. Potential pollutants
8. Non-storm water discharges
9. BMP maintenance
10. Inspections
11. Certifications
12. The Contractor shall designate the onsite contact person responsible for implementing the ECP with the authority to direct resources towards the maintenance or repair of the storm water management controls and should be readily accessible onsite during work hours.

D. Inspections:

1. The Contractor shall employ and provide a qualified inspector to provide and record inspections of the Project site and all associated areas such as staging area(s) a minimum of once every fourteen (14) Calendar Days and within 24 hours after any storm event of greater than 0.5 inch or an alternate schedule of once (1) every seven (7) Calendar Days on the same day each week.
2. Inspection reports shall include, at a minimum, a summary of the scope of the inspection, name(s) of personnel conducting the inspection, the date of the inspection, a record of failed or damaged BMPs, evidence of pollutants escaping the site, and actions taken.
3. A qualified inspector must meet the requirements of TXR150000. Proof of formal training is preferred, but not mandatory. The Owner reserves the right to reject an inspector as unqualified and may either require proof of formal training or require the inspector to submit to a written exam to prove such knowledge and skills or require appointment of a different inspector.

E. The Contractor shall maintain a copy of the ECP onsite available for review by Federal/State inspectors or the OAR within 24 hours of a review request.

1.05 STORM WATER POLLUTION PREVENTION PLANS

A. The Contractor shall apply for and meet the requirements and provisions of the TPDES CGP, Permit No. TXR150000, under the permitting authority of the TCEQ. A copy of the CGP and other information can be found at the TCEQ website https://www.tceq.texas.gov/permitting/stormwater/construction. The SWPPP shall adhere to the requirements in TXR150000, and include the following statements as required by the local authority having jurisdiction, the Airport. These statements are considered BMPs that the Contractor shall be responsible for implementing on the Project.

1. All trucks carrying erodible materials such as soil, sand, gravel, crushed or broken up concrete, shall use a cover, in functional condition, over the bed of the truck while on the public roads of the Airport.
2. Water from any source accumulating in an excavation that has visual or olfactory evidence of contamination such as a sheen or odor or is at a site within the Voluntary Cleanup Program (VCP) area shall not be released from the Project site or allowed to mix with uncontaminated water and shall be contained, stored and properly disposed of in accordance with the Project's Soil Management Plan and Waste Management Plan.

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3. If high pH is observed by the Owner at an outfall sampling point downstream of the Project, the Contractor will be asked to pH test standing water (rainwater or groundwater) at the Project site prior to pumping or draining off. If the standing water is found to be higher than pH 9.0, it shall not be pumped or drained off as routine storm water discharge as "dewatering" and will be considered a wastewater to be recorded on the Project Waste Management Plan for disposal. Water between pH 9.0 to 11.0 may be disposed through a sanitary sewer line with prior approval from EAD, through the OAR. Water above pH 11.0 shall be disposed of off the Airport through a reputable company as wastewater.
4. The following segments are listed as impaired waters on either the Clean Water Act (CWA) 303(d) list or the Texas Integrated Report of Surface Water Quality for CWA sections 305(b) and 303(d): Segment 0822A (Cottonwood Branch Creek), 0822B (Grapevine Creek) and segment 0841 (Estelle Creek). All segments are impaired waters for bacteria. Caution shall be taken with sources of bacteria, such as portable toilets and exposure of sanitary sewer lines, during construction in order to not contribute bacteria to these water segments. Potential bacteria sources on the Project shall be identified and BMPs incorporated into the SWPPP. All portable toilets shall be located at least 50 feet away from any storm drain inlet and at least 100 feet away from the edge of a surface water.
5. Include a list of all Subcontractors in the SWPPP and require a responsible representative of each Subcontractor sign an acknowledgement certifying they are aware of the SWPPP regulations and shall abide by them for this Project.

B. The Contractor shall implement the SWPPP in its entirety, including but not limited to: posting and maintaining of notices, performing required inspections, BMP installation and maintenance, updating and amending the SWPPP documentation as the Project proceeds, and advise the OAR when the Plans or funds are insufficient to meet or maintain the standards of the CGP.

C. Designate the onsite contact person responsible for implementing the SWPPP. This person must have the authority to direct resources towards the maintenance or repair of the storm water management controls and should be readily accessible onsite during work hours.

D. Inspections:

1. The Contractor shall employ and provide a qualified inspector to provide and record inspections of the Project site and all associated areas including staging area(s) a minimum of once (1) every fourteen (14) Calendar Days and within 24 hours after any storm event of greater than 0.5 inch, or an alternate schedule of once (1) every seven (7) Calendar Days on the same day each week.
2. Inspection reports shall include, at a minimum, a summary of the scope of the inspection, name(s) of personnel conducting the inspection, the date of the inspection, a record of failed or damaged BMPs, evidence of pollutants escaping the site, and actions taken.
3. A qualified inspector must meet the requirements of TXR150000. Proof of formal training is preferred, but not mandatory. The Owner reserves the right to reject an inspector as unqualified and may either require proof of formal training or require the inspector to submit to a written exam to prove such knowledge and skills or require appointment of a different inspector.

E. The Contractor shall maintain a copy of the SWPPP onsite available for review by Federal, State or the OAR within 24 hours of a review request.

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PART 2 – PRODUCTS

2.01 MATERIALS

A. Do not use silt fence or silt fabric as an erosion and sediment control BMP within the Airport Operations Area (AOA) without prior approval from Airport Operations

B. Do not use hay bales as an erosion and sediment control BMP on the Project.

C. Do not use straw waddles or other flow blocking devices at active street curb inlets.

PART 3 – EXECUTION

3.01 GENERAL

A. The Contractor shall:

1. Prevent water pollution associated with the construction activity from entering any surface water, drainage device, or adjacent property.
   a. Immediately capture and remove any sediment that escapes from the Project site. The Contractor shall be responsible for documenting any pre-existing accumulated sediment or debris.
2. Install and maintain all BMPs and structural controls in accordance with the NCTCOG iSWM program and any additional manuals approved by the EAD, through the OAR.
3. Immediately correct ineffective control measures and implement new or additional controls as directed by the OAR.
4. Plan and conduct all land disturbing activities to minimize the area to be exposed at any one time, and to minimize the time of exposure.
5. Protect materials from rain exposure by:
   a. Provide protected storage areas for paints, chemicals, solvents, fertilizers, and other potential pollutants.
   b. Store containers on a raised surface.
   c. Cover erodible materials with a tarp or plastic.
6. The Contractor shall dispose of spilled materials in accordance with EPA and Texas Commission on Environmental Quality (TCEQ) regulations and any other applicable federal, state or local laws, rules or regulations. In connection with such disposals, the Contractor shall use only those transporters and disposal facilities that are approved in advance in writing by the Owner. A copy of all transport manifests for the spilled materials shall be obtained and retained in the Contractor's records for reference purposes, to be provide upon request of the Owner or any governmental regulatory agency with jurisdiction over the matter. The cost of collection, containment and disposal of spilled materials shall be the responsibility of the Contractor.
7. Properly contain and dispose of wastewater, such as concrete truck washout, wash water for cleaning paint tools, and curing compounds.
8. Cover all trucks or trailers hauling an erodible material such as soil, gravel, small rock or sand with a tarp while on the public roads of the Airport.
9. Tracking
   a. Prevent off-site tracking by installing and maintaining a construction exit.
10. Dust Control
    a. Maintain dust control in all areas impacted by construction via water application or additional methods as approved by the OAR.
    b. Do not apply water to the point that causes flooding, erosion or pollution.

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3.02 SEQUENCING AND SCHEDULING

A. Prior to ground disturbing activities, the Contractor shall perform the following:

1. The ECP or SWPPP must have been approved by the EAD.
2. Submit NOI to the OAR for forwarding to TCEQ (if applicable), and coordinate submission of the NOI and payment of filing fees with the EAD, through the OAR.
3. Post the CSN at the Project site (if applicable)
4. Provide a hardcopy of the ECP or SWPPP at the Project site
5. All storm water management controls for the initial phase of construction shall be installed and inspected by a qualified storm water inspector.

3.03 MAINTENANCE

A. General

1. Maintain all erosion, sediment, and pollutant control measures in effective operating condition throughout the Project until Final Acceptance.
2. The EAD will inspect the project for environmental compliance and any deficiencies, including installation and maintenance of storm water controls, shall be corrected in the time indicated.
3. If the Contractor fails to correct the deficiencies to the satisfaction of the EAD, the Owner may separately contract a crew to perform the necessary maintenance, and the cost will be deducted from Contract Amount.

B. Construction Exit

1. Maintain construction entrance/exits in a condition which will prevent the tracking of sediment onto any paved surface.
2. For stone exits, periodically re-grade and top with additional stone to maintain efficiency in removal of tracked materials.

C. Perimeter Control

1. Inspect the perimeter of the Project site regularly and remove sediment before it reaches half the height of the control.
2. Ensure perimeter BMPs are properly embedded or toed-in and repair any under-cutting the BMP.

D. Check Dam

1. When a check dam is required for erosion control on the Project, the Contractor shall provide the check dam meeting the following requirements:
   a. The top of the ends of the check dam shall be a minimum of twelve (12) inches higher than the middle of the dam, unless otherwise directed by the OAR.
   b. The check dam shall be embedded a minimum of eighteen (18) inches into the side of the drainage ditch, swale, or channel to minimize the potential for flows to erode around the side of the check dam.
   c. The check dam shall be inspected regularly, and sediment removed when it reaches approximately one-third the height of the check dam or twelve (12) inches, whichever is less.

E. Inlet Protection

1. When inlet protection is required for erosion control on the Project, the Contractor shall provide the inlet protection meeting the following requirements:

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a. Inspect the inlet protection regularly for damage.
b. Remove any blockage from the inlet or inlet protection after every storm event.
c. Clean and/or replace the inlet protection when clogged with sediment, to ensure effectiveness.
d. Remove sediment from the inlet protection before it reaches approximately 50 percent of the design height or volume of the inlet protection.

3.04 CLOSE OUT

A. Prior to close-out of the construction permit, the EAD, through the OAR, must approve the Final Stabilization, or the transfer of responsibility for the SWPPP or ECP to another contractor.

1. The Contractor shall request an inspection to determine if the Final Stabilization meeting the CGP definition has been accomplished.
2. If the EAD determines Final Stabilization has been accomplished, the Contractor shall submit, through the OAR, the following
   a. The NOT, as applicable, shall be submitted to the OAR for forwarding to TCEQ after approval from EAD.
   b. All Project inspection reports.
   c. All amendments incorporated into the SWPPP or ECP during construction.
   d. Additional recordkeeping as required by the CGP, as applicable.

B. The Contractor shall remove all materials, wastes, and temporary BMPs from the Project site including any accumulated sediment issues identified by the OAR.

C. The Contractor shall fully resolve any issue of non-compliance or violation brought by a Federal or State agency.

D. The Contractor shall have completed all submittals and received approvals required for closeout.

- END OF SECTION -

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SECTION: 01 57 19

SPILL PREVENTION CONTROL AND COUNTERMEASURE

PART 1 – GENERAL

1.01 SUMMARY

A. This Section requires the Contractor to provide design and construction information for all oil products temporarily or permanently stored on the Airport. It identifies when a spill prevention control and countermeasure (SPCC) plan is required, and what information is required to update the existing Owner‘s SPCC.

1.02 RELATED REQUIREMENTS

A. Section 01 33 29.06.01, Contaminated Media Management Plan

B. Section 01 57 19.13, Spill Response Plan

1.03 SUBMITTALS

A. The Contractor shall submit the following to the Owner’s Authorized Representative (OAR) for review and approval:

1. A Project site specific SPCC plan.
2. An inventory of all permanent oil containers installed or removed on Airport property.

1.04 DEFINITIONS

A. Oil: Oil in any kind or in any form, including but not limited to fats, oils; greases of animal, fish or marine mammal origin; vegetable oils, including oils from seeds, nuts, fruits or kernels; and other oils and greases, including petroleum, fuel oil, sludge, synthetic oils, mineral oils, oil refuse, or oil mixed with wastes other than dredged spoil. Typical petroleum fuels are gasoline, diesel, and jet fuel.

B. Container: Any container used to store oil. These containers are used for purposes including, but not limited to, the storage of oil prior to use, while being used, or prior to further distribution in commerce. Oil-filled electrical, operating, or manufacturing equipment is not a bulk storage container.

1.05 TEMPORARY OIL STORAGE

A. If during the construction of the Project, oil products will be temporarily transported on the Project site, the Contractor shall consider the following requirements:

1. If oil or oil products will be stored in above ground storage containers of 55-gallon size or more with a total onsite storage capacity of 1320 gallons or more during the Project, the Contractor must prepare a SPCC plan.
2. Prior to construction permit approval, the Contractor shall submit to the OAR for the Airport Environmental Affairs Department (EAD) review and approval, construction site specific SPCC plan. The site-specific plan shall meet the requirements of Code of Federal Regulations (CFR) Title 40, Part 112, and include at a minimum:
   a. An inventory of all oil storage containers on the Project site.
   b. The total capacity of each storage container.
   c. Type of material stored in each storage container.
   d. Design information on secondary containment or diversionary methods utilized in order to prevent release of the materials stored in the containers.
3. The Contractor shall monitor increases or decreases in total oil container capacity throughout the Project.

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a. If the total onsite oil container volumes change, or the type of materials change, the Contractor shall amend the site specific SPCC plan and resubmit to the OAR.
b. If the total capacity of onsite oil containers drops below 1320 gallons before the Project closeout, the site specific SPCC plan may be discontinued. The Contractor shall notify the OAR in writing of the changes and obtain written approval from the EAD, through the OAR, to discontinue the site-specific SPCC plan.

4. At the Substantial Completion of the Project, or when otherwise approved by the OAR, the Contractor shall remove all stored materials and clean/correct any spotting or evidence of spills created by the stored materials. Spill removal shall comply with the requirements in Section 01 57 19.13 - Spill Response Plan and Section 01 33 29.06.01 - Contaminated Media Management Plan.

1.06 PERMANENT OIL CONTAINERS

A. If during construction of the Project, permanent oil containers are installed or removed from the Project site, the Contractor shall consider the following requirements:

1. An inventory of permanent oil containers installed or removed shall be submitted to the OAR for the EAD review. The submitted inventory shall include:
   a. The capacity of each storage container added or removed
   b. The type of materials to be stored in each container
   c. Description of the secondary containment or diversionary methods utilized by storage container.
2. The inventory shall be submitted with the environmental close-out checklist prior to Project closeout.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

- END OF SECTION -

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SECTION: 01 57 19.13

SPILL RESPONSE PLAN

PART 1 – GENERAL

1.01 SUMMARY

A. This Section provides the minimum procedures to prevent, prepare for, notify, and respond to any spills during the Project when it involves fuels, oils, paints, chemicals, regulated substances, or other hazardous materials.

1.02 DEFINITIONS

A. Oil or Oil Products: Oil in any kind or in any form, including but not limited to: fats, oils; greases of animal, fish or marine mammal origin; vegetable oils, including oils from seeds, nuts, fruits or kernels; and other oils and greases, including petroleum, fuel oil, sludge, synthetic oils, mineral oils, oil refuse, or oil mixed with wastes other than dredged spoil.

B. Oil Spills: Quantities that may be harmful to public health. These include the following types of discharges:

1. Violate applicable water quality standards.
2. Cause film or “sheen” upon, or discoloration of the surface of the water or adjoining shorelines.
3. Cause a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines.

C. Spill: Any release or discharge from designated/designed containers. Includes, but is not limited to, spilling, leaking, pumping, pouring, emitting, emptying, or dumping of fuels, oils, hazardous materials, air pollutants and/or hazardous waste unless the emission is covered by an applicable permit.

1.03 SUBMITTALS

A. The Contractor shall submit to the Owner’s Authorized Representative (OAR) the following:

1. A Spill Response Plan (SRP) to be reviewed and approved by the Airport Environmental Affairs Department (EAD) prior to obtaining a building permit.
2. For spills exceeding the reportable quantity for the material, submit a report with the information identified in subsection 3.01(C) within 48 hours of the event.
3. For spills exceeding the reportable quantity for the material, submit a written report with the information identified in subsection 3.02(B) within 25 Calendar Days of the event.

1.04 SPILL RESPONSE PLAN

A. The Spill Response Plan form can be located at:

SPILL RESPONSE PLAN (SRP)

B. An SRP shall be provided when the construction of the Project requires the use or storage of fuels, oils, paints, chemicals, and any other material in quantities that may pose a threat to human health or the environment.

C. The Contractor shall review the SRP on a regular basis, and update when any of the following occurs:

1. Applicable regulations are revised.
2. The SRP fails in an emergency.

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3. The Project site changes in design, construction, operation, maintenance or other circumstances that materially increase potential for fires, explosions, release of hazardous waste or hazardous waste constituents, or changes response necessary in an emergency.
4. Change in list of emergency coordinators.
5. Change in list of emergency equipment.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 SPILL EVENTS

A. The Contractor shall report all spills immediately by phone to Airport Integrated Operations Center (IOC) at 972-973-3112 and activate the SRP immediately upon discovery of a spill event.
   1. The name, address, and telephone number of the person reporting and the responsible person.
   2. The date, time, and location of the spill or discharge.
   3. A specific description of the material discharged or spilled.
   4. An estimate of the quantity discharged or spilled.
   5. The duration of the incident.
   6. The name of the surface water or a description of the waters affected or threatened by the discharge or spill.
   7. The source of the discharge or spill.
   8. A description of the extent of actual or potential water pollution or harmful impacts to the environment and an identification of any environmentally sensitive areas or natural resources at risk.
   9. Any known or anticipated health risks.
   10. The identity of any governmental representative responding to the discharge or spill.
   11. Any other information that may be significant to the response action.
B. Manage all waste in accordance with Section 01 74 19, Construction Waste.
C. All Contractor caused spills shall be cleaned at Contractor's sole expense.

3.02 POST SPILL ACTIVITIES

A. EAD will determine adequacy of the Contractor's cleanup activities. If the Contractor fails to cleanup spill to the satisfaction of the EAD, the Owner will separately contract a response crew to clean up the spill and the cost will be deducted from Contract Amount.
B. For spills that exceed the reportable quantity for that material, the Contractor shall provide a written report to the OAR within 25 Calendar Days of the event. The written report shall include the following:
   1. A statement that the discharge or spill response action has been completed.
   2. A description of how the response action was conducted.
   3. Additional information as requested by the Owner.

- END OF SECTION -

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SECTION: 01 57 19.13.01

SPILL RESPONSE PLAN FORM

Project Name: _____

Permit Number: _____

General Contractors Name: _____

Site Superintendent's Name and phone number:

_____

Start Date: _____ **End Date:** _____

Below is the general procedure to follow in the event of a spill or loss of product that results in an impact or potential impact to soil, surface water, groundwater or sanitary sewer system.

Notifications:

- 911 (if immediate danger to life or health)
- Airport Integrated Operations Center (IOC) at (972) 973-3112 for all spills no matter what the quantity.
- Environmental Emergency Response Contractor (if necessary).
- For Tenant spills that exceed the reportable quantity contact the Texas Commission on Environmental Quality (TCEQ) at 800-832-8224 and the National Response Center (NRC) at 800-424-8802.
- For Project spills that exceed the reportable quantity contact the Airport Environmental Affairs Department (EAD). The EAD will notify the TCEQ and NRC.
- Construction Manager (CM), and tenant coordinator, as applicable.

Cleanup:

- Impacted media shall be picked up and stored in a waterproof and leak proof container or placed on plastic sheeting and securely covered with plastic sheeting until disposal is arranged.
- The Superintendent or Emergency Response Coordinator will work with EAD and CM to determine the appropriate sampling and disposal protocols for handling impacted media.

Follow-up:

- Within 48 hours of a reportable spill, send a written report to the CM and the EAD describing the cause of the release, the total quantity of material discharged, description of the Corrective Action taken or still in progress to be completed, notifications made, and plans for preventing recurrence.
- Complete any follow-up reports required by the TCEQ or NRC within the allowable time frames and provide copies of all reports to the CM and the EAD.

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Project Description:

_____

_____

_____

_____

List of Spillable Materials on Project site: (including fluids from heavy equipment, applied materials such as paint, stored chemicals, adhesives, granular materials, admixes)

Material (i.e., diesel fuel, paint, hydraulic fluid)	Estimated quantity	Storage location (Where is it stored? i.e., excavator, drum, 5-gallon bucket)

Fueling:

Will fueling of vehicles or equipment be done on site? If yes, describe method

_____

Preparedness:

What spill response equipment and supplies will be maintained on site?

_____

_____

Prepared by:

_____
Printed Name

_____
Signature

_____
Company

_____
Date

- END OF SECTION -

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SECTION: 01 66 00

PRODUCT STORAGE AND HANDLING REQUIREMENTS

PART 1 – GENERAL

1.01 SUMMARY

A. This Section covers the requirements for the storage, protection, and maintenance of construction materials and storage areas on the Project.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 STORAGE AND GENERAL

A. The Contractor shall provide for the storage of construction materials and products for the Work of the Project in accordance with the following:

1. Store products, immediately upon delivery at a location approved by the Owner's Authorized Representative (OAR), in accordance with manufacturer's instructions, with seals and labels intact. Protect such products until in final installed condition. Material shall not be stored on the ramp or in operational terminal areas.
2. Arrange storage in a manner to provide access for maintenance of stored items and for inspection.
3. Inspect stored products frequently to ensure that the products are maintained in acceptable conditions.
4. Replace any products determined to be damaged upon delivery or damaged while in storage. A Contract Time extension will not be granted for re-ordering of the damaged products.
5. Provide access to the OAR for progress payment verification and approval purposes.
6. Arrange for ordering and storing approved long lead items.
7. Provide bonded off-site storage and protection when the Project site does not permit on-site storage or protection.

3.02 ENCLOSED STORAGE

A. The Contractor shall provide adequate enclosed product storage on the Project site meeting the following requirements:

1. Store products, subject to damage by the elements, in substantial weather-tight enclosures.
2. Maintain temperature, humidity, and ventilation as required by the manufacturer's instructions.
3. Store unpacked and loose products on shelves, in bins, or in neat groups of like items.

3.03 EXTERIOR STORAGE

A. The Contractor shall provide exterior storage on the Project site meeting the following requirements:

1. Provide substantial platforms, blocking, or skids, to support fabricated products above ground; slope to provide drainage. Protect products from rusting, disfigurement, soiling, staining and damage.

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2. Cover products subject to deterioration from exposure to the elements with impervious sheet materials and provide adequate ventilation to avoid condensation.
3. Store loose granular materials on clean, solid surfaces such as pavement, or on rigid sheet materials, to prevent mixing with foreign matter.
4. Provide positive surface drainage to prevent erosion and ponding of water.
5. Prevent mixing of refuse or chemically injurious materials or liquids.
6. Do not stockpile materials higher than thirty (30) feet unless shown otherwise in the Plans or as directed by the OAR.

3.04 MAINTENANCE OF EQUIPMENT STORAGE

A. The Contractor shall protect and maintain mechanical and electrical equipment in storage throughout the Project including, but not limited to, the following:
   1. Provide the supplier's service instructions on the exterior of the package.
   2. Provide power to and energize space heaters for all equipment for which these devices are provided.

- END OF SECTION -

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SECTION: 01 71 13

MOBILIZATION

PART 1 – GENERAL

1.01 SUMMARY

A. This section includes the following:

1. Mobilization of equipment, personnel, material, supplies, tools, and all other resources necessary prior to beginning the Work.
2. Establishment of temporary facilities and all other facilities necessary prior to beginning the Work.
3. When a staging area is required in the Plans, the Contractor shall abide by the Land Use Requirements - Forms provided in Section 01 71 14.01.

1.02 RELATED SECTIONS

A. 01 22 00, Measurement and Payment

B. 01 71 14.01, Land Use Requirements – Application Procedures

C. 01 74 23, Final Cleaning

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 PROJECT EXECUTION

A. The Mobilization fee shall not exceed eight percent (8%) of the total Base Bid Contract Amount. Should the total amount entered in the bid for mobilization exceed eight percent (8%) of the total Base Bid Amount, the bid shall be deemed non-responsive.

B. The Contractor shall complete all required coordination and forms, submit permits and insurance certificates prior to beginning any construction activity.

C. The Contractor may complete all required temporary facilities as outlined in the Division 01 Sections prior to other construction activities and complete the move-in process after the Land Use Application has been completed and approved.

D. The Contractor shall coordinate with the Owner's Authorized Representative (OAR) to establish the Project submittals procedures, Baseline Schedule and payment procedures.

3.02 FINAL CLEANUP

A. Complete clean up in accordance with Section 01 74 23, Final Cleaning and submit all required final documentation prior to move-out.

3.03 MEASUREMENT AND PAYMENT

A. Measurement

1. Measurement of the item "Mobilization" will be by the "Lump Sum," as the Work progresses as specified in the Contract. See reference specification Section 01 22 00, Measurement and Payment.

B. Payment:

1. When one percent (1%) of the Contract Amount has been earned by the Contractor, fifty percent (50%) of the Mobilization Pay Item or five percent (5%) of the total Contract

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Amount, whichever is less, will be paid. Previous payments under this item will be deducted from this amount.

2. When five percent (5%) of the Contract Amount has been earned, seventy five percent (75%) of the Mobilization Pay Item, or ten percent (10%) of the total Contract Amount, whichever is less will be paid. Previous payments under this item will be deducted from this amount.
3. When ten percent (10%) of the Contract Amount is earned, ninety percent (90%) of the Mobilization Pay Item or fifteen percent (15%) of the total Contract Amount, whichever is less, will be paid. Previous payments under this item will be deducted from this amount.
4. Upon completion of all Work under this Contract, payment for remainder of the Mobilization Pay Item will be paid.

C. Project Specific Pay Item Payment Procedures Requirements:

1. To be defined within each contract by the OAR/DOR on a project specific basis. Section 01 22 00 – Measurement and Payment shall align with the Schedule of Values (SOV) and each Pay Item shall be listed accordingly. Refer to Section 01 22 00 for specific requirements and detailed payment procedures applicable to this section.

- END OF SECTION -

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SECTION: 01 71 14

LAND USE REQUIREMENTS

PART 1 – GENERAL

1.01 SUMMARY

A. Provide a temporary staging area for the Contractor for the Project in accordance with Section 01 55 29, Staging Areas.

B. The Owner's Authorized Representative (OAR) shall confirm the Project requires a staging area and is stated in the Contract.

C. The OAR shall be responsible for enforcement of any compliance issues that may occur on the site of the staging area and trailer lot.

1.02 RELATED REQUIREMENTS

A. Section 01 22 00, Measurement and Payment

B. Section 01 55 29, Staging Areas

C. Section 01 57 13, Temporary Erosion and Sediment Control

D. Section 01 71 14.01, Land Use Requirements – Application Procedures

1.03 SUBMITTALS

A. The Contractor shall submit a Land Use Application to the OAR for the Land Use Committee (LUC) within seven (7) Calendar Days of the Notice to Proceed (NTP). The Land Use, Staging Yard, and Trailer Application forms and procedures are provided in Section 01 71 14.01.

B. Site Plan: If the staging area(s) are not designated in the Contract Documents, the Contractor shall coordinate with the Airport Environmental Affairs Department (EAD), through the OAR, and submit to the OAR a proposed site plan in accordance with Section 01 55 29. The LUC shall review the site plan. There is a mandatory ten (10) Calendar Day review process by the LUC.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 STAGING AREA

A. The Contractor shall provide signage at the entrance to the staging area in accordance with Section 01 55 29.

B. The Contractor shall implement erosion control measures in accordance with Section 01 57 13, Temporary Erosion and Sediment Control.

C. Obtain written approval of separate and distinct storage areas, including employee parking, from the OAR and EAD if areas are not designated in the Contract Documents.

3.02 CLOSURE

A. A Final Stabilization inspection and a fire and safety inspection shall be required in accordance with the Section 01 55 29 prior to approval for a Construction Permit Closure.

- END OF SECTION -

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SECTION: 01 71 14.01

LAND USE REQUIREMENTS – APPLICATION PROCEDURES

All Land Use Applications require an Airport permit number

- Permits can be acquired at dfwsubmittals@dfwairport.com
- For Permit questions, contact the Airport Permit Coordinator

Airport In-House Board Projects:

For all Airport projects, the below procedures are required for all Land Use Application submittals.

- Contact the Airport Land Use Manager for an application.
- DFW Project Manager to verify if an FAA Form 7460-1 – Notice of Proposed Construction or Alteration is required for this staging area operation. The form can be found at the following:

  Notice of Proposed Construction or Alteration
- When a Form 7460-1 is required, FAA requires 45 Calendar Days to be completed, before a receipt of a determination letter from the FAA.
- The Contract must state that the Airport will provide a staging area and or a trailer lot area.
- DFW Project Manager must verify and signs your application.
- Complete application for either staging area or trailer lot.
- Provide exhibit of location wanted for staging area. (PDF Google Earth)
- Provide exhibit of location of your project. (PDF Google Earth)
- Applications will be reviewed for approval by the Land Use Committee.
- AOA gate access and preferred vehicle route to and from the staging area will be stated in an authorization letter.
- Review of application may take up to ten (10) Working Days.
- When approved, an authorization letter will be sent to the Contractor.
- Land Use Application are valid for up to twelve (12) months. Contractor will need to reapply for a Land Use Application for projects longer than 12 months.

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Staging Area Application Procedure

Contractor Land Use Application for Staging Area
Version Date: September 2018
Permit No:

A. To be completed by Contractor:

1. Airport Contract Number and Construction Application Number.

Contract# Click here to enter text. *(9500xxx)* CA# Click here to enter text. *(Also known as permit number)*

2. Contractor's company name and contact information (include subcontractors if applicable).

Provide all company names, mailing addresses, phone numbers, and e-mail addresses.
Click here to enter text.

3. Location and description of staging area.

Include address of the Project site, summary of scope of work and add a pdf from Google Earth of staging area location.
Click here to enter text.

4. List all materials to be stored in the staging area.

Examples: rigid metal conduit, rebar, lumber, etc.
Only materials and products related to the specific contract may be stored inside the area.
Click here to enter text.

5. Vehicles and type of equipment to be stored at the staging area.

Examples: light trucks, back-hoes, air compressors, concrete hoppers, etc.
Click here to enter text.

6. Chemicals/fuel to be stored and quantities.

Examples: curing compounds, paint, paint thinner, chemical toilets, etc.
Note whether chemicals are to be stored indoors or outdoors.
Click here to enter text.

7. List of any work or maintenance to be performed in the staging area.

Examples: equipment servicing, vehicular maintenance, fueling, etc.
Note that only maintenance identified in this application may be performed in the area.

Click here to enter text.

8. Dimensions and location of area requested.

Include address of requested location, approximate calculated area, and distance from project location.
(Field may be completed for you in advance.)
Ex: East Airfield Drive - LOT 43; Image attached
Click here to enter text.

9. Land Use Application Supplemental for Staging Areas.

Representative has read and understands supplement and agrees to abide by the document.
(State that you understand and agree.)
Click here to enter text.

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10. Contract start and expiration dates. (Maximum of up to 12 months period only)

Start Date: Click here to enter a date. Expiration Date: Click here to enter a date.
Notice To Proceed Date *Final Completion Date*

Contractor Representative:

Signature: **Date:**

Representative should be an officer in the company with direct oversight of the work.

Print Name: _____

B. To be completed by your Owner's Authorized Representative:

1. Occupancy term.

Start Date: Click here to enter a date. End Date: Click here to enter a date.
First date land use is required *Last date land use is required*

2. Contract requirements regarding area set up.

Cite the specified requirements included in the contract regarding land use.
Ex: Perimeter fencing, site stabilization, erosion control measures, construction entrance, wheel wash stations, etc.
Click here to enter text.

3. Contract requirements regarding area condition for Contract Close-Out

Cite the specified requirements in the contract for the final condition of the area at Final Completion of the work.

Ex: Removal of perimeter fences, removal of structural erosion control measures,

removal of construction entrance, establishment of perennial grass coverage, etc.
Condition of Area:
Click here to enter text.

Owner's Authorized Representative:

Signature: **Date:**

Print Name: _____

Directions for submission of application:

A. Complete the following applications:
1) General Application
Contact the Airport Land Use Manager with any questions.
2) Erosion Control Plan
Contact the Airport EAD with any questions.
3) Spill Response Plan
Contact the Airport EAD with any questions.

B. Submit all 3 applications to the Airport Land Use Manager.

C. Allow 2-3 weeks for Letter of Authorization to be issued.

Part III - Technical Specification Book V4.3

Trailer Application Procedure

Contractor Land Use Application for Trailer Lot
Version Date: September 2018
Permit No:

A. To be completed by Contractor:

1. Airport Contract Number and Construction Application Number.

   Contract # Click here to enter text. *(9500xxx)* CA# Click here to enter text. *(Also known as permit number)*

2. Contractor's company name and contact information (include subcontractors if applicable).

   Provide all company names, mailing addresses, phone numbers, and e-mail addresses.
   Click here to enter text.

3. Location and description of trailer lot.

   Include address of the Project site, summary of scope of work and add a pdf from Google Earth of trailer location.
   Click here to enter text.

4. List all materials to be stored in the trailer lot area.

   Examples: rigid metal conduit, rebar, lumber, etc.
   Only materials and products related to the specific contract may be stored inside the area.
   Click here to enter text.

5. Vehicles and type of equipment to be stored at the trailer lot.

   Examples: light trucks, back-hoes, air compressors, concrete hoppers, etc.
   Click here to enter text.

6. Chemicals/fuel to be stored and quantities.

   Examples: curing compounds, paint, paint thinner, chemical toilets, etc.
   Note whether chemicals are to be stored indoors or outdoors.
   Click here to enter text.

7. List of any work or maintenance to be performed in the trailer lot.

   Examples: equipment servicing, vehicular maintenance, fueling, etc.
   Note that only maintenance identified in this application may be performed in the area.
   Click here to enter text.

8. Dimensions and location of area requested.

   Include address of requested location, approximate calculated area, and distance from project location.
   (Field may be completed for you in advance.)
   Ex: East Airfield Drive - LOT 43; Image attached
   Click here to enter text.

9. Land Use Application Supplemental and Trailer Requirements.

   Representative has read and understands supplement and agrees to abide by the document.
   (State that you understand and agree.)

   Click here to enter text.

10. Contract start and expiration dates. (Maximum of up to 12 months period only)

    Start Date: Click here to enter a date. Expiration Date: Click here to enter a date.

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Notice To Proceed Date *Final Completion Date*

Contractor Representative:

Signature: **Date:**

Representative should be an officer in the company with direct oversight of the work.

Print Name:

B. To be completed by your Owner's Authorized Representative:

1. Occupancy term.

Start Date: Click here to enter a date. End Date: Click here to enter a date.
First date land use is required *Last date land use is required*

2. Contract requirements regarding area set up.

Cite the specified requirements included in the contract regarding land use.
Ex: Perimeter fencing, site stabilization, erosion control measures, construction entrance, wheel wash stations, etc.
Click here to enter text.

3. Contract requirements regarding area condition for Contract Close-Out

Cite the specified requirements in the contract for the final condition of the area at Final Completion of the work.
Ex: Removal of perimeter fences, removal of structural erosion control measures,

removal of construction entrance, establishment of perennial grass coverage, etc.
Condition of Area:
Click here to enter text.

Owner's Authorized Representative:

Signature:Date:

Print Name:

Directions for submission of application:

A. Complete the following applications:
1) General Application
Contact the Airport Land Use Manager with any questions.
2) Erosion Control Plan
Contact the Airport EAD with any questions.
3) Spill Response Plan
Contact the Airport EAD with any questions.

B. Submit all 3 applications to Airport Land Use Manager.

C. Allow 2-3 weeks for Letter of Authorization to be issued.

- END OF SECTION -

Part III – Technical Specification Book V4.3

SECTION: 01 73 29

CUTTING AND PATCHING

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes the requirements and limitations of cutting and patching as part of the Work.

1.02 RELATED REQUIREMENTS

A. Section 01 11 00, Summary of Work

B. Section 01 50 00, Temporary Facilities and Controls

1.03 DESCRIPTION OF REQUIREMENTS

A. Coordinate the patching of surfaces and finishes in areas where existing items are removed. Drilling the work to install fasteners and similar operations are excluded from the definition of cutting-and-patching.

B. Adhere to all safety precautions as outlined in Section 01 11 00, Summary of Work.

C. Refer to other sections of these specifications for specific cutting-and-patching requirements and limitations applicable to individual units of work.

1.04 SUBMITTALS

A. Submit a written request to Owner's Authorized Representative (OAR) in advance of executing cutting or alteration, other than required by Contract Documents, which affects:

1. Work of Owner or other Contractors.
2. Structural value or integrity of any element of Project.
3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
4. Efficiency, operational life, maintenance or safety of operational elements.
5. Visual qualities of sight-exposed elements.

B. Request shall include:

1. Identification of Project.
2. Location and description of the affected Work.
3. Necessity for cutting alteration or excavation.
4. Effect on any work of the Owner or other Contractors, or on structural or weatherproof integrity of Project.
5. Description of proposed Work:
   a. Scope of cutting, patching, alteration, or excavation.
   b. Trades who will execute work.
   c. Products proposed to be used.
   d. Extent of refinishing to be done.
   e. Cost proposal when applicable.
6. Alternatives to cutting and patching.
7. Written confirmation from manufacturer or installer of existing affected work that cutting and patching work will not void warranty.

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C. Submit a request for Substitution should conditions of Work or schedule indicate change of products from original installation is necessary.

D. Submit written notice to the OAR designating date and time the work will be uncovered or altered.

1.05 COORDINATION

A. Coordinate the cutting and patching work with manufacturer and installer of warranted materials, products or systems to avoid voiding warranty where warranties are in force for the existing work.

1.06 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut-and-patch structural work in a manner resulting in a reduction of load-carrying capacity or load/deflection ratio.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Provide materials for cutting-and-patching which will result in equal-or-better work than the work being cut-and-patched, in terms of performance characteristics and including visual effect where applicable. Comply with the requirements of the Contract Documents and use materials comparable with the original materials and where recognized that satisfactory results can be produced thereby.

B. Submit a request to the OAR for further direction should conditions of work or schedule indicates change of products that are not comparable with the original installation.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine existing conditions of the Work, including elements subject to damage or to movement during cutting, patching, excavating, and backfilling.

B. Examine conditions affecting installation of products, or performance of work.

C. Report unsatisfactory or questionable conditions to OAR. Do not proceed with the Work until notified by the OAR.

3.02 INSTALLATION

A. Do not cut-and-patch structural work in a manner resulting in a reduction of load-carrying capacity or load/deflection ratio. Provide adequate temporary support for work to be cut, to prevent failure. Do not endanger other work.

B. Provide adequate protection of other work during cutting-and-patching, to prevent damage; and provide protection of the work from adverse weather exposure.

C. Maintain excavations free of water.

D. Conform to requirements for temporary barriers, enclosures, and controls described in Section 01 50 00, Temporary Facilities and Controls.

3.03 DUST CONTROL

A. Provide positive methods of dust control and apply dust control materials to minimize raising dust from cutting and patching operations.

3.04 PERFORMANCE

A. Patch with seams which are durable. Complete with specified tolerances for the work.

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B. Employ skilled tradesmen to perform cutting-and-patching.

C. Cut work by methods which will not cause damage to materials to be retained and work adjoining the cut area.

1. Flame cutting of the reinforcing bars is discouraged but permitted if in compliance with the requirements of the American Welding Society (AWS) D.1.1 Structural Welding Code – Steel and D.1.4 Structural Welding Code – Reinforcing Steel by an experienced welder and as per directions by the OAR. Flame cutting in the Air Operations Area (AOA) is not permitted.
2. Where physical cutting action is required, cut work with sawing and grinding tools, not with hammering and chopping tools. Core drill openings through the concrete.

D. Fit work to pipes, sleeves, ducts, conduit and other penetrations through surfaces as called for elsewhere in the Contract Documents. Allowing for movement where movement is required, fill space around pipe or insert with material with physical characteristics equivalent to fire-resistant requirement of penetrated surfaces where fire-rated separations are penetrated.

E. Restore exposed finishes of patched areas and, where necessary, extend finish restoration onto retained work adjoining, in a manner, which will minimize evidence of patching.

F. Refinish the entire affected surface as necessary to provide even finish similar to adjacent finishes.

- END OF SECTION -

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SECTION: 01 74 13

PROGRESS CLEANING

PART 1 – GENERAL

1.01 SUMMARY

A. This Section covers the requirements of cleaning the Work area and disposal of waste materials, debris, and rubbish during construction of the Project.

1.02 RELATED REQUIREMENTS

A. Section 01 74 18, Concrete Waste

B. Section 01 74 19, Construction Waste

PART 2 – PRODUCTS

2.01 EQUIPMENT

A. The Contractor shall provide covered containers for waste materials, debris, and rubbish.

PART 3 – EXECUTION

3.01 CLEANING

A. The Contractor shall perform the following and as may be directed by the Owner's Authorized Representative (OAR):

1. Remove waste materials, debris, and rubbish at least daily. Maintain site in a clean and orderly condition.
2. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, culverts, and other closed or remote spaces prior to closing the space.
3. Clean interior areas prior to application of finishes and maintain in a clean condition to eliminate dust.
4. Avoid causing flying debris in the ramp areas or near the airfield.
5. Keep the Air Operations Area (AOA) and all haul routes free of any debris that may be generated from a construction activity.

3.02 DISPOSAL

A. Collect and remove waste materials, debris, and rubbish from the Project site in accordance with Section 01 74 19.

3.03 OWNER'S RIGHT TO CLEAN UP

A. The Owner may provide progress cleaning if the Contractor does not follow this requirement, the Owner will deduct the cost of this cleanup effort from the Contract Amount.

- END OF SECTION -

Part III - Technical Specification Book V4.3

SECTION: 01 74 18

CONCRETE WASTE

PART 1 – GENERAL

1.01 SUMMARY

A. This Section describes the procedures and practices to minimize or eliminate discharge of concrete waste to storm drain systems or water courses throughout the performance of the Work.

1.02 RELATED REQUIREMENTS

A. Section 01 74 19, Construction Waste

1.03 SUBMITTALS

A. A detail for a Contractor concrete slurry containment system; and

B. A detail for a Contractor concrete washout area.

1.04 REFERENCES

A. The following is a list of policies and regulations which may be referenced in this Section:

1. Texas Administrative Code (TAC): Title 30 Chapter 335, Industrial Solid Waste and Municipal Hazardous Waste.
2. Code of Federal Regulation (CFR): Title 40 Part 131 Water Quality Standards

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 CONCRETE SLURRY

A. General

1. The Contractor shall contain all concrete slurry to prevent discharge to a storm drain or surface water.
2. The concrete slurry shall be continuously vacuumed during saw cutting and slurry and cuttings shall not be allowed to remain on the pavement to dry.
3. The Contractor shall remove slurry residue by abrasion (e.g., scraping or bristle broom) until no further residue may be loosened and only a stain remains.
4. When the Contractor is performing a sawcut operation near a storm drain, the Contractor shall place sandbags or a similar Best Management Practice (BMP) to block the drain during such activities.
5. The Contractor shall remove the BMP immediately upon completion of the sawcut operation.

B. Slurry Container

1. The Contractor shall place the vacuumed slurry into a water-tight slurry waste container and place a sign on the waste container stating “Concrete Slurry Waste Only” in English and Spanish.
2. The slurry shall be allowed to dry prior to disposal and the hardened slurry waste shall be disposed in accordance with Section 01 74 19, Construction Waste.

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C. Slurry Containment

1. If a large amount of concrete slurry waste is anticipated, the Contractor may construct an on-site slurry containment facility.
2. The Contractor shall submit a construction detail or design plan to the OAR to obtain the approval of the Airport Environmental Affairs Department (EAD) prior to construction.
3. The onsite containment may be accomplished through an excavation or constructing a berm to contain the slurry at the surface. Any containment area shall be lined with a minimum of ten (10) millimeters of thick plastic.
4. The containment shall not be located within fifty (50) feet of an inlet, swale, drainage way, channel, and other continuous or interim water body.
5. The Contractor shall place a sign adjacent to the containment stating “Concrete Slurry Waste Only” in English and Spanish.
6. The concrete slurry shall be removed by the Contractor when containment is 50 percent full and always maintain a minimum of one (1) foot freeboard.
7. Allow slurry to dry before disposal.
   a. If it is not feasible to wait for slurry water to evaporate prior to disposal, the Contractor may coordinate with the EAD for additional options.
   b. Any water discharged from a slurry containment area shall not exceed a pH of 8.0.
8. The Contractor shall remove all materials used to construct the concrete slurry containment area from the work site and dispose of waste in accordance with Section 01 74 19, Construction Waste.

3.02 CONCRETE TRUCK WASHOUT

A. General

1. The Contractor shall contain all concrete truck washout water to prevent discharge to a storm drain or surface water.
2. The concrete truck washout containers shall provide sufficient volume to completely contain all liquid and concrete waste generated during washout procedures and a minimum one (1) foot freeboard shall be maintained at all times.
3. The Contractor shall use a vacuum truck to remove excess water and prevent overflowing of the washout containers.
4. Any concrete truck washout shall be located a minimum of fifty (50) feet away from an inlet, swale, drainage way, channel, and other continuous or intermittent water body.
5. The Contractor shall obtain written approval from the OAR and the Airport Operations Department prior to placing a concrete truck washout on the AOA.

B. Owner Provided Concrete Washout Bin

1. The Owner may supply a concrete washout bin for the Project under a separate contract. The EAD will determine if the Project meets the requirements to receive a concrete washout bin based on the size of the Project, amount of concrete to be poured, and location of the Project.
2. All requests for service for the Concrete washout bin shall be coordinated with the EAD, through the OAR, a minimum of 48 hours or two (2) Working Days in advance of the need.
3. The EAD will coordinate bin delivery, the removal of excess water, relocating a bin, replacing a bin, and removing a bin through the OAR.

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4. The only materials allowed to be placed in the concrete washout bin are concrete waste and water from concrete mixer trucks, pump trucks, mixers, chutes, tools, and wheelbarrows. Concrete slurry waste from saw cutting, grinding, and grooving is not allowed to be placed in the bin.
5. The concrete washout bin shall not be moved or shifted in any way. Damage caused to the concrete washout bin shall be paid by the Contractor to the owner of the bin directly. Any damages not paid by the Contractor shall be deducted from the Contract Amount.

C. Contractor Provided Concrete Washout Facility

1. When the Owner will not supply a concrete washout bin, or that the bin provided is not suitable for the Contractor's operation, the Contractor may construct a concrete washout facility.
2. The Contractor shall submit a construction detail or design plan to the OAR for EAD approval prior to construction.
3. The washout facility shall include a containment area accomplished through an excavation or constructing a berm to contain the material at the surface. The containment area shall be lined with a minimum of ten (10) millimeters thick plastic.
4. The containment area shall be designed to provide six (6) cubic feet of storage for every ten (10) cubic yards of concrete poured.
5. The Contractor shall allow concrete washout to harden prior to disposal and the hardened waste shall be disposed in accordance with Section 01 74 19, Construction Waste.
   a. If it is not feasible to wait for concrete wastewater to evaporate prior to material disposal, the Contractor shall coordinate through the OAR with the EAD for additional options of disposal.
   b. Any water discharged from the containment area shall not exceed a pH of 8.0.
6. The Contractor shall break down any residual materials and dispose such materials in accordance with Section 01 74 19, Construction Waste.
7. The Contractor shall remove the containment area within seven (7) Calendar Days of completing the concrete pours, or a soon as the concrete has hardened in the containment area to avoid collecting stormwater or as otherwise directed by the OAR.

- END OF SECTION -

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SECTION: 01 74 19

CONSTRUCTION WASTE

PART 1 – GENERAL

1.01 SUMMARY

A. The Contractor shall be responsible for waste handling, transport, and disposal activities. All waste handling activities including, but not limited to, packaging, labeling, marking, storage, and disposal will be conducted in accordance with applicable regulations and the Environmental Affairs Department (EAD) procedures.

B. The Owner and its contractors are expected to minimize the generation of construction waste, regulated waste and encourage recycling/reuse/salvaging whenever feasible.

C. Utilize the minimum screening and testing criteria described by this Section for constituents of concern where contaminants are known, anticipated or encountered.

D. Report weights of materials recycled, and materials not recycled or reused throughout the project.

E. Remove all Contractor-generated Waste from the Airport property and dispose of properly.

F. Costs associated with performing analytical sampling, screening, containerizing, storing, transportation and disposal of impacted soil, solid waste, hazardous wastes, special wastes, regulated wastes, universal wastes, in solid or liquid form, and materials that are recyclable, reusable, or salvageable is the responsibility of the Contractor, unless otherwise stated in the Contract.

1.02 DEFINITIONS

A. Class 1 Waste: Any nonhazardous industrial solid waste or mixture of industrial solid wastes that, because of its concentration, or physical or chemical characteristics, is toxic, corrosive, flammable, a strong sensitizer or irritant; a generator of sudden pressure by decomposition, heat, or other means; or may pose a substantial present or potential danger to human health or the environment when improperly managed, processed, stored, transported, or disposed of or otherwise managed, as further defined in Chapter 30 of Texas Administrative Code (TAC) §335.505.

B. Class 2 Waste: Any individual industrial solid waste or combination of industrial solid waste that cannot be described as Hazardous, Class 1, or Class 3 as defined in Chapter 30 TAC §335.506.

C. Class 3 Waste: Inert and essentially insoluble industrial solid waste, usually including but not limited to materials such as rock, brick, glass, dirt, and certain plastics and rubber that are not readily decomposable, as further defined in Chapter 30 TAC §335.507.

D. Generator: Entity that produces the waste.

1. Existing Airport site/facility – The waste generated is to be managed as Owner generated wastes.

2. All waste resulting from materials brought on-site by Contractor or waste resulting from Work (that is not Owner waste) is to be managed as Contractor generated waste.

E. Industrial Solid Waste: A solid waste resulting from or incidental to any process of industry or manufacturing, which may include a hazardous waste.

F. Regulated Waste: Any solid waste that requires special handling and disposal because of its quantity, concentration, physical or chemical characteristics.

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G. Reuse: Making use of a material without altering its form. Materials can be reused on-site or reused on other projects off-site, as approved by the Owner.

H. Recycling: The process of sorting, cleaning, treating, and reconstituting materials for the purpose of using the material in the manufacture of a new product.

I. Representative Sample: A portion of a substance being tested that can be expected to exhibit the average properties of the whole. More guidance on sampling is available in the Texas Commission on Environmental Quality (TCEQ) document, “Industrial and Hazardous Waste Sampling and Shipping Procedures.”

J. Salvage: Recovery of materials for on-site reuse.

K. Solid Waste: Any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant or air pollution control facility, and other discarded material including solid, liquid, semisolid or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations.

1.03 ABBREVIATIONS

A. CESQG: Conditionally Exempt Small Quantity Generator as defined in 40 CFR 261.5.

B. NELAC: National Environmental Laboratory Accreditation Conference.

C. NVLAP: National Voluntary Laboratory Accreditation Program.

D. SMP: Soil Management Plan

E. WMP: Waste Management Plan

F. WMR: Waste Management Report

1.04 REFERENCES

A. Code of Federal Regulations (CFR):

1. Title 29 Part 1910, Occupational Safety and Health Standards
2. Title 40 Part 260, Hazardous Waste Management System: General
3. Title 40 Part 261, Identification and Listing of Hazardous Waste
4. Title 40 Part 262, Standards Applicable to Generators of Hazardous Waste
5. Title 40 Part 263, Standards Applicable to Transporters of Hazardous Waste
6. Title 40 Part 266, Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
7. Title 40 Part 268, Land Disposal Restrictions
8. Title 40 Part 273, Standards for Universal Waste Management
9. Title 40 Part 279, Standards for the Management of Used Oil
10. Title 49 Part 172, Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements, and Security Plans
11. Title 49 Part 173, Shippers – General Requirements for Shipments and Packaging
12. Title 49 Part 177, Carriage by Public Highway
13. Title 49 Part 178, Specifications for Packaging

B. Texas Administrative Code:

1. TAC Title 30 Chapter 335, Industrial Solid Waste and Municipal Hazardous Waste

C. Environmental Protection Agency Guidance:

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1. Characterization of Building-Related Construction and Demolition in the United States.
2. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Compendium (SW-846)

D. Texas Commission on Environmental Quality Guidance:
1. RG-022, Guidelines for the Classification and Coding of Industrial and Hazardous Wastes
2. RG-086, Transporting Waste in Texas – A Guide to Regulations
3. RG-234, Industrial and Hazardous Waste: Rules and Regulations for Small Quantity Generators
4. RG-366/TRRP-13, Review and Reporting of COC Concentration Data under TRRP
5. Industrial and Hazardous Waste Sampling and Shipping Procedures

E. Airport Publications:
1. Green Building Standards (GBS)
2. Section 01 33 29.06.01, Contaminated Media Management Plan
3. Integrated Waste Management & Pollution Prevention Plan

1.05 SUBMITTALS

A. A Waste Management Plan (WMP) shall be submitted to the Owner's Authorized Representative (OAR) prior to receiving permit approval from the EAD.

B. A Waste Management Report (WMR) shall be submitted on the first of each month, and upon request by the OAR.

C. Waste profile documentation (process knowledge, waste profile form, applicable Material Safety Data Sheets (MSDS), and/or any analytical results) shall be submitted to the EAD, through the OAR, prior to submission to the landfill, for each hazardous or industrial waste stream.

D. Submit copies of manifests for all Owner generated regulated waste to the EAD, through the OAR, upon request and during Project close-out.

E. Submit copies of all construction demolition and landscaping waste or recycling documentation to the EAD, through the OAR, upon request.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 REGULATED WASTE MANAGEMENT

A. This section covers materials that are classified as regulated waste and may not be disposed of as construction, demolition, or land clearing waste.

B. The Contractor shall be responsible for the profiling, transportation, and disposal of all waste generated within the Project site or generated by the Contractor.

C. Each regulated waste stream generated will have its own waste profile.
1. The Contractor shall conduct testing and analysis of potentially regulated waste streams as soon as possible.
2. Laboratory analysis shall be conducted by NELAC or NVLAP (Asbestos Only) accredited lab. Ensure that individuals collecting samples have the appropriate training and regulatory credentials.

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3. Containers shall be sampled separately, unless the waste is completely uniform. Waste is considered uniform if the waste is from one area.

D. The Contractor shall arrange for the transportation of waste to an approved disposal facility. The Contractor shall only use disposal or recycling facilities listed on the Pre-Approved Disposal/Landfill Facilities list. The list can be located at:

EAD Approved Disposal Facilities

Landfills or Recycling facilities not listed will need to be audited by the EAD before they will be added as an approved disposal location.

E. The Contractor shall ensure all waste leaves the Airport property with the proper shipping paperwork. When waste is ready for disposal it must be transported by a licensed Department of Transportation (DOT) transporter.

F. The Contractor shall dispose of all waste in a timely manner and prior to project closeout. Universal waste must be disposed of within one (1) year from the date of generation. Hazardous waste must be disposed of within six (6) months of the date of generation.

G. The following is a list of commonly encountered regulated waste:

1. Class 1 Non-Hazardous: Texas-specific classifications.
2. Class 2 Non-Hazardous: Texas-specific classifications.
3. Asbestos.
4. Grease-trap waste.
5. Grit-trap waste.
6. Mercury containing equipment.
7. Non-reusable soil.
8. Paint and paint related waste.
9. Rechargeable Batteries
10. Water removed from fire suppression systems.
11. Fluorescent lamp ballasts that are not labeled as “No-PCB’s.”
12. Electronic lamp ballasts that contain batteries.
13. Used Lamps
14. Used Oil Filters

H. Unknown waste stream(s) (i.e., unknown liquid and solid materials) not associated with the Project shall be communicated immediately to EAD, through the OAR. EAD will assist in the proper characterization/profiling and disposal of unknown wastes. The OAR will determine whether the identified material is addressed in the Contract. Upon discovery, the Contractor shall properly contain the unknown waste in a safe manner. The Contractor shall not dispose or mix unknown wastes with other waste streams.

3.02 WASTE MANAGEMENT PLAN

A. Prior to obtaining a building permit, provide a WMP which includes the type of waste, the storage method, handling and transportation procedures, and the disposal location; and how the waste will be managed in accordance with applicable Federal, State and local rules and regulations. A template for the waste management plan can be located at:

Waste Management Plan

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B. Include in the WMP a description of how the plan will be conveyed to each new Subcontractor that enters the Project site and how containers will be identified.

C. Revise and resubmit when additional waste streams are identified, to make corrections, changes in disposal locations or as required by the OAR.

D. Approval of the WMP does not relieve the Contractor of responsibility for compliance with applicable environmental regulations.

3.03 REGULATED WASTE MANAGEMENT OF OWNER GENERATED WASTE

A. The Owner shall be considered the generator of all existing waste. Any waste resulting from materials brought on-site by the Contractor or waste resulting from work from an entity that is not the Owner, is to be managed as Contractor generated wastes. The Owner's waste shall not be mixed with any other generator's waste.

B. The EAD, through the OAR, will provide the Contractor with a regulated waste determination. The Contractor shall provide process knowledge form, MSDS, and /or lab results for the potentially regulated waste streams to the EAD, through the OAR. The process knowledge form can be located at: PROCESS KNOWLEDGE FOR WASTE DETERMINATION

C. When sampling soil, the Section 01 33 29.06.01, Contaminated Media Management Plan (CMMP) shall be followed.

D. The Contractor shall prepare the waste profile documents required by the landfill, including, at a minimum, the process knowledge, the waste profile form, applicable MSDS, and/or any analytical results. All waste profiles, and supporting documentation, must be reviewed and signed by EAD staff prior to being submitted to the waste disposal facility for approval.

E. The Contractor shall ensure that shipping documents for Owner generated wastes are reviewed, and signed by an Owner's employee, or a representative designated by the Vice President, Environmental Affairs. Notification to the EAD, through the OAR, shall be provided, in advance, so that manifest signing arrangements can be coordinated. All shipping documents must be provided to the EAD, through the OAR.

F. Collect and prepare copies of all documentation including waste profiles, test results, manifests, and waste receipts that may be required for Project close-out.

3.04 REGULATED WASTE MANAGEMENT OF CONTRACTOR GENERATED WASTE

A. Any waste resulting from materials brought on-site by the Contractor or waste resulting from work from an entity that is not the Owner, shall be managed as Contractor generated waste. Contractor generated waste shall not be mixed with any generated waste from the Owner.

B. Waste disposal facilities may require the Contractor to complete a waste profile document that identifies the generator (Contractor), customer (Contractor), method of payment, characteristics of the waste (either from lab analysis or generator knowledge), and quantity of the waste. All waste profiles, and supporting documentation, must be provided to the Owner's staff, through the OAR, upon request.

C. Testing and analysis of potentially regulated waste streams shall be provided to the EAD, through the OAR. EAD can assist with sampling parameters upon request.

D. All documentation including waste profiles, test results, manifests, and waste receipts shall be made available to the EAD, through the OAR, upon request.

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3.05 CONSTRUCTION, DEMOLITION, LAND CLEARING WASTE (CDL) & RECYCLING, REUSE SALVAGE MANAGEMENT

A. The Contractor shall submit a Waste Management Report (WMR) to the EAD, through the OAR, on the first of each month and upon request. The WMR can be located at: Waste Diversion Tracking Overview

B. The waste management report includes the following information:

1. List of disposed, recycled, salvaged, or reused materials
2. The quantity of the materials
3. Copy of disposal or recycling receipts
4. Salvage documentation
5. Credit Receipts

C. Materials that are not characterized as regulated waste are considered CDL and may be disposed of as construction/municipal waste or recycled. The Contractor shall provide all necessary resources and labor to properly remove, contain, transport, and dispose of such waste or recyclable/reusable/salvageable material.

D. The Contractor shall utilize a qualified waste handling firm(s) to dispose of all construction waste on the project. This firm(s) shall transport non-recyclable, and/or recyclable materials to an Owner approved landfill or recycling location.

E. The Contractor shall be responsible for reporting weight, classification, any reimbursement rate of materials delivered and the supporting documentation to the OAR in the WMR.

F. The Contractor shall remove and properly dispose of CDL waste from the Project site on a regular basis. CDL waste shall not be allowed to accumulate on the Project site.

G. Recyclable, Reusable, Salvageable materials include, but are not limited to the following:

1. Ferrous Metals (Steel)
2. Non-Ferrous Metals (Copper and Stainless Steel)
3. Tin
4. Aluminum
5. Asphalt
6. Concrete
7. Carpet
8. Wood

3.06 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Provide copies of the WMP to the job site foremen, and each Subcontractor.

B. Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse and return methods to be used by all parties at the appropriate stages of the Project.

C. Conduct waste management meetings during the weekly meeting to share and discuss waste management goals.

D. Labeling and Containers:

1. Label all containers in accordance with 30 TAC 335 Subchapter C and 40 CFR 262 & 264

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2. Package and label wastes to comply with Department of Transportation. DOT labeling requirements as specified in 49 CFR Parts 172, 173, 174, 177, 178, and 179 if transporting.
3. Provide containers for CDL waste.
4. Bins shall be protected during non-working hours from off-site contamination.

E. Storage:

1. Store waste by classification and type, in accordance with 30 TAC 335. See “Guidelines for the Classification and Coding of Industrial and Hazardous Wastes” for more information.
2. Place waste only in containers specifically marked and labeled for that waste.
3. Provide containers compatible with the applicable waste stream.
4. Waste containers shall be maintained in good condition and sealed closed when waste is not being added or removed.
5. Do not store incompatible waste near one another.
6. Space containers sufficiently apart to allow access in case of emergency.
7. Do not comingle regulated materials.
8. Ensure all hazardous, universal, or other regulated waste materials are segregated from CDL waste and recycled material.
9. Ensure recycled materials are clearly labeled with a list of acceptable materials. The list of acceptable materials must be the same as the materials recycled at the recycling processor facility.
10. Ensure recyclable materials contain no more than 10 percent non-recyclable material, by volume.
11. Retain Owner generated wastes on the Airport property in a secure location until waste characterization is complete and waste is ready for disposal.

F. Inspections:

1. The Contractor shall inspect waste storage areas weekly to ensure proper handling of wastes.
2. At a minimum, inspections shall observe the following:
   a. Presence of spilled material.
   b. Integrity of secondary containment structure.
   c. Maintenance of emergency pathways.
   d. Integrity of containers (evidence of leaking, bulging, or corroding).
   e. Closed and secured container lids or covers.
   f. Accurate and complete container labels.
   g. Segregation of containers by hazard class.
   h. Storage capacity of accumulation area.
   i. Segregation of regulated waste, CDL waste, and recycled materials.

- END OF SECTION -

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SECTION: 01 74 23

FINAL CLEANING

PART 1 – GENERAL

1.01 SUMMARY

A. This Section covers the requirements for the Contractor to perform the final cleaning of the Project site.

1.02 PROJECT CONDITIONS

A. The Contractor shall conduct cleaning and waste disposal operations in full compliance with Federal, State, and local environmental and antipollution regulations, ordinances and laws.

1. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in stormwater or sanitary waste disposal systems.
2. Do not burn or bury debris, rubbish, or other waste material on the Project site.
3. Restore damaged areas to the conditions that existed prior to the start of construction as documented by the Contractor in a photographic record.

PART 2 – PRODUCTS

2.01 CLEANING MATERIALS

A. The Contractor shall use materials which will not create hazards to health or property, and which will not damage surfaces.

B. The Contractor shall use only materials and methods recommended by manufacturer of material being cleaned.

PART 3 – EXECUTION

3.01 FINAL CLEANING

A. General:

1. Clean each surface or unit of Work to the condition expected from a commercial building cleaning and maintenance program using experienced workers or professional cleaners and complying with manufacturer's cleaning instructions.
2. Complete cleaning operations and conduct an examination of all Work areas with the Owner’s Authorized Representative (OAR) before requesting inspection for Substantial Completion.

B. Remove grease, petroleum or chemical spills, mastic, adhesives, dust, dirt, stains, fingerprints, labels, lubricants and other foreign materials from visible interior and exterior surfaces.

C. Remove temporary protection and labels.

D. Clean and polish transparent, reflective and glossy surfaces to a clear shine.

E. Vacuum clean carpet.

F. Clean resilient and hard-surface floors.

G. Clean sealed joints.

H. Clean permanent filters of ventilating equipment and replace disposable filters when units have been operated during construction. Clean HVAC air handlers, air terminal units, fan coil units, fans, drain pans, diffusers, grilles, ducts, blowers, and coils if units have been operated without filters during construction.

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I. Clean light fixtures, lamps, globes, and reflectors. Replace burned out lamps and defective starters.

J. Maintain clean condition on the Project site until Final Acceptance.

K. Remove waste, foreign matter and debris from roofs, gutters, areaways and drainage systems. Flush roof drainage system with water until clear.

L. Remove waste, debris and surplus materials from the Project site. Clean grounds: remove stains, spills, and foreign substances from paved areas and sweep clean. Rake clean other exterior surfaces.

- END OF SECTION -

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SECTION: 01 76 00

PROTECTING INSTALLED CONSTRUCTION

PART 1 – GENERAL

1.01 SUMMARY

A. This Section covers the requirements for the Contractor to protect the completed and/or installed Work on the Project.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 PROTECTION OF NEWLY INSTALLED WORK

A. The Contractor shall protect all installed work until Final Acceptance of the Project by the Owner using appropriate and effective means including, but not limited to, the following:

1. Restrict construction workers and traffic from completed and protected areas.
2. Prohibit all unnecessary traffic and storage from surfaces covered by roofing or waterproofing.
3. Provide adequate resilient protection and durable work platforms over all surfaces covered by roofing or waterproofing.
4. Provide clean, smooth plywood, or finished wood boards under all ladders, staging, or scaffolding placed on roofing and waterproofing.
5. Protect all finished surfaces including, but not limited to, door frames, doors, glass, floors, walls, ceilings, soffits, corners, fixtures, furnishings, equipment, and other finished surfaces and work.
   a. Provide at least paper or plastic protection. In all locations of frequent traffic and all locations subject to moving objects whether wheeled or not, provide temporary plywood or fiber board walkways. Use only non-marking rubber-tired carts, dollies, and wagons. Provide temporary plywood or boards under all materials stored over finished floors.
   b. In addition to other acceptance criteria required by the Contract Documents, all finished surfaces shall be in acceptable condition at time of Final Acceptance by the Owner. Repair or replace all damaged materials as needed to achieve this requirement at no additional cost to the Owner.
6. Effectively protect all porous materials including, without limitation, gypsum board, insulation, ceiling tiles and panels, and other fibrous and water-susceptible materials from becoming wet or moisture damaged.
   a. Remove and replace any portion of the Work which becomes water or moisture damaged.
   b. Remove and replace any portion of the Work which shows evidence of biological growth, mold, and mildew.

- END OF SECTION -

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SECTION: 01 76 50

PUNCH LIST

PART 1 – GENERAL

1.01 SUMMARY

A. This section covers the use of a Punch List for the Project Closeout process on the Project.

1.02 DOCUMENTATION

A. All notifications, documentation, and transmittals between the Contractor and other Owner's personnel as part of the Punch List process shall utilize the Unifier software application, unless the Owner for the Project directs an alternate form of transmission.

B. If an alternate form of transmission is directed for the Project, all notifications, documentation, and transmittals shall utilize that form of transmission.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 SUBSTANTIAL COMPLETION

A. Inspection

1. Either party may initiate procedures for Substantial Completion of the Work in its entirety or a designated portion thereof. When the Contractor considers the Work (or a portion thereof that the Owner agrees to accept separately) is substantially complete, the Contractor shall notify the Construction Manager (CM) that the Project is considered ready for an inspection for Substantial Completion in accordance with Section 01 77 00 and shall prepare and submit to the CM a comprehensive list of items to be completed or corrected prior to Final Acceptance. Contractor shall proceed promptly to complete and correct items on the list. Failure to include an item on such list does not alter the responsibility of Contractor to complete all Work in accordance with the Contract Documents.
2. Upon receiving the notification and the list, the CM will schedule a walk-through inspection for the Project with the Contractor, the Inspector, and other Owner's personnel which may have input on the Project or portion of the Project identified ready for inspection in the Contractor's notification.
3. Upon completion of the walk-through inspection, the CM will document the results of the inspection and shall prepare a Punch List that includes all items which are determined to be incomplete or do not meet the requirements of the Contract Documents.
4. The CM will notify the Contractor of the Punch List. Contractor shall, before issuance of a notice of Substantial Completion, complete or correct those items on the Punch List.

B. Corrective Action

1. The Contractor shall review the Punch List and initiate repairs or other Corrective Action necessary to address each item on the Punch List to bring that item or portion of the Work into compliance with the Contract Documents.
2. The Contractor shall contact and coordinate with the CM to discuss or provide any unique Corrective Action for review and approval that will be required as part of the Work to resolve a Punch List item.

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3. The Contractor shall complete each item identified on the Punch List, including those that had impacted the use and occupancy of I/S/E, unless the CM has pre-approved specific items on the Punch List as an exception for approval or for follow-up work.
4. The Contractor shall notify the CM that the Project is ready for a following walk-through inspection and shall prepare and submit to the Construction Manager an updated comprehensive list of items to be corrected prior to Final Acceptance.

C. Reinspection

1. Upon notification by the Contractor that the Work is ready for a follow-up inspection, the CM will schedule the inspection for confirmation that the Punch List items are in conformance with the Contract Documents.
2. At the completion of the follow-up inspection, the Inspector or other Owner's personnel will report the results to the CM, the CM will close each Punch List item or reject the item. The Contractor shall, before issuance of a notice of Substantial Completion, complete or correct those items on the Punch List.
3. When all items on the Punch List have been closed, the CM will close the Punch List.
4. The CM shall have the final decision as to whether or not the Contractor has achieved Substantial Completion. When the CM determines that the Work or designated portion thereof is substantially complete, which determination shall not be unreasonably withheld, the CM will notify the Contractor that Substantial Completion has been achieved, which notice shall establish the date of Substantial Completion.
5. Immediately prior to the issuance of a notice of Substantial Completion, the CM and the Contractor shall jointly inspect and document the condition of the Work, or designated portion thereof, to determine and record its condition, and the CM and the Contractor shall develop a final punch list which must be completed prior to Final Acceptance. The final punch list shall include all punch list items and other incomplete or missing items which CM elected in its discretion to waive for purposes of Substantial Completion. Any inspection and acceptance by Owner shall not, however, alter the Contractor's responsibility to complete all Work in accordance with the Contract Documents, including items discovered by Owner after Substantial Completion.

3.02 FINAL ACCEPTANCE

A. Inspection

1. When the Contractor considers that the Work is finally complete, the Contractor shall notify the CM that the Project is ready for Final Inspection in accordance with Section 01 77 00 and shall provide the CM with all submittals required for Final Acceptance.
2. Upon receiving the notification, the CM will schedule the Final Inspection with the Contractor, the Inspector, and other Owner's personnel which may have input on the Project.
3. Upon completion of the Final Inspection and all submittals required for Final Acceptance, the CM will update the Punch List noting all items are completed or identifying items incomplete or otherwise do not meet the requirements of the Contract Documents.
4. The CM will notify the Contractor of the status of the Punch List and whether it is complete or whether outstanding items exist.

B. Corrective Action

1. If any items on the Punch List are still outstanding, the Contractor shall complete those outstanding items as required until all items are completed.

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2. The Contractor shall notify the CM that the Project is ready for a follow-up inspection.

C. Reinspection

1. Upon notification by the Contractor that the Work is ready for a follow-up inspection, the CM will schedule the follow-up inspection.
2. Upon completion of the follow-up inspection, the Inspector or other Owner's personnel will report the results to the CM and the CM that will close each Punch List item or reject them.
3. When all items on the Punch List have been closed, the CM will close the Punch List.
4. The CM will notify the Contractor that the Punch List has been closed. The CM shall have the final decision as to whether the Contractor has achieved Final Completion, which approval shall not be unreasonably withheld. When the CM agrees that the Work is finally complete, the CM shall notify the Contractor and set the date of Final Acceptance.

- END OF SECTION -

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SECTION: 01 77 00

CLOSEOUT PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

A. This Section covers the requirements for project closeout.

1.02 RELATED REQUIREMENTS

A. Section 01 31 01, Building Information Modeling (BIM)

B. Section 01 74 23, Final Cleaning

C. Section 01 78 23, Operation and Maintenance Data

D. Section 01 78 39, Project Record Documents

E. Section 01 91 00, Commissioning

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 SUBSTANTIAL COMPLETION

A. Either party may initiate procedures for Substantial Completion of the Work in its entirety or a designated portion thereof. When the Contractor considers the Work to be substantially complete (or a portion thereof that the Owner agrees to accept separately), submit to the OAR the following:

1. Written certification that the Work and/or a designated portion thereof, is substantially complete.

2. A list of items to be completed or corrected prior to Final Completion, recognized as incomplete, and reasons the Work is not complete. The Contractor shall proceed promptly to complete and correct items on the list. Failure to include an item on such list does not alter the responsibility of Contractor to complete all Work in accordance with the Contract Documents.

B. Within fourteen (14) Calendar Days after receipt of such certificate and list, the OAR will make examination to determine status of completion.

C. If the OAR acknowledges and agrees that the project is substantially completed along with receiving the list, the OAR will schedule a walk-through inspection(s) for the Project with the Contractor, A/EOR team, Commissioning team (if applicable) and other DFW departments as identified for this project which may have input on the Project or portion of the Project identified ready for inspection in the Contractor's notification.

D. Upon completion of the walk-through inspection(s), the A/EOR will compile the results of the inspection(s) and shall prepare a consolidated List that includes all items which are determined to be incomplete or do not meet the requirements of the Contract Documents and submit to the OAR for distribution.

E. Temporary Certificate of Occupancy (TCO) may be issued in lieu of the preferred Certificate of Occupancy (CO), at substantial completion pending resolution of items discussed and agreed to by DFW Airport Code Department, ETAM, OAR, stakeholders and Contractor. If a TCO is issued, the contractor must apply for TCO extension within ten (10) days and provide a project schedule for when CO will be achieved for Code's approval.

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F. If the OAR determines that the Work is not substantially complete:

1. The OAR will promptly notify the Contractor in writing, providing the reasons for such determination, and a Punch List including all the noted issues.
2. The Contractor shall contact and coordinate with OAR to discuss or provide any unique Corrective Action for review and approval that will be required as part of the Work to resolve Punch List items.
3. The Contractor shall initiate repairs or other Corrective Action necessary to address each item on the Punch List to bring that item or portion of the Work into compliance with the Contract Documents. The Contractor shall send a second written notice to the OAR claiming Substantial Completion has been achieved on the Project and shall prepare and submit to the OAR an updated comprehensive list of items to be completed or corrected prior to Final Acceptance.
4. The OAR will then re-examine the status of the Work.

G. Upon the determination by the OAR that the Work is substantially complete (the OAR shall have the final decision as to whether or not the Contractor has achieved Substantial Completion, which approval shall not be unreasonably withheld), the OAR will:

1. Sign the Certificate of Substantial Completion submitted by the Contractor and email to the contract administrator, accompanied by the list of items that are recognized as outstanding and remain to be completed or corrected, as verified and amended by the OAR.
2. The contract administrator to submit a certificate to the Contractor for written acceptance of responsibilities assigned to the Contractor in the certificate. The letter will include ETAM's operational and maintenance responsibility of the space and management of warranties by the ETAM SPG Warranty Administrator.

H. As a condition for Substantial Completion, the Contractor shall:

1. Advise the OAR of any pending insurance changeover requirements.
2. Obtain and submit the Certificate of Occupancy or Temporary Certificate of Occupancy, operating certificates, and similar releases enabling the Owner unrestricted use of the Project site.
3. Prepare and submit final warranty letters indicating the date of substantial completion.
4. Response to Punch List(s) including commissioning issues log resolution.
    a. Immediately prior to the issuance of a Certificate of Substantial Completion, the OAR and the Contractor shall jointly inspect and document the condition of the Work, or designated portion thereof, to determine and record its condition, and the OAR and the Contractor shall develop a final punch list which must be completed prior to Final Acceptance. The final punch list shall include all punch list items and other incomplete or missing items which OAR elected in its discretion to waive for purposes of Substantial Completion. Any inspection and acceptance by the Owner shall not, however, alter the Contractor's responsibility to complete all Work in accordance with the Contract Documents, including items discovered by Owner after Substantial Completion.

I. After the Work or a designated portion thereof is substantially complete, the Contractor shall:

1. Allow the Owner occupancy of Project site under any provisions stated in the Certificate of Substantial Completion.
2. Complete the items listed for completion or correction within the certificate and/or final punch list provided by the OAR.

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3. Perform final cleaning in accordance with Section 01 74 23, Final Cleaning.

3.02 PARTIAL OCCUPANCY OR BENEFICIAL USE

A. The Board may occupy or use any completed or partially completed portion of the completed Work at any stage, while the punch list scope if still on-going, provided the occupancy or use is consented to by Contractor and Contractor's insurer and authorized by OAR. Consent of Contractor to partial occupancy or beneficial use may not be unreasonably withheld.

B. Immediately prior to the partial occupancy or beneficial use, OAR and Contractor shall jointly inspect the area to be occupied or portion of the Work to be used to determine and record the condition of the Work.

C. Partial occupancy or beneficial use of a portion of the Work does not constitute acceptance of work not in compliance with requirements of the Contract.

D. If the portion of Work is accepted and beneficial use starts, a phase warranty process starts as jointly agreed on by the OAR and Contractor for the portion of Work in use.

3.03 COMMISSIONING

A. The Project may require a formal Commissioning process for one or more specific items of infrastructure, systems, and equipment (Systems). If Commissioning is included for Systems as part of the Project, the section provides the procedures and requirements for acceptance of such Systems by the Airport Energy, Transportation and Asset Management (ETAM) Department. Refer to Section 01 91 00 for detailed requirements and explanations of the Commissioning Process.

B. Commissioning items required for substantial completion.

1. The Contractor request OAR for an inspection of completed Systems installation(s).

2. The OAR sends a request to the ETAM Commissioning Manager (CxM) to facilitate scheduling walkthrough inspection(s) by the OAR, Contractor, CxAg, and ETAM representatives responsible for operating and/or maintaining the Systems. Note that the Systems may require a demonstration conducted by the Contractor as reasonably requested by the ETAM representatives as part of the inspection or as identified in the commissioning plan. Any non-commissionable items identified as requiring attention will be added to the Consolidated Punch List.

3. CxM and CxAg will develop a Commissioning Issues Log and submit this log to the Contractor and OAR for comment and resolution. The Commissioning Issues Log must be completed prior to the issuance of Substantial Completion.

4. In coordination with the CxM, the CxAg noted the completion/resolution of Punch List items in Cx issues Log for commissionable items. The OAR will coordinate with CxM to determine if the Systems have achieved final acceptance in a reasonable timeframe and as required by the contract. The OAR shall have the final decision as to whether or not the Contractor has achieved Systems acceptance and substantial completion.

3.04 FINAL COMPLETION

A. When the Contractor considers that the Work is finally complete, the Contractor shall provide the OAR with all submittals required for Final Acceptance and shall submit written certification that:

1. The Work has been examined by the Contractor and A/EOR for compliance and has been completed in accordance with Contract Documents.

2. All equipment and systems previously excluded from issuance of substantial completion have been tested and are operational.

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3. Work is completed and ready for final inspection.

B. The OAR will re-examine the Project site to verify status of completion within seven (7) Calendar Days after receipt of such certification.
   1. If the OAR considers that any part of the Work is incomplete or defective.
   2. The OAR will promptly notify the Contractor in writing, listing incomplete or defective work.
   3. The Contractor shall take immediate steps to remedy stated deficiencies and send second written certification to the OAR that the Work is complete.
   4. The OAR will re-inspect work.

C. When the OAR determines that the Work is acceptable under Contract Documents the OAR will notify the Contractor that the punch list has been closed and to begin with the formal closeout. The OAR shall have the final decision as to whether the Work is acceptable under the Contract Documents and shall not unreasonably withhold final payment, and the Contractor shall provide to the OAR any remaining documents:
   1. Closeout submittals.
   2. Evidence of payments and release of liens.
   3. Final adjustments of accounts.
   4. Final pay application.
   5. Other documents relating to the Work as the Owner may reasonably require.

3.05 CLOSEOUT SUBMITTALS

A. Evidence of compliance with requirements of governing authorities:
   1. Certificate of Occupancy.
   2. Certificates of Inspection: Mechanical and Electrical systems as required by respective Sections.

B. Commissioning:
   1. Commissioning test plan, results/report, and Corrective Actions documentation in accordance with Section 01 91 00.
   2. The Commissioning Report will be completed by the CxAg and approved by the Commissioning Authority (CxAu).

C. Building Information Modeling (BIM): Provide BIM submittals, in accordance with 01 31 01.

D. Project Record Documents: Provide the Record Documents in accordance with 01 78 39.

E. Operations and Maintenance Data: Provide the data in accordance with 01 78 23.

F. Spare Parts and Maintenance Materials:
   1. Provide products, spare parts, and maintenance materials in quantities specified in each Section in addition to that required for completion of the Work.
   2. Delivery to the Project site or as directed by the OAR and store items properly and obtain a receipt prior to Final Payment.

3.06 EVIDENCE OF PAYMENTS AND RELEASE OF LIENS

A. The Contractor shall deliver the following items to the OAR:
   1. Affidavit of Payment of Debts and Claims.
   2. Affidavit of Release of Liens.
   3. Affidavit of Release of Liens attachments.

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4. Consent of Surety to Final Payment.
5. Release or Waiver of Liens.
6. Separate releases of waivers of liens from subcontractors, suppliers and others with lien rights against property of Owner, together with list of those parties.
7. Submittals shall be duly executed before delivery.

3.07 FINAL ADJUSTMENTS OF ACCOUNTS

A. Submit the final statement of accounting to the OAR that shall reflect adjustments to Contract Amount:
   1. Original Contract Sum
   2. Additions and deductions resulting from:
      a. Previous Change Orders
      b. Allowances
      c. Unit Prices
      d. Deductions for uncorrected Work
      e. Penalties and Bonuses
      f. Deductions for liquidated damages
      g. Other adjustments
   3. Total Contract Amount as adjusted
   4. Previous payments
   5. Contract Amount remaining due

B. The OAR will prepare a final Change Order, reflecting approved adjustments to Contract Amount, which were not previously incorporated previous Change Orders.

3.08 FINAL PAYMENT APPLICATION

A. The Contractor shall submit final Payment Application in accordance with procedures and requirements stated in Conditions of the Contract. Final Payment shall not relieve the Contractor of any warranty obligations contained in the Contract Documents or at law, nor shall it act as a waiver of any claims relating to, but not limited to, any of the following, whether known or unknown at the time of Final Payment:
   1. Any liens or encumbrances.
   2. Any matter for which the Contractor or any subcontractor of any tier is liable or responsible at law.
   3. Any obligations or liability relating to the Contractor's warranties provided in the Contract Documents.
   4. Failure of the Work to comply with the Contract Documents.
   5. Any breach or inaccuracy of any of the Contractor's representations or warranties under the Contract Documents, any Contractor Certificate or under any affidavit, certificate or other instrument or document provided to the Owner. In all cases, the Contractor, without prejudice to the terms of the Contract Documents shall be liable to the Owner for latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the Owner's rights under any warranty and guaranty and all applicable laws.

3.09 ADDITIONAL ADJUSTMENTS

A. No adjustments to the Contract requested by Contractor will be allowed if asserted after execution of Final Payment on the Contract. Acceptance of final payment by the Contractor

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shall constitute a final and irrevocable release and waiver of claims and additional amounts, whether or not any such claims or potential claims arise in contract or in tort or were known or unknown at the time of the application for final payment.

3.10 PORST-CONSTRUCTION EXAMINATION

A. Prior to the expiration of one (1) year from date of Substantial Completion, the OAR, accompanied by other Owner's personnel, will make visual examination of Project site in the company of the Contractor to determine whether further correction of work is required in accordance with provisions of the Contract.

B. The OAR will promptly notify the Contractor, in writing, of any observed deficiencies.

C. The Contractor will contact the OAR to arrange time and establish a schedule for correction of deficiencies and verification by the OAR, and other Owner's personnel, of the corrected discrepancies.

- END OF SECTION -

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SECTION: 01 77 00.01

CLOSEOUT PROCEDURES – SYSTEM ACCEPTANCE

PART 1 – GENERAL

1.01 SUMMARY

A. This Section establishes the procedures required for acceptance of infrastructure, systems, and equipment (Systems) by the Airport Energy, Transportation and Asset Management (ETAM) Department when Commissioning such Systems is included as part of the Project.

1.02 RELATED REQUIREMENTS

A. Section 01 77 00, Closeout Procedures

B. Section 01 91 00, Commissioning

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 PRE-SUBSTANTIAL COMPLETION

A. Commissioning of Systems

1. Pre-Functional Checklists (PFCs) and Functional Performance Tests (FPTs) shall be conducted in accordance with the Commissioning Plan.

2. The Commissioning Issues Log shall be uploaded in Skier Unifier by the Commissioning Agent (CxAg).

B. Informal inspections of the Systems by the Airport Energy, Transportation and Asset Management (ETAM) Department requested by Contractor are conducted by ETAM as coordinated by the Owner's Authorized Representative (OAR).

C. The Contractor requests OAR for formal inspection of completed Systems installation(s).

D. The OAR sends a request to the ETAM Commissioning Manager (CxM) to facilitate scheduling walkthrough inspection(s) by the OAR, Contractor, CxAg and ETAM representatives responsible for operating and/or maintaining the Systems. Note that the Systems may require a demonstration conducted by the Contractor as requested by the ETAM representative as part of the inspection.

E. The Punch List from the walkthrough inspection will be compiled by the CxM who will provide the Punch List to the CxAg to incorporate into the Commissioning Issues Log for non-commissionable items (items not in the Commissioning Plan). In addition, items impacting the use of the Systems will be noted.

F. The Contractor shall notify the OAR that Punch List items, including those that had impacted the use of Systems, have been resolved and the OAR notifies the CxM to facilitate scheduling a verification walkthrough by the responsible ETAM representatives as well as the CxAg. Note that the Systems may require a demonstration conducted by the Contractor as requested by the ETAM representative as part of the verification.

G. In coordination with the CxM, the CxAg notes the completion/resolution of Punch List items in Cx Issues Log for non-commissionable items.

H. The CxAg will complete the review of the following (any issues from this review will be included in the Commissioning Issues Log):

1. Operation and Maintenance (O&M) Manual(s)

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2. Record CAD drawings
3. Record PDF file (.pdf)
4. Record 3D Model (when applicable)
5. Equipment lists

I. The CxAg will verify the completion of the following (any issues with this verification will be included in the Commissioning Issues Log):

1. Required training
2. Warranty certificates
3. Accessories delivered to ETAM

J. Upon notification to the ETAM Systems Performance Group (SPG) Manager by the OAR that all items on the Commissioning Issues Log (both commissionable and non-commissionable), including those that had impacted the use of the Systems, have been resolved as reported by the CxAg, and that all items listed in Sections H and I above have been approved and/or received, the SPG Manager will send an email to the OAR declaring ETAM's acceptance of the Systems upon achievement of Substantial Completion of the Project.

3.02 SUBSTANTIAL COMPLETION

A. The Airport Design, Code, and Construction (DCC) Department issues a Temporary Certificate of Occupancy (TCO).

B. Warranties become effective and managed by the ETAM SPG Warranty Administrator.

C. ETAM assumes ownership of installed Systems that ETAM will have operation and/or maintenance responsibility. Note that if a Temporary Certificate of Occupancy or Substantial Completion Notification is prior to meeting the requirements of Section 3.01.J above, ETAM ownership will be delayed until the requirements in this Section are met.

D. All remaining punch list items, which were determined not to impact the BENEFICIAL USE of Systems, are resolved.

3.03 FINAL ACCEPTANCE

A. The Commissioning Report will be completed by the CxAg and approved by the Commissioning Authority (CxAu).

B. DCC issues a final Certificate of Occupancy.

- END OF SECTION -

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SECTION: 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 – GENERAL

1.01 SUMMARY

A. Provide operation and maintenance manuals for all new operating equipment and systems furnished by the Contractor, and all materials and finishes as noted in specific specification sections.

1.02 RELATED REQUIREMENTS

A. Section 01 31 01, Building Information Modeling (BIM)

1.03 O&M, COMMISSIONING, TRAINING, AND WARRANTY SUBMITTALS

A. Delivery Method

1. The Contractor shall provide the Owner's Authorized Representative (OAR) the manual for the Project as follows:
   a. Hardbound, submit two (2) copies of preliminary draft of the complete manual; or,
   b. Electronically, notify the OAR, through the appropriate methodology (Unifier), that an electronic submittal has been uploaded and is ready for review and comment.
   c. If any content will not upload into the Unifier system, deliver electronic material to the OAR in the form of a DVD or external hard drive(s) in digital PDF format, for review and comment.
   d. The Owner's Authorized Representative will review the draft and return one (1) hardbound copy, or electronically through the Unifier system, with submittal comments.
   e. Upon successful completion of all O&M or Warranty Manual edits, the OAR will advise, and the final accepted version will be uploaded into the Unifier database, in the proper destination folder. An approved O&M hardbound copy will be published in its complete form and delivered with a transmittal to the OAR.
   f. Delivery Quantity- All contractors will follow established Unifier Business Processes (BP). Upload all approved Project Record documents into the appropriate folder in the Unifier system. This includes, but is not limited to, O&M, Warranty, Project Record Drawings, and Training DVDs. In addition, one (1) hardbound copy and three (3) DVD copies of all finalized and approved O&M, Warranty, Project Record Drawings and two (2) Training DVDs are required to be delivered to the OAR. In lieu of DVDs, external hard drive(s) shall be acceptable.
2. Provide final O&M Manual(s) for all equipment placed into service and operated by the Owner prior to Final Acceptance.
3. Utilizing the Owner provided data collection spreadsheet(s), complete the ETAM 101-New Equipment/Asset Inventory Form, ETAM 102-New Equipment/Asset Preventive Maintenance Task and Schedule Form, the ETAM 104-Equipment Warranty Information Form, and/or the Equipment De-commissioning Checklist as determined by Owner representatives. DFW Dev ETAM Equipment Asset Information EAM Forms. ETAM Equipment Asset Information EAM Forms. The content for these forms can be extracted from the BIM models which must have the incorporated data built into them. Refer to Section 01 31 01, Building Information Modeling (BIM), if applicable, for BIM related procedures.

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4. Produce and deliver a professional quality video DVD recording for each training / instruction session. DVDs will be shot and produced by experienced videographers. DVDs of inadequate quality will be remade at Contractor's expense. OAR approved DVD's will be uploaded into the Unifier database in the appropriate location folder by the contractor. If the upload is not successful, see 1.03, A, 3.

1.04 FORMAT OF ELECTRONIC SUBMITTAL – O&M AND WARRANTY

A. Upload all O&M or WARRANTY data in PDF format in the Unifier System in the correct location. If the upload is not successful, see 1.2, A, 3. The Table of Contents directory will be Hyper-linked to the corresponding O&M, shop drawing, and warranty chapters for expedited access. All PDF material is to be formatted for Optical Character Recognition (OCR).

B. Exported spreadsheets integrated into the ETAM required spreadsheets will be required to be uploaded in the Unifier System.

C. Upload final Reconciled FM Models that incorporate all the Data equivalent to the ETAM data sheets into the DFW Common Data Environment (CDE).

1.05 FORMAT OF HARDBOUND SUBMITTAL – O&M AND WARRANTY

A. Prepare hard-copy data in the form of an instructional manual.

1. Binders: Commercial quality, 8-1/2 x 11-inch, 3 (3") inch ring binders with hardback, cleanable, plastic covers. Binder assembly will not exceed 75% of Binder capacity. If multiple binders are required for a complete series, correlate O&M data into related consistent groupings.

2. Binder and DVD cover preparation: Identify each binder with typed or printed title "Operation and Maintenance Instructions"; or "Warranty" list title and location of Project; DFW Airport Contract and Permit numbers, identify subject matter of contents. Identify each Volume 'X of Y' where it is the Xth volume of Y total volumes in each O&M set for the project; Identify each volume as being in 'Set A of B' where the volume is part of the Ath set of B total final O&M Manual sets provided for the project. Spine: Insert filler Tab that contains the Contract Name, "Operation and Maintenance Instructions," or "Warranty" title line, and the Contract and Permit Number. DVD Labels are to be the adhesive type, professionally printed and contain same project information relative to the project.
   a. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.
   b. Provide tabbed flyleaf for each separate product and system, with typed description of product and major component parts of equipment.

3. Text: Manufacturer's original printed data. No second-generation print will be accepted.

4. Shop Drawings: Provide with reinforced punched binder tab. Bind in with text, fold larger drawings to size of text pages.

1.06 QUALITY ASSURANCE

A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.07 NEWLY PREPARED DRAWINGS

A. Newly Prepared Record Drawings: Prepare new drawings instead of following procedures specified for preparation of Record Drawings where new drawings are required by a Change Order issued as a result of acceptance of an alternate, substitution, or other modification and

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the Architect/Engineer determines that neither the original Contract Drawings nor the shop Drawings are suitable to show the actual installation.

1. Consult the Architect/Engineer for the proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction.
2. When completing newly prepared Drawings, utilize the procedures specified for organizing, copying, binding and submittal of Record Drawings. All drawings will include the required DFW “project record” stamp and professional seals, contract and permit numbers, and printed name and signature of the authorized contracted individual.
3. All final Project record Drawings will be built from the finalized project CAD files and assembled in a PDF format. NO handwritten comments will be accepted on finalized Record Drawings in PDF format. All comments, lines, shapes, etc., will be incorporated into the CAD set prior to the assembly of the final PDF Record Drawings. Both CAD and PDF files are to be copied to a DVD and delivered to the OAR, with appropriate project information on the label.

1.08 MANUAL FOR MATERIALS AND FINISHES

A. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designation. Provide information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture-protection and Weather-exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional Requirements: As specified in individual Specifications sections.

E. Provide a listing in Table of Contents for design data, with tabbed flysheet and space for insertion of data.

1.09 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Each item of Equipment and Each System: Include description of unit or system, and component parts. Give function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

B. Panel board Circuit Directories: Provide electrical service characteristics, controls, and communications.

C. Include as-installed color-coded wiring diagrams.

D. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and any special operating instructions.

E. Maintenance Requirements: Include routine procedures and guide for troubleshooting; disassembly, repair, re-assembly instructions; and alignment, adjusting, balancing, and checking instructions.

F. Provide servicing and lubrication schedule, and list of lubricants required.

G. Include manufacturer's printed operation and maintenance instructions.

H. Include sequence of operation by controls manufacturer.

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I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

J. Provide “as-installed” control diagrams by controls manufacturer.

K. Provide Contractor's coordination drawings, with “as-installed” color-coded piping diagrams.

L. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

M. Provide a list of original manufacturer's spare parts, and recommended quantities to be maintained in storage for a 12-month period for OAR review and approval. Spare parts list shall contain the following information:

1. Parts Descriptions.
2. Manufacturer's Part Number.
3. Shelf Life.
4. Recommended Quantity.
5. Unit Price.
6. Name and address of the part manufacturer.
7. Name and address of a local supplier for the part.

N. As applicable, include test and balancing reports, manufacturer factory test reports and certifications, system commissioning and operation testing reports, system start-up reports, and system maintenance reports prior to turn over.

O. Additional Requirements: As specified in individual Specification sections.

P. Provide a listing in Table of Contents for design data, with tabbed flysheet and space for insertion of data.

PART 2 – PRODUCTS

2.01 CONTENTS, EACH VOLUME

A. Table of Contents: Provide title of Project; names, addresses and telephone numbers of Owner’s Authorized Representative and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

B. For Each Product or System: List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.

D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

E. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

F. Warranties: Bind/Insert copy at the end of each applicable section.

PART 3 – EXECUTION

Not Used.

- END OF SECTION -

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SECTION: 01 78 33.36

BONDS AND WARRANTIES

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes the general administrative and procedural requirements for warranties and bonds required by the Contractor based on the Contract Documents, including manufacturer's standard warranties on products and special warranties.

1. The Contractor shall perform the following:
   a. Compile all the specified warranties and bonds in accordance with contract requirements.
   b. Compile the specified service and maintenance contracts.
   c. Co-execute submittals when so specified.
   d. Review submittals to verify compliance with Contract Documents.
   e. Submit to Owner’s Authorized Representative (OAR) for review.

1.02 RELATED REQUIREMENTS

A. Section 01 78 23, Operation and Maintenance Data

1.03 DEFINITIONS

A. Standard Product Warranties: Reprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special Warranties: Written warranties required by the Contract Documents, either to extend time limits provided by standard product warranties or to provide greater rights for the Owner.

C. Emergency Repairs: The Owner reserves the right to make emergency repairs as required to keep systems, equipment, or materials in operation or to prevent damage to persons or property without voiding Contractor's warranty or bond or relieving the Contractor of its responsibilities during the Contract, warranty, or bond periods.

1.04 WARRANTY REQUIREMENTS

A. Related damages and losses: When correcting warranted Work that has failed, the Contractor shall remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.

B. Reinstatement of warranty: When Work covered by a warranty by written endorsement, the reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation but not less than fifty (50) percent of the original warranty period of time.

C. Replacement cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition as determined by the OAR and complying with requirements of Contract Documents.

1. Cost of replacing or rebuilding defective Work during the warranty period, regardless of whether the Owner has benefited from use of the Work, is the Contractor's responsibility.

2. Upon contact from the Owner by electronic communications, requesting repair work covered by warranty, the Contractor shall provide on-site response by repair team no later than twenty-four (24) hours from time of initial contact.

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1.05 SUBMITTAL REQUIREMENTS

A. Assemble the warranties, bonds, service contracts, and maintenance contracts, executed by each of the respective manufacturers, suppliers, and Subcontractors.

B. Place all documents for each product in a separate tabbed section in the warranty book. Provide a Table of Contents listing each section in the binder.

C. Provide complete information for each item at the front of each tabbed section summarizing the following details for each warranty section:

1. Product or work item name.
2. The Contractor or vendor responsible for the warranty, with name of the authorized representative, mobile number, email address, business address and telephone number.
3. Scope of the warranty.
4. The date of the beginning of each warranty, bond or service and maintenance contract will be established by the date of Final Acceptance as defined by OAR.
5. Duration of warranty, bond, or service maintenance contract.
6. Provide proper procedure to follow in the event of a warranty failure and include descriptions of conditions of operation or maintenance which might affect validity of warranty or bond.
7. The Contractor or vendor, name of responsible principal, address, and telephone number.

D. Provide two (2) original signed copies of each warranty requiring a signature or other authentication.

E. Provide completed Excel spreadsheets with ETAM 104-Equipment Warranty Information Form in accordance with Section 01 78 23.

1.06 FORM OF SUBMITTALS

A. Format:

1. Size 8-½ inches x 11 inches sheets punched for standard 3-ring binder.
2. Fold larger sheets to fit into binders.
3. Cover with DFW Brand: Identify each packet with typed or printed title "Bonds and Warranties".
4. List:
   a. Title of Project.
   b. Contract Number.
   c. Name of Contractor.

B. Binders:

1. Commercial quality, white, 3-ring and no larger than three (3”) inch diameter rings, with durable and cleanable plastic covers as approved by the OAR.

1.07 TIME OF SUBMITTALS

A. Submit draft warranties along to the OAR through the Unifier software application and one (1) hard copy to the Commissioning Agent (CxAg) ninety (90) Calendar Days prior to Substantial Completion. Provide signed warranties or a letter of intent indicating that the draft warranty shall be provided with the final warranty book at Substantial Completion.

B. Submit the final warranties to the OAR at Substantial Completion.

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1. When a designated portion of the Work is completed and occupied or used by the Owner, submit properly executed warranties to the OAR within fifteen (15) Calendar Days of the turnover of that designated portion of the Work to the Owner.
2. For items of work, where Final Acceptance is delayed materially beyond Substantial Completion, provide an updated submittal within ten (10) Calendar Days after acceptance, listing date of acceptance as start of warranty period.

1.08 SUBMITTALS REQUIRED

A. Submit all warranties, bonds, service contracts and maintenance contracts as specified in each respective Section.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

- END OF SECTION -

Part III - Technical Specification Book V4.3

SECTION: 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 – GENERAL

1.01 SUMMARY

A. This Section establishes the procedures required for project documentation.

1.02 RELATED REQUIREMENTS

A. Section 01 31 01, Building Information Modeling (BIM)

1.03 CLOSEOUT SUBMITTALS

A. At Contract close out, the Contractor shall deliver the Record Documents to the Owner's Authorized Representative (OAR). These records will be combined with the files from the Program Management Computer System and Central Document Files to make a complete history of the design and construction of the Project.

B. Record Document Finish Manual: This manual is required for all items requiring submittal for color, texture or finish selection. The finish manual shall be of "book" style with pages suited for mounting material samples.

C. Accompany submittal with transmittal letter in duplicate, containing:

1. Date.
2. Project title and number.
3. Contractor's name and address.
4. Title and number of each record document.
5. Signature of Contractor or the Contractor's Authorized Representative (CAR).

PART 2 – PRODUCTS

2.01 MARKING DEVICES

A. Provide felt-tip marking pens for recording information in the color code designated by the OAR at the Pre-Construction Conference.

2.02 DRAFTING SERVICES

A. Retain competent drafting services, as necessary, for transfer of "markup notations" from information recorded during construction.

2.03 MODEL DEFINITIONS

A. Design Model: A Model that has reached the stage of completion that would customarily be expressed by an architect or engineer in two-dimensional Construction Documents.

B. Federated Model: Distinct component models "linked" together in such a manner that the linked data sources do not lose their identity or integrity by being so linked. (Examples: Navisworks model, Combined Revit Model, Glue Model)

C. Construction Model: The equivalent of shop drawings and other information useful to construction, a Model that consists of data imported from a Design Model or, if none exist, from a designer's Construction Document.

D. As-Built Model: The collection of Contractor and Subcontractor fabrication models that have been updated to reflect the finished field conditions.

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E. Record Model: An updated design model that is completed at the end of the project with the construction Teams provided hand markups, digital markups, Sub-contractor fabrication models, and other models that include the As-Built conditions that may vary from the contract documents or better define the as built condition and/or location.

PART 3 – EXECUTION

3.01 RECORD DOCUMENTS

A. The Contractor shall maintain at the Project site one marked-up record copy of:

1. Plans.
2. Specifications.
3. Addenda.
4. Change Orders and other modifications to the Contract.
5. OAR Written Instructions.
6. Approved shop drawings, product data and samples.
7. Field Test Records, to include Commissioning Plan and Test Results and Final Report.
8. Construction photographs.
9. As-built 3D Models (in native model format) and signed off 3D coordination models and print outs. Refer to Section 01 31 01, Building Information Modeling (BIM), if applicable, for BIM-related procedures.
10. Current 4D and 5D models
11. ETAM Asset data sheets
12. Federated Model developed from all trade models into a Navisworks model.

3.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. Store documents in Contractor's field office apart from documents used for construction.

1. Provide files and racks for storage of documents.
2. Provide secure storage space for storage of samples.

B. File documents and samples in accordance with the direction of the OAR.

C. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.

D. Always make documents and samples available for inspection by OAR.

E. Incomplete or out of order documents and samples will be grounds for not approving application for payment.

3.03 RECORDING

A. Label each document "PROJECT RECORD", in neat large, printed letters.

B. Record information concurrently with the Project construction progress. Do not conceal any work until the required information is recorded.

C. Drawings: Legibly mark to record actual construction:

1. Depths of various elements of foundation in relation to finish first floor datum.
2. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

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3. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.
4. Field changes of dimension and detail.
5. Changes made by Field Order or by Change Order.
6. Details not on the original Plans.
7. Revisions to details shown on the Plans.
8. Revisions to electrical circuitry.
9. Actual equipment locations.
10. Duct size and routing.
11. References to related shop drawings and modifications.
12. Note construction change directive numbers, alternate numbers, Change Order numbers and similar identification.

D. Permanent Record Drawings (As- Built Models and Drawings generated from them).

1. The Contractor shall submit one (1) complete draft record set to the OAR for review in accordance with Special Provision 12.0. After the draft record approval, the Contractor shall submit a final record set of As-Built Models and As-Built Drawings in electronic format as prescribed by the DFW BIM Manual, Airport CADD Standards Manual (CADD Manual) and this Section.
2. The Contractor shall submit a complete, organized set of electronic 3D model files including individual sheet files, border files, base files, reference files, and any other type of file used to create each of the final .PDF sheet files. The files shall be organized in the standard organized folder structure that was used to create the .pdf sheet file from the individual sheet file. Each sheet file shall be saved with the border file and all base or reference files attached and functioning upon opening the individual sheet file.
3. Refer to Special Provision 12.0 for additional requirements including the Contractor's endorsement of each sheet for the final submission of the Permanent Record Drawings.
4. The Contractor shall submit one (1) copy of all Permanent Record Drawings files to the OAR on DVDs.
5. Converted As-Built Drawings require the appropriate certifications, endorsements, professional seals, and signatures.
6. Sheets shall be provided in "½ size" sheets – (equivalent to 17" x 22").
7. Drawings may be bond copy affixed with appropriate certifications, endorsements, professional seals and signatures.
8. The As-Built set shall be arranged according to the Contract Plans sheet numbering and Specification numbering system used in the Contract Documents, including supplemental agreement and delivery order numbers. The Contractor shall provide an index and cross-referenced listing of each drawing sheet in the As-Built set.

E. Specifications and addenda: Legibly mark each section to record:

1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
2. Changes incorporated into the Contract by Field Order or by Change Order or Request for Information (RFI).

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3.04 BURDEN OF ACCURACY

A. Reference General Provisions for requirements.

3.05 RECORDING

A. Post changes and modifications to the Contract Documents as they occur. The OAR will periodically review record documents to ensure compliance.

B. The Contractor shall bring the current set of As-Built Drawings to the first weekly meeting of the month for the OAR review.

- END OF SECTION -

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SECTION: 01 78 46

EXTRA STOCK MATERIALS

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes administrative and procedural requirements required of the Contractor for stocking of extra materials for the Project.

1.02 PRODUCTS REQUIRED

A. Provide the quantities of extra materials to the Owner specified in the individual Sections in addition to the quantities required for completion of the Work.

B. Provide products to be identical to those installed in Work. Include all the quantities required for the Project in the original purchase from the supplier or manufacturer to avoid variations in manufacture.

C. Provide a complete list, including Section or Plans references, of all extra materials to be provided under this Contract within 90 Calendar Days of the Notice of Proceed (NTP). Submit list to the Owner's Authorized Representative (OAR) in both hardcopy and an electronic file in Microsoft Excel.

1.03 STORAGE AND MAINTENANCE

A. Temporarily store extra materials with products to be installed in the Work, in accordance with Section 01 66 00, Project Storage and Handling Requirements or in other location acceptable to OAR.

B. When adequate secure storage facilities are available at the Project site capable of maintaining conditions required for storage of materials to the installed in the Work, the extra materials may be stored in available space.

C. Maintain extra materials in the manufacturer's unopened original containers with labels intact and legible, until delivery to the OAR.

1.04 DELIVERY

A. Coordinate final delivery of extra materials with the OAR prior to Substantial Completion.

B. Deliver, unload, store, and account for specified quantities of extra materials in presence of the OAR.

C. The OAR will indicate final placement in building of extra materials.

D. Obtain written acceptance from the OAR of receipt of specified quantities of extra materials.

E. For portions of Work accepted and occupied by Owner prior to Substantial Completion, the Contractor shall deliver proportional quantity of spare parts and maintenance materials if requested by the OAR. Record quantities delivered with the OAR.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

- END OF SECTION -

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SECTION: 01 79 00

DEMONSTRATION AND TRAINING

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes the demonstration and training requirements required of the Contractor on the Project.

1. The Contractor shall instruct and demonstrate the operation of each selected system to the Owner's Authorized Representative (OAR) and other Owner's maintenance and operations personnel.
2. The amount of time to be devoted to the instructional sessions shall be reasonable and consistent with the size and complexity of equipment as determined by the OAR.

1.02 SUBMITTALS

A. The Contractor shall submit a proposed outline and syllabus for each instruction session to the OAR for approval, a maximum of twenty (20) Calendar Days and no less than ten (10) Calendar Days before scheduled date of instruction. Indicate the list of topics to be covered and identify training and visual aids, which will be used.

B. The Contractor shall produce a professional quality video recording on a properly labeled DVD in MP4 format for each instruction session. Experienced videographers shall produce the recordings. One (1) original draft copy of each video shall be submitted to the OAR for approval. Any recordings of unacceptable quality shall be recreated at Contractor's sole expense.

C. Submit complete record of instructions as part of Operations and Maintenance (O&M) Data given to Owner. For each instructional period, supply following data:

1. Date of Training
2. Date of Submittal
3. System or equipment involved
4. Names of instructors and affiliation
5. All participants present at the training.

D. Upon approval of the OAR, the Contractor shall upload one (1) copy of each training video into the Skier Unifier software application into the designated folder, unless otherwise directed by the OAR, and submit two (2) DVD copies of all training videos to the OAR.

1.03 QUALITY ASSURANCE

A. The Contractor shall arrange for services of qualified manufacturer's representatives who are knowledgeable about the product to instruct the OAR and other Owner's personnel on proper maintenance, operation and calibration of equipment.

PART 2 – PRODUCTS

2.01 INSTRUCTION PROGRAM

A. The Contractor shall furnish a minimum of five (5) draft O&M Manuals for the classroom instruction that shall be pertinent to the subject being covered and the approved syllabus.

B. The O&M Manual(s) shall constitute the basis of instruction. Review contents of the manual with the Owner's personnel in full detail to explain all aspects of operations and maintenance

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including, but not limited to, start-up, daily operation, control adjustment, troubleshooting, servicing, and maintenance and shutdown of each item of equipment.

C. Prepare and insert additional data sheets as required in the O&M Manual(s) when it becomes apparent during instruction that it is needed as directed by the OAR.

PART 3 – EXECUTION

3.01 INSTRUCTION TO OWNER'S PERSONNEL

A. Prior to the date of Project Substantial Completion, the Contractor shall instruct the OAR and other Owner's designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment, and systems at agreed schedule. For equipment requiring seasonal operation, perform training at the agreed schedule.

- END OF SECTION -

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SECTION: 01 81 13

SUSTAINABLE DESIGN REQUIREMENTS

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes general requirements and procedures for compliance with the Airport Green Building Standards (GBS) prerequisites and credits needed for the Project to comply with the Airport Sustainability Report.

1. Other GBS prerequisites and credits needed to obtain GBS certification are dependent on material selections and may not be specifically identified as GBS requirements. Compliance with requirements needed to obtain GBS prerequisites and credits may be used as one criterion to evaluate substitution requests.
2. Additional GBS prerequisites and credits needed to obtain the indicated GBS certification are dependent on the Architect/Engineer's design and other aspects of the Project that are not part of the Contract Work.
3. The GBS Project Checklist is included in Section 3 of the GBS.

1.02 RELATED REQUIREMENTS

A. Section 01 50 00, Temporary Facilities and Controls

B. Section 01 74 19, Construction Waste

1.03 DEFINITIONS

A. Regionally Manufactured Materials: Materials that are manufactured within a radius of 500 miles (804.67 kilometers) from the Project location. Manufacturing refers to the final assembly of components into the building product that is installed at the Project site.

B. Regionally Extracted, Harvested, or Recovered Materials: Materials that are extracted, harvested, or recovered and manufactured within a radius of 500 miles (804.67 kilometers) from the Project site.

C. Recycled Content: The percentage by weight of constituents that have been recovered or otherwise diverted from the solid waste stream, either during the manufacturing process (pre-consumer), or after consumer use (post-consumer.)

1. Spills and scraps from the original manufacturing process that are combined with other constituents after a minimal amount of reprocessing for use in further production of the same product are not recycled materials.
2. Discarded materials from one manufacturing process that are used as constituents in another manufacturing process are pre-consumer recycled materials.

1.04 SUBMITTALS

A. The Contractor shall provide the following:

1. Submit any additional GBS submittal requirements included in other Sections.
2. Sustainable design submittals are in addition to other submittals. If the submitted item is identical to that proposed to comply with other requirements, include additional copy with other submittal as record of compliance with indicated LEED requirements instead of separate sustainable design submittal. Mark additional copy "Sustainable design submittal."

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3. Sustainability Action Plans: Provide preliminary submittals within fourteen (14) Calendar Days of the Notice to Proceed (NTP) indicating how the following requirements will be met:
   a. Materials and Resource (MR) Credit MR 1.1, 1.2, and 1.3: Building Reuse - Maintain Existing Walls, Floors, and Roof.
   b. MR Credit 1.4: Building Reuse - Maintain 50% of Interior Non-Structural Partitions
   c. MR Credit 2.1 and 2.2: Construction Waste Management - Waste management plan complying with Section 01 74 19.
   d. MR Credit 4.1 and 4.2: Recycled Content - List of proposed materials with recycled content.
      1) Indicate the cost, post-consumer recycled content, and pre-consumer recycled content for each product having recycled content.
   e. MR Credit 5.1 and 5.2: Regional Materials - Provide a list of all proposed regionally manufactured materials and regionally extracted, harvested, or recovered materials.
      1) Identify each regionally manufactured material, its source, and cost.
      2) Identify each regionally extracted, harvested or recovered material, its source, and cost.
   f. Indoor Environmental Quality Credit 3.1 and 3.2: Construction Indoor Air Quality (IAQ) Management Plan – During Construction and Before Occupancy - Provide a construction IAQ management plan.
      1) IEQ 3.1
         (a) Provide a construction IAQ management plan.
         (b) Product Data for temporary filtration media.
         (c) Product Data for filtration media used during occupancy.
         (d) Construction Documentation: Six photographs at three separate times during construction period, along with brief description of SMACNA approach employed, documenting implementation of IAQ management measures, including scheduling, source control, housekeeping, HVAC protection, and pathway interruption.
      2) IEQ 3.2
         (a) Signed statement describing the building air flush-out procedures including dates when flush-out was started and completed, final volume of air, and statement that filtration media was replaced after flush-out.
         (b) Product Data for filtration media used during flush-out and during occupancy.
         (c) Report from testing and inspecting agency that indicates results of IAQ testing and documentation showing compliance with IAQ testing procedures and requirements.
   g. MR Credit 6: List of proposed rapidly renewable materials. Identify each rapidly renewable material, including cost and fraction by weight that is considered rapidly renewable.
   h. MR Credit 7: List proposed certified wood products. Indicate each product containing certified wood, including its source and cost of certified wood products.
   i. Credit IEQ 4.1: List of proposed adhesives and sealants. Identify each adhesive and sealant, including VOC content.
   j. Credit IEQ 4.2: List of proposed paints and coatings. Identify each paint and coating, including VOC content.
   k. Credit IEQ 4.3: List of proposed flooring materials. Identify each flooring material, including required certification.
   l. Credit IEQ 4.4: List of proposed composite wood and Agrifiber products. Identify each composite wood and Agrifiber product, including statement of no added urea formaldehyde.

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4. Sustainable Progress Reports: The reports shall be concurrent with each Payment Application. Submit reports comparing actual construction and purchasing activities with sustainability action plans for the following:
   a. MR Credit 1.1, 1.2, and 1.3: Building Reuse - Maintain Existing Walls, Floors, and Roof.
   b. MR Credit 1.4: Building Reuse - Maintain 50% of Interior Non-Structural Partitions
   c. MR Credit 2.1 and 2.2: Construction Waste Management - Waste reduction progress reports shall be included along with the Waste Management Report (WMR) described in Section 01 74 19.
   d. MR Credit 4.1 and 4.2: Recycled Content.
   e. MR Credit 5.1 and 5.2: Regional Materials - Regionally manufactured materials and regionally extracted, harvested, or recovered materials.
5. Sustainability Documentation Submittals:
   a. Sustainable Sites (SS) Credit 8: Light Pollution Reduction – Submit the product data for interior and exterior lighting fixtures that stop direct-beam illumination from leaving the building site.
   b. Water Efficiency (WE) Credit 3.1 and 3.2: Water Use Reduction – Submit the product data for plumbing fixtures indicating water consumption.
   c. Energy and Atmosphere (EA) Prerequisite 3.0: Fundamental Commissioning of Building Energy Systems – Submit the product data for new HVAC equipment indicating absence of CFC refrigerants.
   d. EA Credit 4.0: Enhanced Refrigerant Management – Submit the product data for new HVAC equipment indicating absence of hydrochlorofluorocarbon (HCFC) refrigerants, and for clean-agent fire-extinguishing systems indicating absence of HCFC and Halon.
   e. MR Credit 2.1 and 2.2: Construction Waste Management - Comply with the requirements of Section 01 74 19.
   f. MR Credit 4.1 and 4.2: Recycled Content – Submit the product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products that have recycled content. Include statement indicating costs for each product having recycled content.
   g. MR Credit 5.1 and 5.2: Regional Materials – Submit the product data indicating location of material manufacturer for regionally manufactured materials.
      1) Include statement indicating cost and distance from manufacturer to the Project for each regionally manufactured material.
      2) Include statements indicating cost and distance from point of extraction, harvest, or recovery to Project for each raw material used in regionally manufactured materials.
   h. IEQ Credit 1.0: Outdoor Air Delivery Monitoring – Submit the product data and shop drawings for carbon dioxide monitoring system.
   i. IEQ Credit 3.1: Construction IAQ Management Plan
      1) Submit a Construction IAQ Management Plan.
      2) Submit the product data for temporary filtration media and filtration media used during occupancy.
      3) Construction Documentation: Six photographs at three (3) separate occasions during construction along with a brief description of the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) approach employed, documenting implementation of IAQ management measures, such as protection of ducts and on-site stored or installed absorptive materials.
   j. IEQ Credit 3.2: Construction IAQ Management–Before Occupancy

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1) Signed statement describing the building air flush-out procedures including the dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.
2) Submit the product data for filtration media used during flush-out and during occupancy.
3) Report from testing and inspecting agency indicating results of IAQ testing and documentation showing conformance with IAQ testing procedures and requirements.

k. IEQ Credit 4.1: Low-Emitting Materials-Adhesives and Sealants – Submit the product data for adhesives and sealants used on the interior of the building indicating the volatile organic compound (VOC) content of each product used. Indicate the VOC content in gallons per liter calculated according to 40 CFR 59, Subpart D (EPA method 24).

l. IEQ Credit 4.2: Low-Emitting Materials–Paints and Coatings – Submit the product data for paints and coatings used on the interior of the building indicating chemical composition and VOC content of each product used. Indicate the VOC content in g/L calculated according to 40 CFR 59, Subpart D (EPA method 24).

m. IEQ Credit 4.3: Low-Emitting Materials–Flooring Systems – Submit the product data for carpet products indicating the VOC content of each product used.

n. IEQ Credit 4.4: Product Data for products containing composite wood or Agrifiber products or wood glues indicating that they do not contain urea-formaldehyde resin.

o. IEQ Credit 7.1: Thermal Comfort–Design – Submit the product data and shop drawings for sensors and control system used to monitor and control room temperature and humidity.

PART 2 – PRODUCTS

2.01 RECYCLED CONTENT OF MATERIALS

A. MR Credits 4.1 and 4.2: Recycled Content - Provide building materials with recycled content such that post-consumer recycled content constitutes a minimum of 10 percent of the cost of materials used for the Project or such that post-consumer recycled content plus one-half of pre-consumer recycled content constitutes a minimum of 20 percent of the cost of materials used for the Project.

1. The cost of post-consumer recycled content plus one-half of pre-consumer recycled content of an item shall be determined by dividing the weight of post-consumer recycled content plus one-half of pre-consumer recycled content in the item by the total weight of the item and multiplying by the cost of the item.
2. Do not include plumbing, mechanical, and electrical components in the calculation.
3. Recycled content of materials shall be defined according to the Federal Trade Commission's "Guide for the Use of Environmental Marketing Claims," 16 CFR 260.7 (e).

2.02 REGIONAL MATERIALS

A. MR Credit 5.1: Regional Materials - Provide a minimum of 20 percent of building materials (by cost) that are regionally manufactured materials.

B. MR Credit 5.2: Regional Materials – Provide regionally manufactured materials as required by subparagraph "MR Credit 5.1" above, provide at least 50 percent (by cost) that are regionally extracted, harvested, or recovered materials.

C. Do not include plumbing, mechanical, and electrical components, and specialty items such as elevators and equipment in the calculation.

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2.03 LOW-EMITTING MATERIALS

A. IEQ Credit 4.1: Low-Emitting Materials-Adhesives and Sealants - For interior applications use adhesives and sealants that comply with the following limits for the VOC content when calculated according to 40 CFR 59, Subpart D (EPA method 24):

1. Wood Glues: 30 g/L.
2. Metal to Metal Adhesives: 30 g/L.
3. Adhesives for Porous Materials (Except Wood): 50 g/L.
4. Subfloor Adhesives: 50 g/L.
5. Plastic Foam Adhesives: 50 g/L.
6. Carpet Adhesives: 50 g/L.
7. Carpet Pad Adhesives: 50 g/L.
8. VCT and Asphalt Tile Adhesives: 50 g/L.
9. Cove Base Adhesives: 50 g/L.
10. Gypsum Board and Panel Adhesives: 50 g/L.
11. Rubber Floor Adhesives: 60 g/L.
12. Ceramic Tile Adhesives: 65 g/L.
13. Multipurpose Construction Adhesives: 70 g/L.
14. Fiberglass Adhesives: 80 g/L.
15. Structural Glazing Adhesives: 100 g/L.
16. Wood Flooring Adhesive: 100 g/L.
17. Contact Adhesive: 250 g/L.
18. Plastic Cement Welding Compounds: 350 g/L.
19. ABS Welding Compounds: 400 g/L.
20. CPVC Welding Compounds: 490 g/L.
21. PVC Welding Compounds: 510 g/L.
22. Adhesive Primer for Plastic: 650 g/L.
23. Sealants: 250 g/L.
24. Sealant Primers for Nonporous Substrates: 250 g/L.
25. Sealant Primers for Porous Substrates: 775 g/L.
26. Structural Wood Member Adhesives: 140 g/L.
27. Single-Ply Roof Membrane Adhesives: 250 g/L.
28. Special-Purpose Contact Adhesive (That is used to Bond Melamine-Covered Board, Metal, Unsupported Vinyl, Rubber, or Wood Veneer 1/16 Inch or Less in Thickness to Any Surface): 250 g/L.
29. Top and Trim Adhesive: 250 g/L.
30. Sheet-Applied Rubber Lining Adhesive: 850 g/L.
31. Aerosol Adhesive, General-Purpose Mist Spray: 65 percent by weight.
32. Aerosol Adhesive, General-Purpose Web Spray: 55 percent by weight.
33. Special-Purpose Aerosol Adhesive (All Types): 70 percent by weight.

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34. Other Adhesives: 250 g/L.
35. Architectural Sealants: 250 g/L.
36. Nonmembrane Rood Sealants: 300 g/L.
37. Single-Ply Roof Membrane Sealants: 450 g/L.
38. Other Sealants: 420 g/L.
39. Modified Bituminous Sealant Primers: 500 g/L.
40. Other Sealant Primers: 750 g/L.

B. EQ Credit 4.2: Low Emitting Materials-Paints and Coatings - For interior applications use paints and coatings that comply with the following limits for the VOC content when calculated according to 40 CFR 59, Subpart D (EPA method 24) and the following chemical restrictions:

1. Flat Paints and Coatings: VOC not more than 50 g/L.
2. Non-Flat Paints and Coatings: VOC not more than 150 g/L.
3. Anti-Corrosive Coatings: VOC not more than 250 g/L.
4. Varnishes and Sanding Sealers: VOC not more than 350 g/L.
5. Stains: VOC not more than 250 g/L.
6. Dry-Fog Coatings: 400 g/L.
7. Primers, Sealers, and Under coaters: 200 g/L.
8. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
9. Pretreatment Wash Primers: 420 g/L.
10. Clear Wood Finishes, Varnishes: 350 g/L.
11. Clear Wood Finishes, Lacquers: 550 g/L.
12. Floor Coatings: 100 g/L.
13. Shellacs, Clear: 730 g/L.
14. Shellacs, Pigmented: 550 g/L.
15. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
16. Restricted Components: Paints and coatings shall not contain any of the following:
    a. Acrolein.
    b. Acrylonitrile.
    c. Antimony.
    d. Benzene.
    e. Butyl benzyl phthalate.
    f. Cadmium.
    g. Di (2-ethylhexyl) phthalate.
    h. Di-n-butyl phthalate.
    i. Di-n-octyl phthalate.
    j. 1,2-dichlorobenzene.
    k. Diethyl phthalate.
    l. Dimethyl phthalate.
    m. Ethylbenzene.
    n. Formaldehyde.

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o. Hexavalent chromium.
p. Isophorone.
q. Lead.
r. Mercury.
s. Methyl ethyl ketone.
t. Methyl isobutyl ketone.
u. Methylene chloride.
v. Naphthalene.
w. Toluene (methylbenzene).
x. 1,1,1-trichloroethane.
y. Vinyl chloride.

PART 3 – EXECUTION

3.01 CONSTRUCTION WASTE MANAGEMENT

A. MR Credit 2.1 and 2.2: Construction Waste Management – Perform activities in compliance with Section 01 74 19.

3.02 CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT

A. EQ Credit 3.1: Construction IAQ management Plans-During Construction – Perform construction activities in compliance with SMACNA IAQ Guideline for Occupied Buildings under Construction.

1. If the Owner authorizes the use of permanent heating, cooling, and ventilating systems during construction period as specified in Section 01 50 00, Temporary Facilities and Controls, install filter media having a Minimum Efficiency Reporting Value (MERV) of 8 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.
2. Replace all air filters immediately prior to occupancy. Replacement air filters shall have MERV 13 according to ASHRAE 52.2.

B. EQ Credit 3.2: Construction IAQ Management-Before Occupancy

1. Engage an independent testing and inspecting agency to conduct a baseline indoor air quality testing program according to the EPA Protocol for Environmental Requirements, Baseline IAQ and Materials.

- END OF SECTION -

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SECTION: 01 83 19

CONTRACTOR ROOFING AREA ACCESS

PART 1 – GENERAL

1.01 SUMMARY

A. This section covers the requirements for the contractor to acquire access to the airport's various roofing areas.

1.02 RELATED REQUIREMENTS

A. Section 01 74 13, Progress Cleaning

B. Section 01 74 19, Construction Waste

1.03 ROOF ACCESS PROCEDURES

A. Requestors obtain and complete all forms that are required to access roofs on all DFW Airport Building and Terminals to install, uninstall, or maintain equipment. Requestor shall complete this form, all pages and include or attach as much information as possible, including drawing(s), column and grid location when scheduling a rooftop unit flashing or penetration. All forms to be completed and sent to accessroof@dfwairport.com for processing. In all cases, no penetrations or removal of items will occur without prior approval. The roofs are under warranty and these cases must be scheduled with Energy, Transportation and Asset Management (ETAM) Roofing Manager.

B. The forms must be approved before accessing the roof. Stickers will be provided and must be installed on each piece of equipment and penetration. Photos need to be taken of each piece of equipment and penetration and sent to accessroof@dfwairport.com.

C. The Airport requires ten (10) calendar days to coordinate the requests. This allows time for all stakeholders to adequately review, ask questions, prepare personnel & equipment and approve the request.

1.04 CONTRACTOR REQUIREMENTS

A. The Airport Control Center must be notified by a Facilities Building Maintenance representative prior to entering roof areas. Only activities directly communicated to DFW Airport Facilities Representative may be conducted on the roof.

B. The Contractor must complete Roof Access Request Form when scheduling roof access.

C. The Contractor must provide a safety plan to the DFW Airport in advance of the Work and maintain adequate safety procedures at all times.

D. Where roof anchor systems are being used, the Contractor must obtain the most recent anchor inspection reports from the DFW Airport. The Contractor performing the Work shall determine the need to use a Fall Arrest or Travel Restraint System. The appropriate system must be used at all times when there is a risk of injury due to falling. A rescue plan must be part of the safety plan when a Fall Arrest System is being used. All persons using a Fall Protection System must be properly trained and authorized.

E. If any "Hot Work" is to be performed on the roof, a copy of the current Hot Work Permit must accompany this Permit upon submission and comply with Section 01 35 23, Hot Work Operations and Control.

F. Any roof membrane damage, regardless of severity, MUST be reported to Facilities Building Maintenance immediately.

G. No smoking on roofs.

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H. Throwing anything from the roof is prohibited. Loose objects that can blow off the roof may not be left unattended.

I. Lifting or lowering objects from the edge of the roof or from level to level on a roof is prohibited unless:

1. The work is performed by trained personnel using the proper lifting equipment.
2. Fall protection measures are in place.
3. Ground safety measures are in place.
4. All applicable OSHA rules are being followed at all times.

J. Tampering with any existing roof equipment is strictly prohibited. Penetrations through a roof membrane or roof component must be approved in advance through a Facilities Building Maintenance Supervisor.

K. Sharp or pointed objects may not be placed directly on roof membrane. All equipment must be placed on pads or curbs and in such a way that damage to the roof membrane or roof components will not occur.

1.05 ROOF CLEANUP

A. All debris and materials must be secured and kept at least ten (10) feet from the roof edge. All debris must be removed at the end of each day.

B. Roof must be inspected by Energy, Transportation and Asset Management (ETAM) Roofing Manager before leaving the roof area.

C. Contractor shall perform Cleaning and Waste Disposal in accordance with Section 01 74 13 and Section 01 74 19.

1.06 ENFORCEMENT

A. Violations

1. If the Contractor violates terms of its Operating Authority or the Code of Rules and Regulations, the OAR will notify the Contractor of the violation and may either deny or terminate access to roof based on the nature of violation.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

- END OF SECTION -

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CONTRACTOR ROOFING AREA ACCESS – FORMS

DFW INTERNATIONAL AIRPORT
Roof Access Request Form

ETAM requires **SEVEN** work days to process a request
DO NOT include security sensitive information on this form

Communications process:

The requestor shall complete this form, ALL Pages and include or attach as much information as possible, including drawing(s), column and grid location when scheduling a roof access. Once the form is completed, email to **accessroof@dfwairport.com** for processing. The Airport requires seven work days to coordinate the requests. This allows time for all stakeholders to adequately review, ask questions, prepare personnel & equipment and approve the request.

Stakeholders should review the request and note any concerns to include but not limited to security violations, safety issues, operational impacts, etc... If special instructions or contingency plans need to be addressed, please respond to **ALL** and detail your concerns and requirements. If the contingency plan is sensitive information, send this directly to the Roofing Manager; do not distribute the information except to authorize personnel.

GENERAL INFORMATION – ALL REQUIRED INFORMATION				
Requestor Name	On Site Contact Person	Phone		
Company Name	Contact Info	Contact Phone		
Date(s) of Access	Time (midnight will not be accepted):	Terminal	Gate or Fac.#	Column/Row
Anticipated Completion Date	Photographs – Minimum 3	New	Existing	SkyLink

Impacted Facilities/Terminals: **Facility # and Level/Location Required.*

Facility #	Facility Name	Facility Level / Location	Reason for Access

Approved: _____ Roofing Manager: _____ Date:

Notes:_____

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DFW INTERNATIONAL AIRPORT
Flash Penetrations through Roof/Walls Request Form

ETAM requires **seven** work days to process a request

DO NOT include security sensitive information on this form

Communications process:

The requestor shall complete this form, ALL Pages and include or attach as much information as possible, including drawing(s), column and grid location when scheduling a rooftop unit flashing or penetration. Once form is completed, email to accessroof@dfwairport.com for processing. The Airport requires seven work days to coordinate the requests. This allows time for all stakeholders to adequately review, ask questions, prepare personnel & equipment and approve the request.

Stakeholders should review the request and note any concerns to include but not limited to security violations, safety issues, operational impacts, etc... If special instructions or contingency plans need to be addressed please respond to **ALL** and detail your concerns and requirements. If the contingency plan is sensitive information, send this directly to the Roofing Manager; do not distribute the information except to authorize personnel.

GENERAL INFORMATION – ALL REQUIRED INFORMATION				
Requestor Name	On Site Contact Person	Phone		
Contractor Company Name	Contractor Contact Info	Contractor Contact Phone		
Date(s) of Install Requested	Time (midnight will not be accepted):	Terminal	Gate or Bldg.#	Column/Row
Date(s) completed	Photographs – Minimum 3	New	Existing	Non-Degradable Labels

Include any attachments (schedules, drawings, specifications, Product Data, MSDS sheets, etc.) with the email. NOTE: ALL ROOFTOP EQUIPMENT AND DISHES MUST BE LABELLED.

ADDITIONAL EQUIPMENT OR INFORMATIONAL REQUIREMENTS			
APPROVAL	**ITEM**		**DESCRIPTION**

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- END OF SECTION -

SECTION: 01 91 00

COMMISSIONING

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes the requirements for Commissioning the Project including:
   1. Start up and testing of equipment and systems.
   2. Identification and documentation of all infrastructure, systems, and equipment (Systems) issues and failures.
   3. Corrective Actions and acceptance of corrected Systems.
   4. Coordination of Commissioning requirements.
   5. Cloud based Commissioning (Cx) platform shall be provided by the Commissioning Agent (CxAg) and utilized by the Cx team for commissioning project documentation.

1.02 RELATED REQUIREMENTS

A. Section 01 31 00, Building Information Modeling
B. Section 01 77 00, Closeout Procedures
C. Section 01 77 00.01, Closeout Procedures – System Acceptance
D. Section 01 78 23, Operation and Maintenance Data
E. Section 01 78 33.36, Bonds and Warranties
F. Section 01 78 39, Project Record Documents
G. Section 01 79 00, Demonstration and Training

1.03 DESCRIPTION

A. Purpose:
   1. To obtain an approved Commissioning Plan and final Commissioning Report accepted by the Airport Commissioning Authority as required by Airport Board Policy (ABP).
B. Design and Construction Phase Commissioning Goal:
   1. Issuance of a Commissioning Plan to reflect the design intent of the final system configurations and operations necessary to obtain a permit for construction.
C. Post-Construction Phase Commissioning Goal:
   1. The Issuance of an approved final Commissioning Report to reflect all Systems commissioned have been designed, installed, operated, and functionally tested to meet the construction specification requirements and have met the minimum operational and training requirements of the Owner as necessary for the Owner acceptance and issuance of a Certificate of Occupancy (CO).
D. Systems to be commissioned will be listed in detail in the Specifications listed below, and in PART 3 of this Section, when applicable with the Project's Scope of Work:
   1. Division 5 – Metals
   2. Division 7 – Thermal Moisture Protection / Building Envelope
   3. Division 11 – Equipment
   4. Division 13 – Special Construction

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5. Division 14 – Conveying Equipment
6. Division 21 – Fire Suppression
7. Division 22 - Plumbing
8. Division 23 – Heating, Ventilation, and Air Conditioning (HVAC)
9. Division 25 – Integrated Automation
10. Division 26 – Electrical
11. Division 27 – Communications
12. Division 32 – Exterior Improvements
13. Division 33 – Utilities
14. Division 34 – Transportation

1.04 DEFINITIONS

A. Basis of Design: The Basis of Design (BOD) is a document that details the Architect/Engineer's design plan to achieve the Owner's Project Requirements (OPR). This document includes assumptions, existing conditions, and performance boundaries.

B. Commissioning: A systematic process of verifying and documenting that the performance and maintainability of Systems fulfill the operational and functional requirements of the Owner and the Owner's representatives, users, and operators. Commissioning is intended to achieve the following specific objectives according to the Contract Documents.

1. Verify that all applicable Systems are installed according to the Contract, manufacturer's recommendations, and to industry accepted minimum standards and that they receive adequate operational checkout by the Installing Subcontractor(s).
2. Verify and document proper performance of all Systems.
3. Verify that all Operations and Maintenance (O&M) documentation is complete.
4. Verify that the Owner's operating personnel are adequately trained.

C. Commissioning Agent (CxAg): The person selected to chair the Commissioning Team and coordinates and oversees the development and execution of the Commissioning Plan. The CxAg will be selected and employed by the Owner. The CxAg will be a licensed professional engineer in the State and experienced in the Commissioning of mechanical and electrical systems of the type and complexity installed in this Project. The CxAg will have experience in construction process, direct digital control systems, and test adjust and balance operations. The CxAg shall not be associated with or employed by the Contractor or any Subcontractor or equipment/system supplier connected with the Project.

D. Commissioning Coordinator: An authorized representative of the Owner, Contractor, Installing Subcontractor(s) or other members of the Commissioning Team who are designated in writing to the Commissioning Team, who attend Commissioning meetings and who act as the responsible central point of contact between their companies and the Commissioning Team.

E. Commissioning Authority (CxAu) or Designee (CxAuD). DFW Airport Board manager responsible for ensuring compliance with the DFW Airport Board Commissioning Policy and approving proponents for commissioning, the project commissioning plan, and the Final Commissioning Report.

F. Commissioning Plan: The plan prepared by the CxAg provides guidance and outlines the execution of the Commissioning process, verifying that the Systems perform at or above the expected level as specified in the Contract Documents. The Commissioning Plan is a detailed account of the Commissioning activities as they relate to the Project. The plan includes a list

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of Commissioning Team members, phases of the Project, each team member's Commissioning related responsibilities during each phase and the expected deliverables from each team member. Communication protocols between the members of the team and their respective companies are defined in the plan. As a living document, the plan will be continuously updated to reflect the evolving process as developed by the Commissioning Team. The Final Commissioning Plan is inclusive of the completed initial approved Commissioning Plan plus all approved and completed commissionable items associated with construction phase changes as provided for in the following:

1. Requests For Information.
2. Design Change Notices.
3. Approved Addenda or Alternatives.
4. Approved final submittals, including control systems sequences of operation.

G. Commissioning Team: The group responsible for working together to implement the Commissioning process. The group can consist of all, or part of the following members as dictated by the complexity and length of a Project:

1. Commissioning Authority (CxAu)
2. Senior Commissioning Manager (Sr. CxM)
3. Senior or Implementation Project Manager
4. Project Manager
5. Commissioning Manager (CxM)
6. Commissioning Agent (CxAg)
7. Architect/Engineer
8. Construction Manager at Risk (CMAR)
9. Contractor Commissioning Coordinator
10. Contractor
11. Controls Subcontractor (CC)
12. Electrical Subcontractor (EC)
13. Mechanical Subcontractor (MC)
14. Fire Protection Subcontractor (FPC)
15. Owner's Authorized Representative (OAR)
16. Owner's Authorized Facility Manager
17. Owner's Authorized Central Utility Plant (CUP) Manager
18. Quality Assurance (QA) Inspectors
19. Design Code and Construction Department (DCC) Inspector
20. Design Code and Construction Department (DCC) Representative
21. Information Technology Systems (ITS) Representative
22. Department of Public Safety (DPS) Representative
23. Energy, Transportation and Asset Management (ETAM) Representative
24. Environmental Affairs Department (EAD) Representative
25. Testing, Adjusting and Balancing (TAB) Subcontractor

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26. Other Installing Subcontractors or equipment suppliers.

H. Contractors Test Report: The Contractors' tests are defined as any form of start-up, adjustment, or calibration performed on individual pieces of equipment as specified within the Contract Documents. The CxAg will provide a test report form to be used by the Installing Subcontractor as a cover sheet for the actual test results, for the documentation of each specified Contractor's test. The Contractor is responsible for uploading the digital documents to the Owner's designated electronic project management system, the Skier Unifier software application, or as otherwise directed by the OAR for the Project.

I. Deficiency: An issue or observation that prohibits the successful passing of any step on the verification test procedure for any Systems that are specified in the Commissioning scope of the Project.

J. Issue: An observable item reported as a possible risk or concern to the Project.

K. Installing Subcontractor: The Subcontractor or supplier responsible for the actual installation of the System.

L. Owners Project Requirements (OPR): A written document detailing the functional requirements of the Project and the expectations of how it will be used and operated by the Owner. The document may include Project and design goals, measurable performance criteria, budgets, schedules, success criteria, and supporting information. This document may evolve as the Project progresses.

M. Pre-Functional Checklist (PFC): A checklist created by CxAg designed to demonstrate that the system is completely installed and ready for Functional Performance Testing. At the end of installation, the Installing Subcontractor completes the PFC to certify that the work is complete, and the system is ready for Functional Performance Testing.

N. Functional Performance Test (FPT): A test that confirms each system will perform as specified functionally. The Installing Subcontractor shall perform each FPT. The CxAg will coordinate, witness, and document the FPT. During the FPT, the Installing Subcontractor shall sequence the system as outlined in the approved FPT procedure and provide the required test equipment and building automation system access as required.

O. Commissioning Issues Log: A formal and ongoing record or deficiencies or issues and their resolution, which have been raised by members of the commissioning team during the commissioning process. The Commissioning issues log shall be maintained through a digital or cloud based-commissioning platform, method approved by Commissioning Authority (CxAu).

P. Digital/Cloud based Commissioning Platform: A digital/cloud-based platform where project specific commissioning documents will be housed and accessed during the duration of the project. Access to the selected platform to be provided by the CxAg to pertinent commissioning team members.

1.05 COMMISSIONING AIRPORT BOARD POLICY AND COMMISSIONING PLAN

A. Under Airport Board Policy ET.001.04 – Commissioning, it is the policy of the Board that all Board buildings and other appropriate facilities, infrastructure, and Systems be commissioned. The policy provides the requirements for commissioning acceptance by the Airport's Commissioning Authority and the Commissioning Authority Designees.

B. The Commissioning Plan provides guidance in the execution of the Commissioning process based on the Project Scope of Work.

C. Commissioning Process provides a brief overview of typical Commissioning tasks during construction and the general order in which they should occur on the Project.

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1. Commissioning during construction begins with a scoping meeting conducted by the CxAg where the Commissioning process is reviewed with the Commissioning Team members.
2. Additional meetings may be required throughout construction to plan, scope, coordinate, schedule future activities and resolve problems.
3. Equipment documentation including Architect/Engineer approved submittals are provided to CxAg including detailed start-up procedures.
4. CxAg works with the Commissioning Team in developing start-up documentation formats, including PFCs, to be completed during the start-up process.
5. The checkout and performance verification proceeds from simple to complex, from component level to Systems and intersystem levels with PFCs being completed prior to functional testing.
6. The Installing Subcontractor(s), under his own direction, execute and document the PFCs and perform start-up and initial checkout. The Contractor documents that the PFCs and start-up were completed according to the approved plans. The Installing Subcontractor(s) will provide a minimum three (3) Working Days, notification to the CxAg, OAR, and other Owner's personnel of the date and time scheduled for performing start-up and initial checkout processes prior to the start up, so that they may witness start-up and the initial checkout.
7. The CxAg, in cooperation with the Installing Subcontractor(s), suppliers, and manufacturers develop specific equipment and system FPT procedures for all designated divisions and any other Systems identified as requiring Commissioning as part of the Project.
8. All other Divisions shall have the Contractor and the Installing Subcontractor(s), in cooperation with the suppliers and manufacturers; develop specific equipment and system FPT procedures to be submitted for Architect/Engineer approval and in accordance with the Project Specifications for use by the Commissioning Team for review, comment, and report form development. The FPT procedures are executed by the Installing Subcontractor(s), witnessed and documented by the CxAg.
9. Items or issues associated with non-compliance in material, installation, setup, or sequence of operation are corrected at the Contractor’s expense and the system retested.
10. The Contractor reviews the O&M documentation for completeness and schedules and coordinates the Owner’s personnel training. All O&M documentation must be submitted in accordance with Section 01 78 23 and approved prior to the start of training. Refer to Section 01 79 00 for additional requirements.
11. The Contractor reviews and coordinates the training provided by the Installing Subcontractor(s), suppliers, manufacturers, the CxAg documents and verifies that the training was conducted and met the minimum requirements of the Owner. Refer to Section 01 79 00 for demonstration and training requirements.
12. Deferred testing is conducted, as specified for standard testing.
13. Final Commissioning Plan shall be completed and documented prior to Substantial Completion.
14. A Commissioning summary log is required in the Commissioning Plan and report to identify all Systems designated to have warranties and their warranty duration. Refer to

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Section 01 78 33.36 for acceptance procedures for generic and final warranty manual submissions.

1.06 RESPONSIBILITIES

A. The Contractor shall:

1. Develop and provide a complete list of Systems to be commissioned and of Systems requiring Owner personnel training for inclusion into the Commissioning Plan.
2. Facilitate the coordination of the Commissioning work and ensure that Commissioning activities are being scheduled into the master schedule.
3. Include the cost of Commissioning in the Contract Amount.
4. Furnish a copy of all Contract Documents, Addenda, Requests for Information (RFI), Change Orders, and approved submittals and Shop Drawings related to commissioned Systems to the CxAg.
5. Ensure each purchase order or subcontract written includes requirements for submittal data, O&M data, Commissioning tasks and training.
6. Assist with the development and documentation of Commissioning test procedures for all Systems with the Installing Subcontractor(s).
7. Ensure that all Installing Subcontractor(s) execute their Commissioning responsibilities according to the Commissioning Plan, Contract Documents, and schedule.
8. Designate a Commissioning Coordinator who will attend Commissioning scoping meetings and other necessary meetings scheduled by the CxAg to facilitate the Commissioning process.
9. Coordinate the training of the Owner's personnel, including reviewing and approving the training plans and coordinate the digital recordings of the Owner's personnel training including clear audio recording of all questions and inquiries and their associated responses, in accordance with Section 01 79 00. B.
10. Utilize the cloud-based commissioning platform for commissioning documentation.

B. The Contractor shall ensure that all Installing Subcontractor(s):

1. Include the cost of Commissioning as a line item in the sub-contract price.
2. Provide submittal data, O&M data, Commissioning tasks and training according to Contract Documents in each purchase order or subcontract written.
3. Designate a Commissioning Coordinator who shall attend the Commissioning scoping meeting and other meetings scheduled and required by the Commissioning Agent to facilitate the Commissioning process.
4. Provide normal cut sheets and shop drawing submittals of approved equipment as part of the submittals.
5. Provide documentation prior to normal O&M Manual(s) submittal to the Contractor and CxAg for development of start-up and FPT procedures.
    a. Provide the following to the Contractor and CxAg:
        1) Detailed manufacturer installation and start-up instruction.
        2) Operating, troubleshooting and maintenance procedures.
        3) Full details of any Owner-contracted tests.
        4) Full factory test reports.
        5) Full warranty information which clearly identifies all responsibilities of the Owner to keep the warranty in force.
        6) Installation, start-up and checkout materials that are shipped with the equipment.

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7) Actual field checkout forms are to be used by the factory or field technicians.

b. Provide the proposed O&M Manual(s) format, organization, and content to CxAg for review and comment. The manual shall follow the guidelines in accordance with Section 01 78 23.

c. Provide additional documentation, deemed necessary by the CxAg, for the Commissioning process.

6. Prepare and provide a copy of the O&M Manual(s) and submittals of the commissioned Systems using normal submittal procedures through the Contractor to the CxAg for review and comment.
7. Assist in clarifying the operation and control of commissioned Systems in areas where the Project Specifications, control drawings, or equipment documentation are insufficient for writing detailed testing procedures. Coordinate efforts with the Architect/Engineer as required.
8. Coordinate with the CxAg and provide the specific FPT procedures to ensure feasibility, safety, equipment protection, and provide necessary written alarm limits to be used during the tests to the CxAg through the Contractor.
9. Develop a full start-up and initial checkout plan using the manufacturer's startup procedures and the PFCs for all commissioned Systems. Submit through the Contractor to the CxAg for review and comment prior to start-up.
10. Execute the PFCs through the cloud-based commissioning platform for all commissioned Systems during the start-up and initial checkout process.
11. Perform and clearly document all completed start-up and system operational checkout procedures, providing a copy to the Contractor and the CxAg.
12. Address and resolve current Punch List items prior to beginning FPTs.
13. Provide skilled technicians to execute the starting of equipment and to execute the FPT. Ensure that technicians are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments, and problem solving.
14. Perform FPTs for specified Systems. Assist the CxAg in interpreting the monitoring data, as necessary.
15. Correct all deficiencies which include differences between specified and observed performance as interpreted by the Contractor and/or CxAg and the Architect/Engineer and retest the equipment.
16. Prepare the O&M Manual(s) according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
17. Prepare redline and CAD (electronic) drawings for all final as-built drawings for Contractor-generated coordination drawings.
18. Provide training of the Owner's operating personnel as required in the Commissioning Plan. Refer to Section 01 79 00 for demonstration and training requirements.
19. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty. Develop, execute and document Contractor maintenance plans for Systems placed into service prior to beneficial occupancy. Provide records and reports of all pre-turnover maintenance.
20. Provide the equipment for testing in accordance with the Project Specifications.

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C. The Contractor shall ensure that equipment suppliers:

1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep all applicable warranties in force.
2. Include all special tools, including software and instruments only available from the supplier and specific to a piece of equipment, required for testing equipment according to these Contract Documents in the base bid price provided to the Contractor. This bid price does not include stand-alone data logging equipment that may be used by the CxAg.
3. Provide information requested by the CxAg regarding Systems sequence of operation and testing procedures.
4. Review test procedures for Systems installed by factory representatives.

D. Architect/Engineer

1. Designate a Commissioning Coordinator who shall attend the Commissioning scoping meeting and other necessary meetings scheduled by the CxAg to facilitate the Commissioning process.
2. Provide the Basis of Design (BOD) documentation to the Contractor for inclusion in the O&M Manual(s).
3. Review SRCs for Systems to be commissioned.
4. Assist in clarifying the operation and control of commissioned Systems in areas where Project Specifications, control drawings, or equipment documentation are insufficient for writing detailed testing procedures.
5. Review of O&M Manual(s) according to the Contract Documents.
6. Provide technical assistance for resolution of non-conformances or deficiencies as appropriate.

E. Commissioning Agent (CxAg)

1. The primary role of the CxAg is to coordinate the development and execution of the Commissioning Plan, and to observe and document the performance of commissioned Systems, in particular, whether Systems are functioning in accordance with the documents design intent and in accordance with the Contract Documents. The CxAg is not responsible for design concepts, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CxAg may assist with problem solving non-conformances or deficiencies, but ultimate responsibility for such corrections is the responsibility of the Contractor, Installing Subcontractor(s), manufacturer, and/or Architect/Engineer, as appropriate. The CxAg will:
    a. Provide digital or cloud-based commissioning platform for use on the project (or alternate method approved by the CxAuD). Access to the selected platform to be provided by the CxAg to pertinent commissioning team members.
    b. Coordinate the development of and maintain the Commissioning Plan.
    c. Coordinate the Commissioning activities.
    d. Coordinate the Commissioning work and coordinate with the Commissioning Team to ensure that Commissioning activities are being incorporated into the master schedule.
    e. Assist with the revisions to the Commissioning.
    f. Plan and conduct a Commissioning scope and coordination meeting.
    g. Request and review information required to perform Commissioning tasks, including O&M materials, Contractor start-up and checkout procedures.

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h. Prior to start-up operations, gather and review the current control sequences and interlocks and work with the Installing Subcontractor(s) and the Architect/Engineer until sufficient clarity has been obtained, in writing, to be able to assure detailed testing procedures are written.
i. Review the submittals of the Contractor and Installing Subcontractor(s) applicable to Systems being commissioned for compliance with Commissioning requirements, along with normal construction submittals.
j. Create, review, approve, and distribute preliminary pre-functional checklists (PFCs).
k. Review and comment on the start-up and initial checkout plan for Systems as developed by the Installing Subcontractor.
l. Perform site visits, to observe component and system installations. Attend selected planning and Project construction meetings to obtain information on construction progress. Review Project construction meeting minutes for revisions/substitutions relating to the Commissioning process. Assist in resolving any discrepancies.
m. Review pre-functional checklists for acceptance and conduct site observations as necessary for quality assurance.
n. Review start-up reports.
o. Analyze any FPT data as well as trend logs and monitor data to verify performance.
p. Coordinate, witness, and approve manual FPTs performed by the Installing Subcontractor(s). Coordinate re-testing as necessary until satisfactory performance is achieved.
q. Review equipment warranties to ensure that the Owner's responsibilities are clearly defined and provide a listing of warranties indicating equipment and duration of warranty.
r. Witness and document the training of the Owner's operating personnel. Provide a sign-in sheet for each session and conduct survey after each session.
s. Compile and maintain a Commissioning issues log through a digital or cloud-based commissioning platform (method approved by CxAu). Acceptance of the Commissioning process is dependent on the resolution of all Commissioning issue log items.
t. Review and approve the preparation of the Systems O&M Manual(s) in accordance with Section 01 78 23. Compile and provide listing equipment for the O&M Manual(s).
u. Provide a final Commissioning Report including suggestions for improvement in the process.
v. Provide benefit and value matrix and identify the Commissioning value matrix in final Commissioning Report.
w. Identify additional areas or Systems that should be included in the warranty manual information provided or in other areas under the Contract Documents.
x. Assist the Owner's personnel in developing reports, documents, and requests for services to remedy outstanding problems.

1.07 SCHEDULING

A. The CxAg will work with the Commissioning Team to schedule the Commissioning activities. The CxAg will provide sufficient notice to the Commissioning Team for scheduling Commissioning activities. The Contractor shall integrate all Commissioning activities into the master schedule. All parties will address scheduling problems and provide the necessary notifications in a timely manner to expedite the Commissioning process.

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1.08 QUALITY ASSURANCE

A. The Contractor and each Subcontractor involved with Systems to be commissioned on the Project will assign a Commissioning Coordinator with at least five (5) years' experience with coordination of construction disciplines and verification testing of complete systems. This position is not a full-time position unless the complexity of the job requires such a full-time position. The Commissioning Coordinator(s) will be submitted for approval of the OAR subject to satisfactory experience and performance. The Commissioning Coordinator(s) responsibilities shall include:

1. Coordination meetings.
2. Planning.
3. Scheduling.
4. Documentation.
5. Maintain close communication and coordination with the CxAg.
6. Development of testing procedures in coordination with the Installing
7. Subcontractor(s).
8. Submitting the Contractor's test report submittal to the CxAg through the cloud-based platform.
9. Submit the completed PFCs to the CxAg through the cloud-based platform.
10. Perform functional performance tests (FPTs).
11. Corrective Actions rectification and documentation.
12. Specified training planning and coordination.

1.09 QUALITY CONTROL

A. Ensure that the Contractor and each Installing Subcontractor follow the established Contractor's Quality Control (QC) program and procedures.

B. Ensure that the Contractor and each Installing Subcontractor correct all deficiencies and incorporate the necessary adjustments to O&M Manual(s) and as-built drawings for applicable issues identified in any seasonal testing.

1.10 SUBMITTALS

A. The CxAg will provide the Contractor with specific requests for the type of submittal documentation required to facilitate the Commissioning work. These requests include the submission of electronic versions of all submittals, documents, manuals, etc. and will be integrated into the normal submittal process and protocol of the construction personnel and added to the Contractor's submittal register. At a minimum, each request will include:

1. Manufacturer and model number.
2. Manufacturer's printed installation and detailed start-up procedures.
3. Full sequences of operation.
4. O&M data.
5. Performance data.
6. Any performance test procedures.
7. Control drawings.
8. Details of Owner contracted tests.

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9. List of installation materials that are shipped with the equipment.
10. Field checkout sheet forms to be used by the factory or field technicians.
11. Factory test results.

B. All documentation requested by the CxAg will be included in each Installing Subcontractor(s) contribution to the O&M Manual(s).

C. The CxAg will review and comment on approved submittals related to the commissioned Systems for conformance to the Contract Documents as it relates to the Commissioning process, to the functional performance of the Systems, and to adequacy for developing test procedures. This review is intended primarily to aid in the development of FPT procedures and only secondarily to verify compliance with the Systems specifications.

D. The Contractor shall ensure that each Installing Subcontractor(s) designates a Commissioning Coordinator and provides information facilitating the incorporation and coding identification of Commissioning activities in the Construction Schedule within four (4) weeks of the Notice to Proceed (NTP).

E. The Contractor shall submit a detailed schedule to the CxAg at least four (4) weeks prior to start of testing.

F. The Contractor shall ensure that each Installing Subcontractor(s) submits test reports through the Contractor to the CxAg upon successful completion of each test.

G. The Contractor shall ensure that each Installing Subcontractor(s) submits information for the O&M Manual(s) (format, content, and organization) through the Contractor to the Architect/Engineer and the CxAg for review within at least ninety (90) Calendar Days prior to the start of scheduled verification testing.

H. The Contractor and each Installing Subcontractor(s) shall submit the O&M Manual(s) in accordance with the individual Specification Sections requiring an O&M Manual(s) and Section 01 78 23.

I. The supplier and Installing Subcontractor shall certify that the installed and operating Systems have been completed (with all deficiencies corrected) and that they are performing in accordance with the Contract Documents including all tests and other requirements stipulated therein.

1.11 TRAINING

A. The Contractor shall coordinate O&M training activities through the Commissioning Plan.

1. The Contractor shall provide training plans for equipment software systems and major components as specified in individual Project Specifications a minimum of ninety (90) Calendar Days prior to beginning verification testing.

B. The Training Plan shall include:

1. Equipment or Systems involved in training session.
2. Trainer’s name, company, and experience.
3. Course outline/syllabus and list of training materials.
4. Time required for the training session(s).

C. Suggested Training Topics:

1. Preventive maintenance procedures and frequencies.
2. Visual inspection parameters include operating sound and noise warnings.
3. Normal range of gauge and meter readings.

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4. Use of special tools.
5. Source of operating supplies, lubricants, cleaning materials, etc.
6. Manufacturer contact names and telephone numbers.
7. Warranty periods and enforcement procedures.
8. Design and normal functional operating parameters (capacities, flows, temperatures, speeds, energy consumption, etc.
9. Breakdown or malfunction conditions and troubleshooting.
10. Routine testing procedures.

D. The Contractor shall document performance of training session by completing the O&M training form provided by the OAR. Indicate on the form:
1. Date of training.
2. List of attendees and their affiliation.
3. Planned duration of training (hours and/or minutes).
4. Topics agenda, instructor names & company affiliation, instructor contact information.
5. Detailed list of planned handouts.

E. The Contractor shall obtain written acceptance of training session from the CxM.

F. The Contractor shall record all training sessions and submit for review and approval in accordance with Section 01 79 00 and submit the final documentation after incorporating all edits required by the review in accordance with Section 01 79 00 with a fully executed O&M training form.

PART 2 – PRODUCTS

2.01 TEST EQUIPMENT

A. The Contractor or Installing Subcontractor shall provide all standard testing equipment required to perform startup and initial checkout and the required FPT shall be provided by the Installing Contractor for the equipment being tested.

B. The Contractor or Installing Subcontractor shall provide special equipment, software, tools, and instruments that are only available from the supplier and specific to a piece of testing equipment (test tools) required for adequate testing. The cost of such test tools shall be included in the base bid price to the Contractor and will become the property of the Owner when testing is complete.

C. The Contractor or Installing Subcontractor shall repair any damage to these test tools and calibrate the tools, so they are fully functional when turned over to the Owner and provide full documentation on the use, maintenance and calibration with these test tools.

D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Contract Documents.

E. Calibration records for all testing equipment shall be provided to the CxAg through the Contractor.

PART 3 – EXECUTION

3.01 MEETINGS

A. Scoping Meeting:
1. Approximately 30-60 Calendar Days prior to start-up of construction or installation of the Systems to be commissioned, the CxAg will schedule, plan and conduct a Commissioning

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scoping meeting with the entire Commissioning Team in attendance. Multiple scoping meetings may be required due to multiple features of the Work as the construction progresses. The Contractor shall prepare and distribute meeting minutes to all parties. Information gathered from this meeting will allow the CxAg to revise the Commissioning Plan to its "final" version, which will also be distributed to all parties.

B. Miscellaneous Meetings

1. Additional meetings may be planned and conducted by the CxAg as construction progresses covering such topics as coordination, deficiency resolution, and planning issues with the respective Installing Subcontractor(s).

3.02 REPORTING

A. The CxAg will provide regular updates and reports to the Commissioning Authority and OAR.

B. The CxAg will regularly communicate with all members of the Commissioning Team to apprise them of the Commissioning progress and scheduling changes through memos, progress reports, etc.

C. The CxAg will provide regular Commissioning issues log updates through the digital or cloud-based platform to all members of the Commissioning team.

D. A final Commissioning Report by the CxAg will be provided focusing on evaluating the Commissioning process issues and identifying areas where the process could be improved. All acquired documentation, logs, minutes, reports, communications, findings, unresolved issues, etc., will be compiled in appendices and provided with the report. PFCs, FPTs, and monitoring reports will be part of the final Commissioning Report.

E. CxAg will provide a digital or cloud-based commissioning platform for use on the project (or alternate method approved by the CxAu). Access to the selected platform to be provided by the CxAg to pertinent commissioning team members. Approved platforms may include, but are not limited to:

1. Facility Gride
2. CxAlloy
3. Others as approved by CxAu

F. Commissioning Deliverables:

1. Design Review Report / Comments Log
2. Design Phase Cx Plan
3. Project Kick-off Meeting – Agenda / Minutes
4. Weekly Cx Coordination Meeting – Agenda / Minutes
5. Monthly Project Progress Report
6. Construction Phase Cx Plan
7. Cx Issues Log
8. Draft Cx Report
9. Lessons Learned Meeting / Report
10. Project Closeout Record Documentation
11. Final Cx Report – Published in a digital format report
12. Addendum Cx Report – Opposite Season / 10-month Warranty Inspection
13. Lessons Learned Meeting / Report

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G. Validate the following specification requirements have been met:
   1. 01 31 00 Building Information Modeling (BIM)
   2. 01 77 00 Closeout Procedures
   3. 01 77 00.01 System Acceptance
   4. 01 78 23 Operation & Maintenance
   5. 01 78 33. 36 Bonds and Warranties
   6. 01 78 39 Project Record documents
   7. 01 79 00 Demonstration & Training

3.03 SYSTEMS TO BE COMMISSIONED

A. The Division 22 and 23 Installing Subcontractor(s) shall take the lead in Commissioning of the following mechanical and plumbing systems. The list of systems to be commissioned on individual projects will vary and may include but not be limited to the following:
   1. Hydronic chilled and heating water coil and piping
   2. Vapor barrier insulation and thermal protection systems
   3. Domestic Hot Water piping systems
   4. Variable frequency drives
   5. Air handling units
   6. Fan coil units
   7. VAV terminal units
   8. Fan powered terminal units
   9. General exhaust fans
   10. Plumbing systems
   11. HVAC test and balance
   12. Building management and control systems
   13. Heat Trace Systems
   14. Heat Exchangers
   15. Radiant, Unit, or Duct Heaters
   16. Emergency Power Systems

B. The Division 26 Installing Subcontractor(s) shall take the lead in Commissioning of the following electrical Systems. The list of systems to be commissioned on individual projects will vary and may include but not be limited to the following:
   1. Lighting and lighting control systems
   2. Electrical switchgear
   3. Automatic transfer switches
   4. Uninterrupted power systems
   5. Fault current analysis verification
   6. Grounding systems
   7. Lightning protection systems
   8. Emergency lighting

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9. Branch and distribution panels
10. Distribution transformers
11. Electric Vehicle Charging Stations
12. Heat Trace Systems
13. Renewable Energy Generation Systems
14. Specialty Electrical and lighting Systems
15. Digital Signage and information display systems
16. Auto docking Levelers
17. Dock Screening equipment
18. Smart Restrooms
19. Generators
20. Battery Backup Systems
21. Equipment and Facility Integrated System Tests (IST)
22. Conveyance and transportation systems
23. Cathodic protection systems

C. The Installing Subcontractor and suppliers shall take the lead in Commissioning of the following Systems:
   1. Division 34 - Baggage Handling Systems.
   2. Division 14 or 34 - Vertical Transportation Systems.

D. The OAR will take the lead in Commissioning of the following Systems:
   1. Division 5 – Metal: Guard Rails / Ladders / Stairs / Barriers
   2. Division 7 and 10 – Thermal and Moisture Protection / Building Envelope
   3. Division 11 - Equipment
   4. Division 13 – Special Construction
   5. Division 14 or 34 – Passenger Boarding Bridges
   6. Division 21 - Fire suppression systems
   7. Division 26- Photometric Measurements
   8. Division 27 - Access control and CCTV systems
   9. Division 27 - Communications and technology systems (Ethernet, fiber, phones, etc.)
   10. Division 28 - Fire alarm and voice evacuation system
   11. Division 28 - Public address system
   12. Division 32 – Exterior Improvements
   13. Division 33 - Utilities
   14. Division 34- Pavement sensors

3.04 CONTRACTOR TEST

A. The Contractor shall ensure that each Installing Subcontractor and suppliers provide a list and schedule of specified Contractor tests to the CxAg.

B. Unless specified otherwise, the Contractor shall provide a minimum of four (4) weeks' notice to the CxAg prior to execution of the specified Contractor's tests.

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C. The Contractor shall submit test reports to the CxAg and the Architect/Engineer within one (1) week of completion of each test.

3.05 SUBSTANTIATING SYSTEM READINESS

A. The Contractor shall:

1. Construct or install Systems and confirm readiness for testing prior to start of FPTs.
2. Inform the CxAg in writing of the System readiness for verification testing at least four (4) weeks prior to the scheduled start of testing. Complete the SRCs and submit to CxAg.
3. Perform and document instrumentation and digital controller calibration or provide documentation verifying manufacturer's performance of calibration prior to FPT testing. CxAg may observe calibration procedures.
4. Do not commence with any FPT until such Systems have been documented as ready for testing via finalization of the PFC through the cloud-based commissioning platform and has been reviewed and accepted by the CxAg.

3.06 START-UP, PRE-FUNCTIONAL AND INITIAL CHECKOUT

A. The following procedures apply to all equipment and systems to be commissioned as part of the Project.

1. The Installing Subcontractor(s) responsible for the startup of any System shall develop detailed start-up plans for all equipment which is a part of that System. Each piece of equipment will receive a full pre-functional checkout. The CxAg will assist in the development of a detailed start-up plan to ensure that each of the manufacturers' recommended procedures has been completed. The parties responsible for the PFC and startup will be identified in the Commissioning scoping meeting and in the PFC. The party responsible for executing FPTs are identified in the testing requirements.
   a. The CxAg will assist in the development of checklists that indicate required procedures to be executed as part of startup and initial checkout of the systems and the party responsible for their execution.
   b. The Contractor shall determine which Installing Subcontractor is responsible for executing and documenting each of the line items tasks and shall note the responsible party on the form. Each form may have more than one party responsible for its execution.
   c. The Contractor shall ensure that the Installing Subcontractor responsible for the purchase of the equipment develops the full start-up plan by combining or adding to the Architect/Engineer checklists with the manufacturer's detailed start-up and checkout procedures from the O&M Manual and the normal field checkout sheets. The plan will include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan. The full start-up plan may consist of:
      1) The PFCs.
      2) The manufacturer's standard written start-up procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
      3) The manufacturer's normal field checkout sheets.
   d. The Contractor shall ensure that the Installing Subcontractor submits the full start-up plan to the CxAg for review and comment.
   e. The CxAg will review and approve the procedures and the format for documenting them, noting any procedures that need to be added.

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f. The full start-up procedures and the approval form may be provided to the Contractor for review and approval, depending upon the management protocol.

2. Execution of PFCs and Start-up.
   a. Two (2) weeks prior to start-up, the Contractor, the Installing Subcontractor(s) and suppliers will schedule start-up and checkout with the CxAg. The performance of the PFCs, startup, and checkout are directed and executed by the Installing Subcontractor or supplier with oversight by the Contractor. When checking off PFCs. Finalized documents will be completed through the cloud base commissioning platform.
   b. The CxAg shall observe the procedures for each piece of primary equipment, unless there are multiple units, whereby a statistical sampling strategy may be used as approved.
   c. The CxAg may observe a sampling of the PFCs and start-up procedures for lower-level components of System equipment.
   d. The Contractor, in conjunction with Installing Subcontractor(s), and suppliers shall execute start-up and pre-functional checklist. The Contractor shall provide the CxAg with written notification that the start-up and the pre-functional tests or PFCs have been completed (by digital or cloud-based commissioning platform).
   e. Only individuals with direct knowledge and witnessed that a line-item task on the PFC was actually performed should initial or check that item off.

3. Deficiencies, Non-conformance and Approval in Checklists and Start-up.
   a. The Contractor shall ensure that the Installing Subcontractor clearly lists any outstanding items of the initial start-up and pre-functional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies shall be submitted to the CxAg within two (2) Working Days of the test completion.
   b. The Contractor and the CxAg shall review the report and submit either an NCR or an approval to the Installing Subcontractor. The Contractor and CxAg shall work with the Installing Subcontractor to correct test deficiencies or incomplete items. The Installing Subcontractor or suppliers shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner and shall notify the CxAg as soon as outstanding items have been corrected and resubmit an updated start-up report and a Statement of Correction on the original NCR. When satisfactorily completed, the CxAg will recommend approval of the execution of the checklists and start-up of each system using a standard form.

4. Pre-functional Test Form
   a. After the initial Systems submittal phase, the CxAg shall prepare Pre-Functional Test forms for each item of Systems equipment as part of the Commissioning process. The Contractor shall review the respective Pre-Functional Test forms for accuracy, completeness, and provide comments to the CxAg.

3.07 VERIFICATION/FUNCTIONAL PERFORMANCE TEST

A. Objective

1. The objective of Functional Performance Tests (FPTs) and verification tests is to demonstrate that each System operates according to the documented design intent and the requirements within the Contract Documents. Functional testing facilitates bringing the Systems from a state of Substantial Completion to full dynamic operation. Each System shall be operated through all modes of operation where there is a specified

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System response. The Contractor or Installing Subcontractor shall verify each sequence within the sequences of operation.

B. FPTs and verification testing may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results. The CxAg will determine which method is most appropriate for tests that do not have a specified method. Simulating conditions shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical. Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible. The Contractor and the Installing Subcontractor executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Contractor and the Installing Subcontractor shall return all affected Systems, due to these temporary modifications, to their pre-test condition.

C. The Contractor and the Installing Subcontractor shall perform verification test procedures as outlined in the approved verification test plan.

D. The Installing Subcontractor shall provide input into the Contractor's master scheduling process with regards to timing and duration of verification test procedures.

E. The CxAg will review and provide comments on final detailed verification test procedures. The Contractor and the Installing Subcontractor shall develop the verification test procedures from information incorporated in the System shop drawings and submittals.

F. The CxAg will provide feedback on the efficiency of the procedures and possible alternate approaches to achieving the same results.

3.08 FUNCTIONAL PERFORMANCE TEST FORMS

A. The Contractor and the Installing Subcontractor(s) shall provide personnel and equipment to perform the FPT procedures. After the finalization of the Pre-functional Test forms, the CxAg will prepare FPT forms for each System which is a part of the Commissioning process. The Contractor shall review the respective FPT forms for accuracy, completeness, and provide comments to the CxAg.

B. Sample FPT forms are required with each Commissioning Plan submission for acceptance.

3.09 CORRECTIVE ACTIONS

A. The Contractor shall perform or ensure the Installing Subcontractor(s) or suppliers provide Corrective Actions for the resolution of deficiencies identified in the Commissioning Issue Log.

B. The CxAg will document deficiencies discovered during the Commissioning process on an Issue Log within one (1) Working Day of discovery.

1. Deficiency Identification Process:
    a. Document date of identification.
    b. Describe the nature of deficiency.
    c. Distribute and/or provide access to the Commissioning issues log (by digital or cloud-based commissioning platform) to the Installing Contractor's Commissioning Coordinator.
    d. Distribute copies to:
        1) Contractor
        2) Architect/Engineer
        3) Other contractors impacted by deficiency.
2. The Contractor shall ensure the Installing Subcontractor performs the following:

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a. Obtains original issues log on to the Cx digital platform approved by the CxAu for the project.
b. Records the date of direction.
c. Provides a description of Corrective Action required.
d. Records the name of person issuing the direction.
e. Determines the estimated date to complete the Corrective Action.
f. Notifies, in writing, of completion of the above-mentioned activities to the CxAg.
g. Notifies / distributes (as applicable) copies of the issues log to:
    1) Architect/Engineer
    2) Contractor
    3) Installing Subcontractor's Commissioning Coordinator
    4) Other contractors impacted by the deficiency

3. The CxAg will perform a verification of the Corrective Action completion and record (by digital or cloud-based commissioning platform) the following:
    a. Date of the retest.
    b. Determined status - Resolved or Corrective Action required.
    c. Name of person performing verification.
    d. Notifies / Distributes (as applicable) copies of the issues log to:
        1) Architect/Engineer
        2) Installing Contractor's Commissioning Coordinator.
        3) Contractor.
        4) Other contractors impacted by deficiency.

C. Cost of Retesting

1. The cost for retesting and commissioning due to the action of, or a deficiency caused by, the Contractor or Installing Subcontractor shall be the sole responsibility of the Contractor. Any costs for retesting not due to the actions of, or a deficiency caused by, the Contractor or Installing Subcontractor, may be negotiated with the Owner in accordance with the Contract Documents.

D. Failure Due to Manufacturer Defect

1. If ten (10%) percent or three (3) of any individual item (size alone does not constitute a difference), whichever is greater, fails to perform in accordance with the Contract Documents (mechanically or substantively) due to manufacturing defect, which in the sole determination of the OAR renders the item unable to meet its performance requirements, all identical units will be considered unacceptable. In such a case, the Contractor shall provide the OAR and CxAg with the following:
    a. Within one (1) week of notification, the Installing Subcontractor or manufacturer's representative shall examine all other identical units and record the findings. The findings shall be provided within two (2) weeks of the original notice.
    b. Within two (2) weeks of the original notification, the Installing Subcontractor or manufacturer's representative shall provide a signed and dated, written explanation of the problem, cause of failure, and all proposed solutions including full equipment submittals of the original installation.
    c. The OAR is solely responsible for determining whether replacement of all identical units or repair is acceptable.
    d. Upon acceptance of a solution to the deficiency or non-conformance, the Contractor, Installing Subcontractor, and/or manufacturer's representative shall replace or repair all identical items and extend the warranty accordingly, if the original equipment warranty had begun, at no cost to the Owner. The replacement/repair work shall

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proceed with reasonable speed beginning within one (1) week from when parts can be obtained.

E. Approval

1. The CxAg notes each satisfactorily demonstrated FPT on the test form. The CxAg recommends acceptance of each test using a standard form. The OAR will provide any final approval on each test using the same form and will provide a signed copy to the CxAg and the Contractor.

3.10 SEASONAL COMMISSIONING AND OCCUPANCY VARIATIONS

A. The Contractor shall provide a demonstration of the operation of the Commissioned Systems at approximately ten (10) months into the initial warranty period. The CxAg will witness the demonstration of the Systems and prepare an “Opposite Season” report as well as a “Lessons Learned” report for the Project if required by the Commissioning Plan.

B. The intent of the ten (10) month demonstration will be to identify any operational concerns, document suggested solutions and review the long-term operational and re-commissioning requirements of the Systems.

C. The Contractor shall use FPT forms to document performance.

3.11 OPERATION AND MAINTENANCE MANUALS

A. The following O&M Manual requirements do not replace O&M Manual documentation requirements elsewhere in the respective Project Specification Sections.

B. The Architect/Engineer shall compile and prepare design documentation for all Systems specified in each division of the Specification Sections and deliver this documentation to the Contractor for inclusion in the O&M Manual(s) prior to the training of Owner personnel.

C. The CxAg shall receive a copy of the O&M Manual(s) for review.

D. Field checkout sheets and logs should be provided to the CxAg for inclusion in the Commissioning Record Book section of the O&M Manual(s).

E. Review of the Commissioning related sections of the O&M Manual(s) shall be performed by the Architect/Engineer, the Contractor, and the CxAg.

3.12 TRAINING OF OWNER PERSONNEL

A. The Contractor shall be responsible for training coordination, scheduling, and ultimately to ensure that training of the Owner’s personnel is completed in accordance with the requirements of this Section.

B. The CxAg shall be responsible for witnessing and approving the content and adequacy of the training of the Owner personnel for commissioned Systems.

3.13 WRITTEN WORK PRODUCTS

A. The Contractor’s written work products shall consist of the start-up and initial checkout plan described and the completed start-up, initial checkout and PFCs, manufacturer’s factory documentation and testing; field testing inspection forms, Contractor inspection forms, and O&M Manual(s) both in electronic and hard copy in accordance with this Section. These work products shall be submitted to the CxAg to be included in the final Commissioning Report as required.

3.14 FORMS AND DOCUMENTATION

A. The forms and documents to be used for the Commissioning processes shall be in accordance with the Building Commissioning Association (BCA), AABC Commissioning Group (ACG), National Environmental Balancing Bureau (NEBB), American Society of

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Heating, Refrigerating and Air Conditioning Engineers (ASHRAE), or the University of Wisconsin or as otherwise provided or approved for the Project by the CxAg and the OAR.

1. Project documentation required of the Commissioning Firm shall be provided using a cloud-based platform and may include but not limited to the following:
   a. Cx Plan
   b. Cx Specification
   c. Owner Project Requirements (OPR)
   d. Design review Checklist
   e. Design Review Comments
   f. Pre-functional Test Requirements
   g. Functional Performance Test (FPT)
   h. Project Record Documentation Checklists
   i. Project Key Log and Key Log Map
   j. Project Valve Tag Schedules and Listings
   k. Project Accessories Listings
   l. Specialized Tools or instrument Listings
   m. Project AHU filtration Listing including sizes and quantities per system
   n. Project Attic Stock
   o. Commissioning Issues Log with Resolutions
   p. Final Cx Report
   q. Systems Manual
   r. Operations and Maintenance Review / Report
   s. Photo Journaling / Equipment and Project Site Pictures
   t. Equipment Manifest – BIM LOD 500 or ETAM Forms 101 and 102
   u. Construction Document Review Log
   v. Project Training Verification Log & Training digital Media
   w. Cloud Based Cx platform information and technology instruction
   x. Addendum Cx Report – Opposite Season / 10-month Warranty Inspection
   y. Warranty Equipment Manual and Warranty Manifest – ETAM Form 104
   z. As-Built Drawings / BIM Models / Record Documents
   aa. Benefits Matrix / Log and Benefit Summary
   bb. Cost Benefit Analysis (CBA) / Valve Matrix and Value Summary
   cc. DFWIA Design Guidelines
   dd. DFWIA Administrative Policy and Procedure ET.001.04 (08/01/23)
   ee. DFWIA Green Building Standards and Worksheets
   ff. DFWIA Lessons Learned Meeting / Report
2. Provide pictures of equipment and issues identified in the commissioning issues log using digital or cloud-based commissioning platform.
3. Provide demonstration of trend logging performance of the building automation system.
4. Maintain consistency throughout Commissioning Plan and final Commissioning Report for all approved forms.
5. Provide digital hyperlinks for all Commissioning Report sections.

- END OF SECTION -

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SECTION: 02 80 00.11

ASBESTOS

PART 1 – GENERAL

1.01 SUMMARY

A. This Section covers requirements for asbestos surveys, abatements, reporting and training regarding work at DFW Airport. This specification shall be conduct in accordance with other specifications, regulations promulgated by the EPA and OSHA; guidance set forth in NIOSH; the Texas Administrative Code; and any other applicable federal, state, and local government regulations. Whenever there is a conflict or overlap of the above references, the most stringent provisions are applicable. Any variances from this specification or any of the supporting documentation must have prior approval from EAD.

1.02 RELATED REQUIREMENTS

A. Section 01 74 19, Construction Waste Management.

1.03 REFERENCES

A. The following is a list of standards and codes which may be referenced in this Section:
   1. Texas Administrative Code (TAC): Title 25 Part 295 Chapter C Texas Asbestos Health Protection Rules.
   2. U.S. Code of Federal Regulations (CFR):
      a. Occupational Safety & Health Act (OSHA):
         1) Title 29 Part 1926.1101, Construction-Asbestos.
         2) Title 29 Part 1926.134, Respiratory Protection.
      b. Environmental Protection Agency:
         1) Title 40 Part 61, Subpart M, National Emission Standards for Asbestos (NESHAP).
         2) Title 40 Part 763, Asbestos Hazard Emergency Response Act of 1986 (AHERA).
      c. Department of Transportation: Title 49 Part 171 & 172, Transportation of Hazardous Materials.

1.04 DEFINITIONS

A. Asbestos: Asbestiform varieties of Chrysotile, Amosite (Cummingtonitegrunite), Crocidolite (Riebeckite), Anthophyllite, Actinolite, and Tremolite.

B. Asbestos-Containing Material (ACM): Any material containing more than one percent asbestos.

C. Poly Sheeting: 6 mil poly sheeting.

D. Preparation Work: The TDSHS defines the term preparation as including, but not limited to:
   1. Pre-cleaning; sweeping; wet wiping; HEPA vacuuming; sealing penetrations and openings; installing polyethylene; installation of isolation barriers (critical barriers, demising/dividing walls, etc.); installation of any part of a decontamination enclosure system or any part of the water line connections to the shower, drains, and/or filtration; installation, set-up, or use of any load-out/bag-out systems; installation, maintenance, or selection of respiratory systems of fiber reduction systems (i.e.: misting, spraying, etc.); positioning of warning signs; or
   2. Installation of engineering controls (local exhaust ventilation equipped with HEPA filter dust collection systems, constructing enclosures or isolation mechanisms to control processes producing asbestos dust, ventilation of the regulated area to move contaminated air away from the breathing zone of employees and toward a filtration or

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collection device equipped with a HEPA filter); installation of scaffolding (in an area that may disturb asbestos during the installation); installation, set-up, calibration, and etc. of monitoring devices (including sampling systems and manometers); or

3. Removal of any item from a space within a public building, once an abatement contractor takes control of that space. Removal of an item (fixture, furnishing, etc.) that is in no way contaminated with asbestos, or does not pose a risk of asbestos disturbance by its removal, is permitted if done prior to allowing the abatement contractor to occupy or take control of the space.

E. Presumed Asbestos-Containing Material (PACM): Any material, yet to be sampled using PLM, containing an unknown amount of asbestos.

1.05 ABBREVIATIONS

A. EPA: Environmental Protection Agency.
B. HEPA: High Efficiency Particle Arresting.
C. MSHA: Mine Safety and Health Administration.
D. NIOSH: National Institute for Occupational Safety and Health.
E. OAR: Owner's Authorized Representative
F. OSHA: Occupational Safety & Health Administration
G. PLM: Polarized Light Microscopy.
H. SDS: Safety Data Sheet
I. TAHPR: Texas Asbestos Health Protection Rules
J. TDSHS: Texas Department of State Health Services

1.06 SUBMITTALS

A. All abatement submittals shall follow the requirements outlined in Section 01 35 24 Asbestos Operations and Control. Abatement Submittals: In the event the contractor needs to have PACM or ACM removed they shall submit the following:

1. Abatement Notification. The contractor or abatement contractor shall provide the following information to EAD, at least 20 working days prior to the abatement start date.
   a. Type of abatement work
   b. Abatement Work Schedule.
   c. Demolition Work Schedule
   d. Asbestos Amounts
   e. Abatement Contractor Information
   f. Abatement Supervisor Information.
   g. Abatement Worker Information
   h. NESHAP Training Individual Information.
   i. Demolition Contractor Information
   j. Waste Transporter License.
2. Abatement Contractor Pre-Abatement Submittals. The abatement contractor shall provide EAD with current copies of the following documents listed below at least 20 working days prior to the abatement start date.
   a. Asbestos Abatement Company
   b. TDSHS Asbestos Abatement Contractor License
      1) Respirator Protection Program
   c. Materials specification, including SDS for chemical used for abatement activities.

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d. Equipment certificates.
e. One million dollars of insurance coverage for environmental spills and releases. (need to determine the appropriate place to insert)
f. Waste Transporter
    1) TDSHS waste transporter license
    2) One million dollars of insurance coverage for environmental spills and releases. (need to determine the appropriate place to insert)
    3) Post Abatement Documentation. Please provide all abatement related documentation to EAD within 30 Calendar days of the abatement end date.
        (a) Abatement Supervisor(s) / Worker(s)
            (1) TDSHS licenses / registrations
            (2) EPA certifications / accreditations
            (3) TDSHS Physician's Written Statements
            (4) Respiratory Fit Tests
            (5) Any specialized training as required
            (6) Any amendments to the abatement project submittals.

B. Safety Data Sheets. The contractor shall submit an electronic version of the safety data sheets for all building materials to the OAR for review by EAD prior to closure of the building permit.

C. Correspondence between the regulatory agencies and the Contractor (and/or any subcontractor) regarding Work at DFW Airport.

1. EAD shall be the sole agency to correspond to the TDSHS regarding Board work at DFW Airport.

2. All correspondence received by the contractor related to Board work shall be submitted to EAD within 24 hours.

1.07 QUALIFICATIONS

A. General Construction Work. All onsite construction personnel who potentially work near ACM are required to have 2 hours of Asbestos Awareness training as required by 29 CFR 1926.1101.

B. Asbestos Abatement Areas. All asbestos abatement personnel shall be appropriately licensed or registered in accordance with the TAHPR. Onsite personnel shall have their current license and supporting documentation while onsite and readily available upon request.

C. Asbestos Transport. All contractors shall be appropriately licensed in accordance with the TAHPR while transporting any asbestos waste.

D. Competent Person: Contractor shall designate a "competent person" having the qualifications and authority required by 29 CFR 1926.1101.

1.08 ASBESTOS SURVEY & ASBESTOS REMOVAL PLANS

A. A Limited Asbestos Report will be provided as exhibited by this section. This document will discuss the areas that were inspected, materials that were observed, any PACM / ACM that was discovered, the condition of any PACM / ACM and locations of the PACM / ACM. This document shall be communicated with Contractor staff, their sub-contractors, and shall be onsite and readily viewable to all project employees.

1. If work extends outside of the current project site or new materials are revealed during project operations, it is the contractor's responsibility to notify the OAR. The contractor shall refrain from disturbing any unsurvey areas or materials prior to obtaining an ACM Survey/Report.

B. If the contractor determines ACM/PACM will be disturbed, an abatement project design will be provided through the OAR by EAD. This document will come in the form of a project manual

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that will outline the type(s) of asbestos; abatement methodologies; personal protective equipment to be employed; and waste handling and disposal by the abatement contractor.

1.09 REGULATORY REQUIREMENTS

A. Comply with all local, state, and federal laws and regulations governing asbestos abatement. These include but are not limited to regulations listed in paragraph 1.03 of this specification.

B. General construction personnel are prohibited from disturbing PACM or ACM without appropriate asbestos licensing/training and approval from EAD.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 GENERAL WORK ACTIVITIES

A. The contractor shall follow these measures outlined below while conducting work if PACM / ACM are present in the project site.

1. Communicate to workers where the PACM / ACM is located and instruct them not to disturb the material. New workers shall be informed prior to working in the project area.
2. Instruct workers on emergency procedures should PACM / ACM become dislodged or accidentally disturbed.
    a. Accidental / Emergency Release of PACM / ACM. In the event PACM / ACM become dislodged or disturbed the contract shall perform the following:
        1) Remove all persons from the room. All personnel shall be removed, and the area secured to prevent entry.
        2) Contact the AOC at 972-973-5572. Be prepared to provide the location, time of the release, and quantity of the dislodged material. EAD will contact the contractor with further instruction.
        3) After notification to AOC notify the OAR to report
        4) Minimize further migration of asbestos fibers by isolating the HVAC system to the affected room. EAD will contact the contractor and provide further direction.
3. Ensure that all work areas have been surveyed for ACM prior to any disturbance. If work extends outside of the current project site or impacts materials that have not been addressed in the ACM survey/report, it is the contractor's responsibility to notify the OAR. The contractor shall refrain from disturbing any un-surveyed areas or materials prior to obtaining a new ACM Survey. See paragraph 1.06.A for requesting an ACM Survey.
4. Confirm approved SDS submittals do not contain asbestos containing materials prior to installation.

3.02 ASBESTOS ABATEMENT

A. The contractor shall follow these measures when conducting work that disturbs PACM/ACM.

1. Work Preparation
    a. No activities including preparation work shall commence at the abatement project site until:
        1) All submittal requirements in paragraph 1.06.B have been fulfilled and approved.
        2) An asbestos abatement design has been provided by EAD.
        3) The start date on the asbestos abatement notification submitted to TDSHS.
2. Emergency Precautions
    a. Establish emergency and fire exits from the work area and train employees and subcontractors with evacuation procedures.

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b. The abatement contractor shall be prepared to administer first aid to injured and contaminated personnel. When an injury occurs, stop Work and implement fiber reduction techniques (e.g., water spraying) until the injured person has been removed safely from the Work area. Treat seriously injured personnel immediately or evacuate without delay for decontamination.
c. Prominently post the location of the nearest telephone, as well as the telephone numbers of all emergency response personnel in the Clean Room.

3. Signs & Labels
   a. The abatement contractor shall post signs and labels as required by the TAHPR and 29 CFR 1926.1101 regulations.
4. Personal Protection and Decontamination:
   a. The abatement contractor shall provide necessary protective and safety equipment to all staff to carry out the abatement operations stated in the asbestos project design. In addition, the abatement contractor shall provide to authorized visitors and inspectors:
      1) Protective disposable clothing, eye protection, and hard hats as required by job conditions.
      2) Respiratory protective equipment approved by NIOSH and MSHA.
      3) Decontamination: Shower and bath water shall have hot and cold-water mixing faucets. Wastewater shall either be filtered or collected and discarded as asbestos waste. Provide soap and shampoo to aid in removing dust from the entrant's skin and hair.
5. Abatement Preparation
   a. Clear all personnel and all moveable objects from the abatement area before the Work commences unless specified otherwise. The removal and the replacement of removed items upon completion of the abatement shall be the responsibility of the Contractor.
   b. Secure the area and provide adequate protective controls for the HVAC system, mechanical systems, electrical systems and plumbing systems.
   c. Disabling HVAC Systems: The HVAC system(s) that service the regulated area shall be deactivated and locked off. All ducts, grills, access ports, and vents shall be sealed off with two layers of poly sheeting to prevent entrainment of contaminated air.
      1) Shared HVAC Systems: If components of an HVAC system are connected to a system that will service another zone during the project, the portion of the duct in the regulated area shall be sealed and pressurized. Additional precautions shall include but are not limited to caulking and covering all duct joints, and other openings in the HVAC system with two layers of poly sheeting. The duct shall remain pressurized throughout the duration of the project to prevent entrainment of contaminated air.
   d. Sealing Elevators. If an elevator shaft is in the regulated area, it shall be shut down and isolated with two layers of plastic sheeting. The sheeting shall provide enough slack to accommodate the pressure changes in the shaft without breaking the air-tight seal.
   e. Removing Mobile Objects: Clean all movable objects and remove them from the Work area before an enclosure is constructed unless moving the objects creates a hazard. Mobile objects shall be assumed to be contaminated and shall be either cleaned with amended water and a HEPA vacuum and then removed from the area or wrapped and disposed of as regulated waste.
   f. Cleaning and Sealing Surfaces: All surfaces shall be cleaned with water and a HEPA vacuum prior to constructing the enclosure. Cover surfaces of stationary objects with

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two layers of poly sheeting secured with duct tape or an equivalent method to provide a tight seal around the object.

6. Enclosure
   a. The abatement contractor shall follow the EAD provided abatement project design regarding enclosure construction. The enclosure shall protect all building systems not planned for abatement removal. Enclosures shall be both airtight and watertight except for those openings designed to provide entry and/or air flow control. Enclosures shall be constructed, monitored, maintained in accordance with TAPHR and 29 CFR 1926.1101 requirements.
   b. All Enclosure shall contain a work area, a decontamination area, and waste storage area.
      1) Structural Integrity: Frames shall be constructed to support all unsupported spans of sheeting. The walls, ceilings and floors shall be supported in such a manner that portions of the enclosure will not fail during normal use.
      2) Openings: All necessary openings into the enclosure will be constructed with one or more airlocks that will automatically close in the event the enclosure loses negative pressure. Charcoal filters shall be used to mitigate any nuisance odors.
7. Enclosure Airflow
   a. The abatement contractor shall confirm:
      1) All negative pressure devices are in good working order and maintained properly through the entire duration of the abatement.
      2) Air exhausted from the enclosure shall pass through HEPA filter during the entire duration of the abatement.
      3) All HEPA filters are used in accordance with the manufacturer's requirements.
      4) The HEPA filters are replaced when the air flow volume is reduced by the build-up of dust in the filtration material.
      5) Exhaust air from the negative pressure unit are directed away from the public, adjacent workers and intakes for HVAC systems.
8. Tools and Equipment
   a. Any contaminated equipment or tools brought to the site shall be sealed inside two layers of poly and appropriately labeled. The tools or equipment shall not be unsealed until they are placed inside of an operational negative pressure enclosure.
   b. Scaffolding, as required to accomplish the Work, shall meet all applicable state and federal safety regulations.
   c. Transportation Equipment: Equipment used to transport contaminated materials shall be suitable for loading, temporary storage, transport and unloading of contaminated waste without exposure to persons or property.
   d. Vacuum Equipment: All vacuum equipment utilized in the Work area shall utilize HEPA filtration systems.
   e. High-speed abrasive disc saws shall be equipped with point of cut ventilator or enclosures with HEPA filtered exhaust air.
9. Exposure Monitoring & Medical Surveillance
   a. The abatement contractor shall be responsible for all exposure monitoring and medical surveillance for their personnel. Monitoring shall be performed in accordance with TAPHR and 29 CFR 1926.1101 requirements.
   b. Negative exposure assessments must be review and approved by EAD and their asbestos consultant prior to use.
   c. Exposure monitoring and / or medical surveillance will be provided to EAD or their asbestos consultant upon request within 24 hours.

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10. Abatement Monitoring & Inspection
    a. The performance and execution of the Work shall be monitored by an EAD appointed asbestos consultant and/or asbestos project manager / air monitoring technician. This consultant or their staff may not be employed by the abatement contractor for OSHA personnel exposure monitoring during the duration of the project.
    b. The frequency of monitoring shall be at the discretion of the asbestos consultant.
    c. The abatement contractor shall cooperate with and support the asbestos consultant throughout the abatement process.
    d. The asbestos consultant will provide copies of the sample results to the abatement contractor.
    e. Aggressive air sampling for clearance of the containment area and completion of abatement will be based on results of ambient air sampling inside the containment area, conducted by the asbestos consultant.
    f. If clearance monitoring fails, contractor reclaims and absorbs the cost of additional sampling.
11. Asbestos Removal
    a. The abatement contractor is responsible for managing emissions and contaminated media in accordance with TAPHR and 29 CFR 1926.1101 to prevent asbestos exposure during the asbestos abatement.
    b. The abatement contractor shall keep materials adequately wetted with amended water to prevent fiber emissions.
12. Cleaning
    a. The abatement contractor shall manage debris within the regulated area in accordance with TAPHR and 29 CFR 1926.1101 requirements.
    b. All surfaces within the enclosure shall be cleaned and HEPA vacuumed before the exhaust ventilation system is deactivated and the enclosure is disassembled. An approved encapsulant shall be sprayed onto areas after the visible dust has been removed.
13. Disposal Activities
    a. The abatement contractor shall manage all asbestos wastes in accordance with the TAPHR, 29 CFR 1926.1101 and Section 01 74 19, Construction Waste Management.
    b. Asbestos waste disposal facility will be listed in the asbestos project design. Any variance from the facility must be approved by EAD prior to transport.
    c. Asbestos waste shall be secured until the waste is received by the approved landfill.
    d. EAD will provide universal waste manifest.
    e. An authorized designee of the EAD shall sign all waste manifests.
14. Repair and Restoration
    a. The contractor is responsible for repair of any damages incurred to the finishes, floor, walls, or any other item or fixture during the execution of the Work.

- END OF SECTION -

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SECTION 11 12 00 – PARKING CONTROL EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Provide all labor, materials, and equipment for the complete installation of Work called for in the Contract Documents.

B. This section includes the minimum requirements for the expansion of the existing DFW Airport parking access control and revenue system (PARCS) to include the parking area(s) included in this project.

C. The existing PARCS utilizes the parking access control solution from SKIDATA AG. It is the Owner's intent that all expansions to the system utilize like and, where specified, approved materials and that the resulting operations are in the same form and function as the existing system.

D. Included in this section are the minimum composition requirements and installation methods for the following:
   1. Parking Control Units
   2. AVI Readers
   3. Credential Readers
   4. Lift Arm Parking Gates
   5. Intercom Stations

E. The SKIDATA head-end possesses sufficient capacity to accommodate the alterations specified in these contract documents. However, additional system is to be provided by the Contractor.

F. Category 6A UTP and fiber optic horizontal distribution cable will be provided under Section 27 15 00.

G. Fiber optic backbone cable and jumpers will be provided under Section 27 13 00.

1.3 DEFINITIONS AND TERMS

A. Trade association names and communications terminology are frequently abbreviated. The following acronyms or abbreviations may be referenced within this Section.

1.	ANSI American	National Standards Institute
2.	AVI Automatic	Vehicle Identification
3.	DCM	Design Criteria Manual
4.	EMI	Electromagnetic Interference
5.	IEEE	Institute of Electrical and Electronics Engineers
6.	LAN	Local Area Network
7.	NEC	National Electric Code
8.	NEMA	National Electric Manufacturers Association
9.	NECA	National Electrical Contractors Association
10.	NTTA	North Texas Toll Authority.
11.	OAR	Owner's Authorized Representative
12.	PARCS	Parking Access Control and Revenue System
13.	TIA	Telecommunications Industry Association
14.	UL	Underwriters Laboratories

1.4 QUALITY ASSURANCE

A. Installation and integration of new components to the existing PARCS (SKIDATA) is to be performed by Owner's sole-source provider, SKIDATA.
   1. SKIDATA has a services agreement with the Owner to provide maintenance and installation support services for the existing PARCS.
   2. Coordinate any sole source requirements with the Owner prior to bidding. Contact Christopher Meeks with DFW ITS via email at cmeeks@dfwairport.com to coordinate.
   3. SKIDATA services are to be retained as a subcontractor to Contractor.
   4. The SKIDATA contact is Trey Billings via phone (908) 842-4573 or email at Trey.Billings@skidata.com.

B. All equipment and cabling must be installed in a neat and skillful manner. All methods of construction that are not specifically described or indicated in the contract documents must be subject to the control and approval of the OAR.

C. Equipment and materials must be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, or a substitution is requested, equipment must be equivalent in every way to that of the equipment specified. All substitutions are subject to the control and approval of the OAR.

D. Contractor's Qualifications:
   1. Firms regularly engaged in the installation of parking control systems and related peripherals and that have five (5) years of installation experience with systems like that required for this project.

2. Provide references to include client names, phone numbers and a summary of project details. These references will be checked, and the clients will be asked questions related to the performance of your company.
3. Provide verification that installation personnel responsible have been professionally trained to install the products described in this Section.
4. Provide full time project manager with a minimum of ten (10) years' field experience in installation of communications systems and infrastructures. Project manager must be assigned for the duration of the project and must not be replaced without written consent from the OAR.

E. Manufacturer's Qualifications:
1. Firms regularly engaged in manufacture of products of the types, ratings and capacities required for this project; whose products have been in satisfactory use in similar service for not less than five (5) years, with production capabilities per applicable NEMA standards.

F. Material and Work specified herein must comply with the applicable requirements of:
1. IEEE 802 – Local Area Network Standard
2. NECA 1-2015 – Standard Practice of Good Workmanship in Electrical Construction
3. ANSI/TIA-606-C – Administration Standard for Telecommunications Infrastructure
4. NSI/TIA-607-D – Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
5. NFPA 70 – National Electric Code (currently adopted edition)
6. Title 47 CFR Part 15, Subpart B – Radio Frequency Devices, Unintentional Radiators
7. DFW Airport Design Criteria Manual
8. Applicable codes and directives of authorities having jurisdiction.

G. Work:
1. The Work must be performed in compliance with the applicable manufacturer's installation instructions, Standards, and certifications listed herein, the Contract Documents, and governing codes and regulations of the authorities having jurisdiction.
2. The drawing and specification requirements govern where they exceed Code and Regulation requirements.
3. Where requirements between governing Codes and Regulations vary, the more restrictive provision applies.
4. Nothing in the Contract Documents grants authority or permission to disregard or violate any legal requirements.

1.5 CONFLICTS

A. This installation must be made in strict accordance with the Specifications, Drawings, any applicable codes, referenced publications and standards. In case of conflicts, notify the OAR in writing prior to commencement of affected work.

1.6 PERMITS

A. The Contractor must secure and pay for all necessary permits and fees required for the execution of this Work. Work will not start until all permit applications are approved.

1.7 SCHEDULING

A. The Contractor must comply with all scheduling requests established by OAR, both prior to commencing Work, and during construction. The Contractor must provide a detailed schedule of work to be performed. This schedule must be submitted with the bid and, if accepted, will be used to track work status.

B. Work should be scheduled not to interfere with day-to-day operations within the facility. Operations vary by area and should be given careful consideration in relation to the schedule.

C. The successful Contractor for all or any portion of the work described by this RFP package will be responsible for achieving a complete and fully functional installation on or before the contract scheduled completion date.

1.8 REQUIREMENTS

A. All references to manufacturers, model numbers and other pertinent information herein are intended to establish standards of performance and quality of construction. The OAR must approve material submittal and substitutions in writing.

B. Verification that all the components specified and installed meet the criteria specified by the respective component manufacturer, supplier and designer is the responsibility of the Contractor.

C. All installation tools, special equipment and testing apparatus required to accomplish field connections and related work as described herein must be furnished by the Contractor at no additional cost.

D. The requirements as given in this document are to be adhered to unless revised by the OAR in writing.

E. The Owner reserves the right to waive these requirements at any time.

1.9 SUBMITTALS

A. Comply with provisions of Division 01.

B. Provide all submittal requirements under this section as a single package.

C. Provide product data for the following:

1. Product data consisting of manufacturers specifications for each type of product to be installed, all applicable certifications and elevation/plan documents supporting compliance with stated Specifications.
2. Proposed format of as-built documentation.

1.10 CONTRACTOR CLOSE OUT SUBMITTALS

A. Submit Closeout documentation in accordance with Division 01 of the Project Manual and any applicable supplements. The number of submittal sets required is the greater of either the requirements of Division 01 of the Project Manual, or a minimum of four (4) sets.
   1. Segregate documents into separate binders containing data relevant to operational, maintenance, and warranty issues.
   2. Provide above closeout documentation as an electronic file in PDF format.

B. Warranty and Maintenance:
   1. Test Report Binder(s)
   2. Record Drawings

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials factory-packaged in containers or reels and handle them in accordance with manufacturer's recommendations. Store in a clean, dry space and protect products from damaging fumes and traffic. Handle materials carefully to avoid damage.

B. Storage space on project site may be limited. Contractor must coordinate delivery and arrange storage of materials and equipment with the OAR.

C. Components sensitive to damage in a harsh environment must be stored off-site and delivered as needed.

D. Provide protective covering during construction to prevent damage or entrance of foreign matter.

E. Contractor is responsible for on-site security of tools, test equipment and materials.

F. Replace at no expense to Owner, product damaged during storage, handling, or the course of construction.

1.12 PROJECT CONDITIONS

A. Verify conditions on the job site are applicable to this Work. Notify Architect in writing of discrepancies, conflicts, or omissions promptly upon discovery.

B. The Drawings diagrammatically show cabling and arrangements of equipment fitting the space available without interference. If conditions exist which make it impossible to install Work as

shown, recommend solutions and/or submit drawings to the Architect for approval, showing how the Work may be installed.

1.13 WARRANTY

A. Warrant labor and product to be free of defects and deficiencies, and to conform to the drawings and specifications as to kind, quality, function, and characteristics, following Contractor Warranty requirements defined in Division 01. Repair or replace defects occurring in labor or product within the Warranty period without charge.

B. All surplus parts and pieces from the installation must be maintained as a spare parts inventory at the building site. Parts replaced during the warranty period must have a warranty matching that of the original part from date of replacement.

PART 2 - PRODUCTS

2.1 GENERAL

A. The products specified in this document do not necessarily constitute the exhaustive list of products required to complete the statement of work. Except where described in the SUMMARY subpart of this document, the contractor is responsible for providing any other parts and materials needed to deliver a complete and working system.

2.2 MANUFACTURERS

A. The approved manufacturers for products used in this Work include the following:
   1. SKIDATA
   2. Zenitel

2.3 PARKING CONTROL EQUIPMENT (by Skidata)

A. Parking Control Modules
   1. Provide parking control modules for each gate.
   2. Module must be capable of interfacing with AVI and handheld credential readers, and capable of communicating with the existing SKIDATA headend to determine authorization, and be able to activate a parking control gate.
   3. Approved product:
      a. SKIDATA Parking.Logic

B. Control Arm
   1. Provide control arms for each entry and exit lane.
   2. Control arms to have the following capabilities.
      a. Designed for use in Class II, III, and IV access areas.

b. Includes an integrated controller that supports direct communication with the PARCS headend.

3. Provide vehicle loops and any other components necessary to meet UL 325.
4. Approved products:
   a. SKIDATA Barrier.Gate

C. AVI Readers
1. Provide an AVI reader for each entry lane.
2. Reader must be compatible with the existing transponders used by the employee buses and NTTA compatible TransCore eGo series tolltags.
3. Include mounting hardware for mounting the reader to the gantry.
4. Include cabling from the reader to the control cabinet.

D. Credential Readers
1. Provide card readers at each entry lane.
2. Reader is to be installed in a reader pedestal, accessible by the driver.
3. Coordinate the reader model and technology with the PARCS integrator.
4. Include an 18 AWG, 6-conductor cable from the reader to the control cabinet.

E. Credentials
1. Provide a quantity of 10,000 handheld access cards.
2. Card technology must be compatible with the credential reader

F. Intercom Station
1. Provide an intercom station, next to each card reader, in the same reader pedestal enclosure.
2. Substation to have the following characteristics and capabilities.
   a. Stainless steel front plate with one call button.
   b. IP66 rated.
   c. High sound pressure level.
   d. Automatic gain control.
   e. Noise and acoustic echo cancelling.
   f. Utilizes IP network standards.
   g. Powered using Power-over-Ethernet (PoE) technology.
3. Approved products:
   a. Zenitel TCIS-2
   b. Owner approved equivalent.

G. Reader Pedestal
1. Provide a card reader pedestal at each entry lane.
2. Pedestal to have the following properties.
   a. 42-inch high gooseneck design.
   b. Powder coated safety yellow.
3. Provide an enclosure with each pedestal.
4. Enclosure to have the following properties.
   a. 16-inch high, 16-inch wide, minimum 3 inches deep.
   b. Stainless steel construction.

5. Acceptable combination.
   a. PedestalPro
      1) 42-9C-YEL Pedestal
      2) MC-SS-16-E Enclosure
   b. Owner approved equivalent.

PART 3 - EXECUTION

3.1 EXAMINATION

A. A. Inspect the jobsite and survey the conditions to be encountered during performance of the work. This must be accomplished prior to starting the work. Failure of the Contractor to become familiar with the site conditions must not relieve the Contractor of responsibility for full completion of the work in accordance with the contract provisions.

B. Verify that all conduit, wires, cables and control equipment are installed and ready for connection and integration with the rest of the system.

C. Examine area to be protected and verify that environmental characteristics will not affect effective communication and interfacing. Report observed problems in writing.

D. Determine that power supplies, conduit, wires, cables, connections, and equipment are ready for installation and interfacing before attempting installation.

E. Check all power and communications cabling for continuity before making connections.

F. Visually inspect each piece of equipment, determine defects, and correct.

G. Inspect locations where installation work will be performed. Verify that site conditions found are in accordance with drawings and are acceptable for Contractor's installation work. Report any discrepancies in writing to the Design Consultant, stating suggested means of correction

3.2 INSTALLATION

A. Install all system components, including furnished equipment, and appurtenances in accordance with the manufacturer's instructions, and as shown, and must furnish all necessary interconnections, services, and adjustments required for a complete and operable system as specified and shown. Control signal, communications, and data transmission line grounding must be installed as necessary to preclude ground loops, noise, and surges from adversely affecting system operation.

B. Install the equipment in accordance with the contract documents, all applicable codes and standards and the Manufacturer's written instructions. The installed system must meet all applicable equipment and performance requirements.

C. Standardize the installation practices and material to provide uniform materials and procedures to the maximum extent possible.

D. All equipment connected to alternating current circuits must be protected from power line surges. Equipment protection must meet the requirements of ANSI C62.41. Fuses must not be used for surge protection.

E. All inputs must be protected against surges induced on device wiring. Outputs must be protected against surges induced on control and device wiring installed outdoors and as shown. All communications equipment must be protected against surges induced on any communications circuit.

F. All cables and conductors, except fiber-optics, which serve as communications circuits from the existing access control CPU to field equipment, and between field equipment, must have surge protection circuits installed at each end. Fuses must not be used for surge protection.

G. Inspect each component, determine obvious defects, and correct.

H. All electrical service (not low voltage) work must be in accordance with Division 26.

I. Perform tests as recommended by manufacturer or as required to ensure the PARCS. Correct all deficiencies detected, and retest affected components

J. Record test data, tabulate, and write narrative describing tests, results, deficiencies found, corrective measures, and results of retesting. Certify that the equipment has been tested and is ready for performance verification testing.

3.3 IDENTIFICATION AND LABELING

A. All devices, cables, conduits, and cabinets must be labeled in accordance Specification Section 27 05 53, “Identification for Communications Systems”.

3.4 GROUNDING

A. All cable shields and pair shields must be grounded at one (1) point only. Cables that originate from field panels and serve field devices must be grounded to the signal ground terminal in the field panel.

3.5 SYSTEM TESTING

A. Provide all personnel, equipment, instrumentation and supplies necessary to perform all testing.

3.6 CLEANING

A. Remove temporary coverings and protection of adjacent work areas. Remove unused, excess, and left over products, debris, spills, or other excess materials. Remove installation equipment.

B. Leave finished work and adjacent surfaces in neat, clean condition with no evidence of damage.

C. Repair or replace damaged installed products.

D. Legally dispose of debris.

E. Clean installed products in accordance with manufacturer's instructions prior to Owner's, or Owner's Representative's, final punch walk.

3.7 ACCEPTANCE

A. Final acceptance will be withheld until the following activities have been successfully completed:

B. Acceptance of all submittals.

C. Delivery of final documentation.

D. Successful testing.

E. Successful training and demonstration, including operation of systems using the manuals, if called for in these specifications.

END OF SECTION 270000

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Copper building wire rated 600V or less.
2. Connectors, splices, and terminations rated 600V and less.

1.3 DEFINITIONS

A. RoHS: Restriction of Hazardous Substances.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: Indicate type, use, location, and termination locations.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with overall insulation layer or jacket, or both, rated 600V or less.

B. Standards:

1. Listed and labeled as defined in NFPA 70, by qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking per UL's "Wire and Cable Marking and Application Guide."

C. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

D. Conductor Insulation:

1. Type THHN and Type THWN-2: Comply with UL 83.
2. Type XHHW-2: Comply with UL 44.

2.2 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by qualified testing agency, and marked for intended location and use.

B. Connectors and splices shall be manufactured by Hubbell, Service Wire Company, Burndy, or approved equal.

C. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1. Material: Copper or Aluminum.
2. Type: Two hole with long barrels.
3. Termination: Compression.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Conductors shall be solid for 10 AWG and smaller; stranded for 8 AWG and larger.

B. Branch Circuits: Copper. Solid for 10 AWG and smaller; stranded for 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN/THWN-2, single conductors in raceway.

B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

D. Exposed Branch Circuits: Type THHN/THWN-2, single conductors in raceway.

E. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points per Section 260533 "Raceways and Boxes" before pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

F. Support cables per Section 260529 "Hangers and Supports."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals per manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables per Section 260553 "Identification."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly per Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
2. Perform each of following visual and electrical tests:
    a. Inspect exposed sections of conductor and cable for physical damage and correct connection per single-line diagram.
    b. Test bolted connections for high resistance using one of following:
        1) Low-resistance ohmmeter.
        2) Calibrated torque wrench.
        3) Thermographic survey.
    c. Inspect compression-applied connectors for correct cable match and indentation.
    d. Inspect for correct identification.
    e. Inspect cable jacket and condition.
    f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply potential of 500V dc for 300V rated cable and 1000V dc for 600V rated cable for one-minute duration.
    g. Continuity test on each conductor and cable.
    h. Uniform resistance of parallel conductors.
3. Initial Infrared Scanning: After Substantial Completion, but before Final Acceptance, perform infrared scan of each splice in conductors 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during scan.
    a. Instrument: Use infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    b. Record of Infrared Scanning: Prepare certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
4. Follow-up Infrared Scanning: Perform additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.

B. Cables will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports to record following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans showing dimensioned locations of grounding features specified in "Field Quality Control" Article, including following:

1. Ground rods.
2. Grounding arrangements and connections for separately derived systems.

B. Qualification Data: For testing agency and testing agency's field supervisor.

C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include following:
    a. Plans showing as-built, dimensioned locations of system described in "Field Quality Control" Article, including following:
        1) Ground rods.
        2) Grounding arrangements and connections for separately derived systems.
    b. Instructions for periodic testing and inspection of grounding features at grounding connections for separately derived systems based on NETA MTS.
        1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.

2) Include recommended testing intervals.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Certified by NETA.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B3.
2. Stranded Conductors: ASTM B8.
3. Tinned Conductors: ASTM B33.
4. Bonding Cable: 28 kcmil, 14 strands of 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: 4 AWG or 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.3 CONNECTORS

A. Listed and labeled by NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, 2-bolt connection to ground bus bar.

D. Beam Clamps: Mechanical type, terminal, ground wire access from 4 directions, with dual, tin-plated or silicon bronze bolts.

E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.

F. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.

G. Conduit Hubs: Mechanical type, terminal with threaded hub.

H. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

I. Lay-in Lug Connector: Mechanical type, copper rated for direct burial terminal with set screw.

J. Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and long-stud lengths, capable of single and double conductor connections.

K. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.

L. Straps: Solid copper, cast-bronze clamp. Rated for 600A.

M. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Stainless steel; 3/4 inch by 10 feet.

B. Ground Plates: 1/4 inch thick, hot-dip galvanized.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for 8 AWG and smaller, and stranded conductors for 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, 3/0 AWG minimum.

1. Bury at least 30 inches below grade.

C. Grounding Conductors: Green-colored insulation with continuous yellow stripe.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except as otherwise indicated.
3. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to ground bus. Install main bonding jumper between neutral and ground buses.

3.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with feeders and branch circuits.

3.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. Use exothermic welds for below-grade connections.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if disconnect-type connection is required, use bolted clamp.

D. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate per NFPA 70; use minimum of 20 feet of bare copper conductor not smaller than 4 AWG. Bond grounding conductor to reinforcing steel in at least 4 locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

E. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.

5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.

2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with calibrated torque wrench per manufacturer's written instructions.

3. Test completed grounding system at each location where maximum ground-resistance level is specified and at service disconnect enclosure grounding terminal. Make tests at ground rods before conductors are connected.

   a. Measure ground resistance no fewer than 2 full days after last trace of precipitation and without soil being moistened by means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.

   b. Perform tests by fall-of-potential method per IEEE 81.

4. Prepare dimensioned Drawings locating each ground rod and other grounding electrodes. Identify each by letter in alphabetical order, and key to record of tests and observations. Include number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed 10 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified value, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Metal wireways and auxiliary gutters.
3. Boxes, enclosures, and cabinets.

B. Related Requirements: Section 260543 "Underground Ducts and Raceways" for exterior duct banks, manholes, and underground utility construction.

1.3 DEFINITIONS

A. GRC: Galvanized rigid steel conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For wireways and fittings, hinged-cover enclosures, and cabinets.

1.5 INFORMATIONAL SUBMITTALS

A. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Metal Conduit:

1. Listing and Labeling: Listed and labeled as defined in NFPA 70, by qualified testing agency, and marked for intended location and application.
2. GRC: Comply with ANSI C80.1 and UL 6.
3. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

B. Metal Fittings:

1. Comply with NEMA FB 1 and UL 514B.

2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by qualified testing agency, and marked for intended location and application.

3. Fittings, General: Listed and labeled for type of conduit, location, and use.

4. Expansion Fittings: Steel, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

C. Joint Compound for GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated or required, and sized per NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by qualified testing agency, and marked for intended location and application.

B. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

C. Wireway Covers: Hinged type unless otherwise indicated.

D. Finish: Manufacturer's standard enamel finish.

2.3 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

C. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 pounds. Outlet boxes designed for attachment of luminaires weighing more than 50 pounds shall be listed and marked for maximum allowable weight.

D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

E. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

F. Device Box Dimensions: 4 inches square by 2-1/8 inches deep or as required.

G. Gangable boxes are prohibited.

H. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated or required.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; sides finished with manufacturer's standard enamel.

I. Cabinets:

1. NEMA 250, Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: GRC.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Minimum Raceway Size: 3/4-inch trade size.

C. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

3.2 INSTALLATION

A. Comply with requirements in Section 260529 "Hangers and Supports" for hangers and supports.

B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

C. Complete raceway installation before starting conductor installation.

D. Arrange stub-ups so curved portions of bends are not visible above finished slab.

E. Install no more than equivalent of three 90-degree bends in conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

F. Make bends in raceway using large-radius preformed ells. Field bending shall be per NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.

G. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches of enclosures to which attached.

I. Raceways Embedded in Slabs:

1. Run conduit larger than one-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Arrange raceways to keep minimum of one inch of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved for each specific location.

J. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

K. Coat field-cut threads on PVC-coated raceway with corrosion-preventing conductive compound before assembly.

L. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than 4 AWG.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

N. Install raceways square to enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

O. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in locknut area before assembling conduit to enclosure to assure continuous ground path.

P. Cut conduit perpendicular to length. For conduits 2-inch trade size and larger, use roll cutter or guide to make cut straight and perpendicular to length.

Q. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-pound tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

R. Install raceway sealing fittings at accessible locations per NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in flush steel box with blank cover plate having finish like that of adjacent plates or surfaces. Install raceway sealing fittings per NFPA 70.

S. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between seal and following changes of environments. Seal interior of raceways where otherwise required by NFPA 70.

T. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

U. Expansion-Joint Fittings:

1. Install in each run of aboveground RMC conduit that is located where environmental temperature change may exceed 100 degrees F and that has straight-run length that exceeds 100 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of following locations:
    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 degrees F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 degrees F temperature change.
3. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per degree F of temperature change for metal conduits.
4. Install expansion fittings at locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected per manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

V. Flexible Conduit Connections: Comply with NEMA RV 3. Use maximum of 72 inches of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations.

W. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA and Texas Accessibility Standards requirements. Install boxes with height measured to center of box unless otherwise indicated.

X. Do not support boxes by conduits.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Raceways and Cabling."

3.4 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits and fittings, including GRC.
2. Rigid nonmetallic duct.
3. Duct accessories.
4. Precast concrete handholes.
5. Utility structure accessories.

B. Related Requirements: Item P-610 “Concrete For Miscellaneous Structures” for poured in place concrete-encased ducts and duct banks.

1.3 DEFINITIONS

A. Duct: Single duct or multiple ducts. Duct may be either installed singly or as component of duct bank.

B. Duct Bank:

1. Two or more ducts installed in parallel, with or without additional casing materials.
2. Multiple duct banks.

C. GRC: Galvanized rigid (steel) conduit.

D. Trafficways: Locations where vehicular or pedestrian traffic is normal course of events.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include duct-bank materials, including spacers and miscellaneous components.
2. Include duct, conduits, and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
3. Include accessories for handholes and boxes.
4. Include underground-line warning tape.

B. Shop Drawings:

1. Precast or Factory-Fabricated Underground Utility Structures:

a. Include plans, elevations, sections, details, attachments to other work, and accessories.

b. Include duct entry provisions, including locations and duct sizes.

c. Include reinforcement details.

d. Include grounding details.

e. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.

f. Include joint details.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For concrete and steel used in precast concrete handholes, as required by ASTM C858.

B. Source quality-control reports.

C. Field quality-control reports.

1.6 MAINTENANCE MATERIALS SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Furnish cable-support arms and associated fasteners in quantities equal to 5 percent of quantity of each item installed.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified per ASTM E329 for testing indicated.

1.8 FIELD CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under following conditions, and then only after arranging to provide temporary electrical service per requirements indicated:

1. Notify Construction Manager and Owner no fewer than 14 days in advance of proposed interruption of electrical service.

2. Do not proceed with interruption of electrical service without Construction Manager's and Owner's written permission.

B. Ground Water: Assume ground-water level is at grade level unless lower water table is noted on Drawings.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND FITTINGS

A. GRC: Comply with ANSI C80.1 and UL 6.

B. Listed and labeled as defined in NFPA 70, by nationally recognized testing laboratory, and marked for intended location and application.

2.2 RIGID NONMETALLIC DUCT

A. Underground Plastic Utilities Duct: Type EPC-40-PVC RNC, complying with NEMA TC 2 and UL 651, with matching fittings complying with NEMA TC 3 by same manufacturer as duct.

B. Listed and labeled as defined in NFPA 70, by nationally recognized testing laboratory, and marked for intended location and application.

C. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 DUCT ACCESSORIES

A. Duct Spacers: Factory-fabricated, rigid, PVC interlocking spacers; sized for type and size of duct with which used and selected to provide minimum duct spacing indicated while supporting duct during concreting or backfilling.

B. Underground-Line Warning Tape: Comply with requirements for underground-line warning tape specified in Section 260553 "Identification."

2.4 PRECAST CONCRETE HANDHOLES AND BOXES

A. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.

B. Comply with ASTM C858 for design and manufacturing processes.

C. Frame and Cover: Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.

D. Cover Finish: Nonskid finish shall have minimum coefficient of friction of 0.50.

E. Cover Legend: Molded lettering, "ELECTRIC."

F. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.

G. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.

1. Extension shall provide increased depth of 12 inches.

1. Slab: Same dimensions as bottom of enclosure and arranged to provide closure.

H. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at installation location with ground-water level at grade.

I. Knockout Panels: Precast openings in walls, arranged to match dimensions and elevations of approaching duct, plus additional 12 inches vertically and horizontally to accommodate alignment variations.

1. Splayed location.

2. Knockout panels shall be located no less than 6 inches from interior surfaces of walls, floors, or frames and covers of handholes, but close enough to corners to facilitate racking of cables on walls.

3. Knockout panel opening shall have cast-in-place, welded-wire fabric reinforcement for field cutting and bending to tie into concrete envelopes of duct.

4. Knockout panels shall be framed with at least 2 additional No. 3 steel reinforcing bars in concrete around each opening.

5. Knockout panels shall be 1-1/2 to 2 inches thick.

J. Handholes 12 inches wide by 24 inches long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.5 UTILITY STRUCTURE ACCESSORIES

A. Accessories for Utility Structures: Utility equipment and accessory items used for utility structure access and utility support, listed and labeled for intended use and application.

B. Pulling Eyes in Concrete Walls: Eyebolt with reinforcing-bar fastening insert, 2-inch-diameter eye, and one-by-4-inch bolt.

1. Working Load Embedded in 6-inch, 4000-psi Concrete: 13,000-pound-foot minimum tension.

C. Bolting Inserts for Concrete Utility Structure Cable Racks and Other Attachments: Flared, threaded inserts of noncorrosive, chemical-resistant, nonconductive thermoplastic material; 1/2-inch ID by 2-3/4 inches deep, flared to 1-1/4 inches minimum at base.

1. Tested Ultimate Pullout Strength: 12,000-pound-foot minimum.

D. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 degrees F. Capable of withstanding temperature of 300 degrees F without slump and adhering to clean surfaces of plastic ducts, metallic conduit, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.

E. Cover Hooks: Heavy duty, designed for lifts 60-pound-foot and greater. Two required.

2.6 SOURCE QUALITY CONTROL

A. Test and inspect precast concrete utility structures per ASTM C1037.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate layout and installation of duct, duct bank, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in field. Notify Architect if there is conflict between areas of excavation and existing structures or archaeological sites to remain.

B. Coordinate elevations of duct and duct-bank entrances into handholes, and boxes with final locations and profiles of duct and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct and duct bank will drain to handholes, and as approved by Architect.

C. Clear and grub vegetation to be removed and protect vegetation to remain per Section 311000 "Site Clearing." Remove and stockpile topsoil for reapplication per Section 311000 "Site Clearing."

3.2 UNDERGROUND DUCT APPLICATION

A. Duct for Electrical Feeders and Branch Circuits: Type EPC-40-PVC RNC, concrete-encased unless otherwise indicated.

B. Stub-ups: Concrete-encased RNC.

3.3 UNDERGROUND ENCLOSURE APPLICATION

A. Handholes and Boxes for 600V and Less:

1. Units in Roadways and Other Deliberate Traffic Paths and in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete. AASHTO HB 17, H-20 structural load rating.
2. Units in Sidewalk and Similar Applications with Safety Factor for Nondeliberate Loading by Vehicles: Precast concrete, AASHTO HB 17, H-10 structural load rating.
3. Cover design load shall not exceed design load of handhole or box.

3.4 EARTHWORK

A. Excavation and Backfill: Comply with Section 312000 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.

B. Restoration: Replace area after construction vehicle traffic in immediate area is complete.

C. Restore surface features at areas disturbed by excavation and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.

D. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Section 329200 "Turf and Grasses" and Section 329300 "Plants."

E. Cut and patch existing pavement in path of underground duct, duct bank, and underground structures per "Cutting and Patching" Article in Section 017300 "Execution."

3.5 DUCT AND DUCT-BANK INSTALLATION

A. Where indicated on Drawings, install duct, spacers, and accessories into duct-bank configuration shown. Duct installation requirements in this Section also apply to duct bank.

B. Install duct per NEMA TCB 2.

C. Slope: Pitch duct minimum slope of 1:300 down toward handholes and away from buildings and equipment.

D. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with minimum radius of 48 inches, both horizontally and vertically, at other locations unless otherwise indicated.

1. Duct shall have maximum of three 90-degree bends or total of bends shall be no more 270 degrees between pull points.

E. Joints: Use solvent-cemented joints in duct and fittings and make watertight per manufacturer's written instructions. Stagger couplings so those of adjacent duct do not lie in same plane.

F. Terminator Entrances to Concrete Handholes: Use manufactured, cast-in-place duct terminators, with entrances into structure spaced approximately 6 inches on center for 4-inch duct and vary proportionately for other duct sizes.

1. Begin change from regular spacing to terminator spacing 10 feet from terminator, without reducing duct line slope and without forming trap in line.

2. Expansion and Deflection Fittings: Install expansion and deflection fitting in each duct in area of disturbed earth adjacent to handhole. Install expansion fitting near center of straight-line duct with calculated expansion of more than 3/4-inch.

G. Building Wall Penetrations: Make transition from underground duct to GRC at least 10 feet outside building wall, without reducing duct line slope away from building and without forming trap in line. Use fittings manufactured for RNC-to-GRC transition. Install GRC penetrations of building walls as specified in Section 260544 "Sleeves and Sleeve Seals for Raceways and Cabling."

H. Sealing: Provide temporary closure at terminations of duct with pulled cables. Seal spare duct at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.

I. Pulling Cord: Install 200-pound-foot-test nylon cord in empty ducts.

J. Concrete-Encased Ducts and Duct Bank:

1. Excavate trench bottom to provide firm and uniform support for duct. Prepare trench bottoms as specified in Section 312000 "Earth Moving" for pipes less than 6 inches in nominal diameter.

2. Width: Excavate trench 12 inches wider than duct on each side.

3. Depth: Install so top of duct envelope is at least 24 inches below finished grade in areas not subject to deliberate traffic, and at least 30 inches below finished grade in deliberate traffic paths for vehicles unless otherwise indicated.

4. Support duct on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.

5. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than 5 spacers per 20 feet of duct. Place spacers within 24 inches of duct ends. Stagger spacers approximately 6 inches between tiers. Secure spacers to earth and to duct to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.

6. Minimum Space between Duct: 3 inches between edge of duct and exterior envelope wall, 2 inches between ducts for like services, and 4 inches between power and communications ducts.

7. Elbows: Use manufactured duct elbows for stub-ups, at building entrances, and at changes of direction in duct unless otherwise indicated. Extend encasement throughout length of elbow.

8. Reinforcement: Reinforce concrete-encased duct. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.

9. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.

10. Concrete Cover: Install minimum of 3 inches of concrete cover between edge of duct to exterior envelope wall, 2 inches between duct of like services, and 4 inches between power and communications ducts.

11. Concreting Sequence: Pour each run of envelope between terminations in one continuous operation.

    a. Start at one end and finish at other, allowing for expansion and contraction of duct as its temperature changes during and after pour. Use expansion fittings installed per manufacturer's written instructions or use other specific measures to prevent expansion-contraction damage.

    b. If more than one pour is necessary, terminate each pour in vertical plane and install 3/4-inch reinforcing-rod dowels extending minimum of 18 inches into concrete on both sides of joint near corners of envelope.

12. Pouring Concrete: Comply with requirements in "Concrete Placement" Article in Section 033000 "Cast-in-Place Concrete." Place concrete carefully during pours to prevent voids under and between duct and at exterior surface of envelope. Do not allow

heavy mass of concrete to fall directly onto ducts. Allow concrete to flow around duct and rise in middle, uniformly filling open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-installation application.

13. Concrete Color: Red dye added during batching.

K. Underground-Line Warning Tape: Bury conducting underground line specified in Section 260553 "Identification" no less than 12 inches above concrete-encased duct and duct banks and approximately 12 inches below grade. Align tape parallel to and within 3 inches of centerline of duct bank. Provide additional warning tape for each 12-inch increment of duct bank width over nominal 18 inches. Space additional tapes 12 inches apart, horizontally.

3.6 INSTALLATION OF CONCRETE HANDHOLES AND BOXES

A. Precast Concrete Handhole Installation:

1. Comply with ASTM C891 unless otherwise indicated.
2. Install units level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances.
3. Unless otherwise indicated, support units on level bed of crushed stone or gravel, graded from one-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

B. Elevations:

1. Install handholes with bottom below frost line.
2. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes one inch above finished grade.
3. Where indicated, cast handhole cover frame integrally with handhole structure.

C. Waterproofing: Apply waterproofing to exterior surfaces of handholes after concrete has cured at least 3 days. Waterproofing materials and installation are specified in Section 071353 "Elastomeric Sheet Waterproofing." After duct has been connected and grouted, and before backfilling, waterproof joints and connections, and touch up abrasions and scars.

D. Hardware: Install removable hardware, including pulling eyes, and **c**able arms as required for installation and support of cables and conductors and as indicated.

E. Field-Installed Bolting Anchors in Concrete Handholes: Do not drill deeper than 2 inches for anchor bolts installed in field. Use minimum of 2 anchors for each cable stanchion.

3.7 GROUNDING

A. Ground underground ducts and utility structures per Section 260526 "Grounding and Bonding."

3.8 FIELD QUALITY CONTROL

A. Perform following tests and inspections:

1. Demonstrate capability and compliance with requirements on completion of installation of underground duct, duct bank, and utility structures.
2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide minimum 12-inch-long mandrel equal to duct size minus 1/4 inch. If obstructions are indicated, remove obstructions and retest.
3. Test handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding."

B. Correct deficiencies and retest as specified above to demonstrate compliance.

C. Prepare test and inspection reports.

3.9 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of duct until duct cleaner indicates that duct is clear of dirt and debris. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Bands and tubes.
4. Tags.
5. Signs.
6. Paint for identification.
7. Fasteners for labels and signs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.

B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule: For each piece of electrical equipment and electrical system components to be index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

D. Delegated-Design Submittal: For arc-flash hazard study.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Comply with NFPA 70E and Section 260573.19 "Arc-Flash Hazard Analysis" requirements for arc-flash warning labels.

F. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 degrees F, ambient; 180 degrees F, material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Color-Coding for Phase- and Voltage-Level Identification, 600V or Less: Use colors listed below for ungrounded service, feeder, and branch-circuit conductors.

1. Color shall be factory applied or field applied for sizes larger than 8 AWG if authorities having jurisdiction permit.
2. Colors for 120/240 Circuits:
    a. Phase A: Black.
    b. Phase B: Red.
    c. Neutral: White.
3. Colors for 240/480V Circuits:
    a. Phase A: Brown.
    b. Phase B: Orange.
    c. Neutral: Gray.
4. Color for Equipment Grounds: Green.
5. Colors for Isolated Grounds: Green with 2 or more yellow stripes.

B. Warning Label Colors: Identify system voltage with black letters on orange background.

C. Warning labels and signs shall include, but are not limited to, following legends:

1. Workspace clearance warning for equipment rated for more than 250V and less than 1000V: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 42 INCHES."
2. Workspace clearance warning for equipment rated for less than 250V and more than 100V: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

D. Equipment Identification Labels: White letters on black field.

2.3 TAPES

A. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by one to 2 inches wide; compounded for outdoor use.

B. Underground-Line Detectable Warning Tape:

1. Tape:

a. Recommended by manufacturer for method of installation and suitable to identify and locate underground electrical utility lines.

b. Printing on tape shall be permanent and shall not be damaged by burial operations.

c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

2. Color and Printing:

a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.

b. Inscriptions for 3-Inch-Wide Polyethylene Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".

2.4 SIGNS

A. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.

2. Thickness:

a. For signs up to 20 square inches, minimum 1/16 inch thick.

b. For signs larger than 20 square inches, 1/8 inch thick.

c. Engraved legend with white letters on black background.

d. Punched or drilled for mechanical fasteners with 1/4-inch grommets in corners for mounting.

2.5 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

G. System Identification for Raceways and Cables under 600V: Identification shall completely encircle cable or conduit. Place identification of 2-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

H. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from floor.

I. Accessible Fittings for Raceways: Identify covers of each junction and pull box of following systems with wiring system legend and system voltage. System legends shall be as follows:

1. "POWER."

J. Self-Adhesive Wraparound Labels: Secure tight to surface at location with high visibility and accessibility.

K. Self-Adhesive Labels:

1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.

2. Unless otherwise indicated, provide single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where 2 lines of text are required, use labels 2 inches high.

L. Self-Adhesive Vinyl Tape: Secure tight to surface at location with high visibility and accessibility.

1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for minimum distance of 6 inches where splices or taps are made. Apply last 2 turns of tape with no tension to prevent possible unwinding.

M. Underground Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in common trench **or** concrete envelope exceeds 16 inches overall.

2. Install underground-line warning tape for direct-buried cables and cables in raceways.

N. Laminated Acrylic or Melamine Plastic Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.

2. Unless otherwise indicated, provide single line of text with 1/2-inch-high letters on 1-1/2-inch-high sign; where 2 lines of text are required, use labels 2 inches high.

3.3 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

C. Accessible Raceways and Metal-Clad Cables, 600V or Less, for Feeder and Branch Circuits, More Than 30A and 120V to Ground: Identify with self-adhesive raceway labels.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

D. Accessible Fittings for Raceways and Cables within Buildings: Identify covers of each junction and pull box of following systems with self-adhesive labels containing wiring system legend and system voltage. System legends shall be as follows.

1. "POWER."

E. Power-Circuit Conductor Identification, 600V or Less: For conductors in pull and junction boxes, and handholes, use vinyl wraparound labels to identify phase.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

F. Locations of Underground Lines: Underground-line warning tape for power and lighting cable.

G. Instructional Signs: Self-adhesive labels, including color code for grounded and ungrounded conductors.

H. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels.

1. Apply to exterior of door, cover, or other access.

2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, following:

a. Controls with external control power connections.

I. Arc Flash Warning Labeling: Self-adhesive labels.

J. Operating Instruction Signs: Self-adhesive labels.

K. Equipment Identification Labels:

1. Equipment: Laminated acrylic or melamine plastic sign.

2. Equipment to Be Labeled:

a. Panelboards: Typewritten, 8.5-inch by 11-inch, directory of circuits in location provided by panelboard manufacturer. Panelboard identification shall be in form of self-adhesive, engraved, laminated acrylic or melamine label.

b. Each section of each lighting and appliance panelboard shall be labeled with panelboard name and source name and location. Identification shall be above panelboard door. Circuit numbers shall be permanently labeled at factory; stick-on decals are unacceptable.

c. Panelboard main circuit breakers: Breaker identification shall be adjacent to breaker in form of self-adhesive, engraved, laminated acrylic or melamine label, labeled “MAIN ####.”

d. Spare circuit breakers shall be labeled “SPARE.”

e. Contactors.

f. Dry-Type Transformers: Label shall be directly above manufacturer nameplate and wiring diagram. Transformer name shall be in one-inch high letters; kVA rating, high voltage, low voltage, phase, primary source and circuit number(s)that includes tag designation indicated on Drawings for transformer, feeder, and panelboards or equipment supplied by secondary, and secondary load or panelboard shall be 0.5-inch letters.

g. Enclosed circuit breakers.

h. Enclosed safety switches: Label shall be on outside cover and shall include source and circuit number(s) and load served.

i. Enclosures and electrical cabinets.

j. Exterior lighting switch or controls: Label shall be on outside cover and shall include source and circuit number(s) and load served, in 0.25-inch letters.

k. Junction box: Label shall be on outside cover and include designations of circuits in box.

l. Monitoring and control equipment: Label shall be on outside cover or door.

m. Push-button stations.

n. Receptacles and switches: Label shall be on inside of cover plate and shall include source and circuit number(s) in all capital letters, in 0.25-inch letters.

o. Switch for load that cannot be seen from control point: Label shall be on outside cover plate and shall include source and circuit number(s) and load served.

p. Time clocks: Label shall be on outside cover.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
2. Luminaire supports.
3. Luminaire-mounted photoelectric relays.

B. Related Requirements:

1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
2. Section 265613 "Lighting Poles and Standards" for poles and standards used to support exterior lighting equipment.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color rendering index.

C. Lumen: Measured output of lamp and luminaire, or both.

D. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaire.
4. Lamps, include life, output (lumens, CCT, and CRI), and energy-efficiency data.
5. Photometric data and adjustment factors based on laboratory tests, complying with IES LM-79 and IES LM-80.

a. Manufacturer's Certified Data: Photometric data certified by manufacturer's laboratory with current accreditation under NVLAP for Energy Efficient Lighting Products.

6. Wiring diagrams for power, control, and signal wiring.
7. Photoelectric relays.
8. Means of attaching luminaires to supports and indication that attachment is suitable for components involved.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of following:

1. Luminaire.
2. Photoelectric relay.

B. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by qualified testing agency.

C. Source quality-control reports.

D. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires [**and photoelectric relays**] to include in operation and maintenance manuals.

1. Provide list of lamp types used on Project. Use ANSI and manufacturers' codes.
2. Provide list of photoelectric relay types used on Project; use manufacturers' codes.

1.7 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturers' laboratory that is accredited under NVLAP for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by independent agency, with experience and capability to conduct testing indicated, that is NRTL as defined by OSHA in 29 CFR 1910.7, accredited under NVLAP for Energy Efficient Lighting Products and complying with applicable IES testing standards.

C. Provide luminaires from single manufacturer for each luminaire type.

D. Each luminaire type shall be binned within 3-step MacAdam Ellipse to ensure color consistency among luminaires.

E. Installer Qualifications: Authorized representative who is trained and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying strippable, temporary protective covering before shipping.

1.9 FIELD CONDITIONS

A. Verify existing and proposed utility structures before start of work associated with luminaire installation.

B. Mark locations of exterior luminaires for approval by Architect before start of luminaire installation.

1.10 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, following:

   a. Structural failures, including luminaire support components.
   b. Faulty operation of luminaires and accessories.
   c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by NRTL.

C. UL Compliance: Comply with UL 1598 and listed for wet location.

D. Lamp base complying with ANSI C81.61.

E. Bulb shape complying with ANSI C79.1.

F. Lamps dimmable from 100 percent to zero percent of maximum light output.

G. Internal driver.

H. Nominal Operating Voltage: 240V ac.

I. Lamp Rating: Lamp marked for outdoor use and in enclosed locations.

J. Source Limitations: Obtain luminaires from single source from single manufacturer.

2.2 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

A. Comply with UL 773 or UL 773A.

B. Contact Relays: Factory mounted, single throw, designed to fail in on position, and factory set to turn light unit on at 1.5 to 3 fc and off at 4.5 to 10 fc with 15-second minimum time delay. Relay shall have directional lens in front of photocell to prevent artificial light sources from causing false turnoff.

1. Relay with locking-type receptacle shall comply with ANSI C136.10.
2. Adjustable window slide for adjusting on-off set points.

2.3 MATERIALS

A. Metal Parts: Free of burrs and sharp corners and edges.

B. Sheet Metal Components: Epoxy-coated steel. Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit re-lamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during re-lamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.

D. Housings:

1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
2. Provide filter/breather for enclosed luminaires.

E. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include following lamp characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage, and coating.
c. CCT and CRI for luminaires.

2.4 FINISHES

A. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

B. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.

2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and 2 finish coats of high-gloss, high-build polyurethane enamel. Color: As selected from manufacturer's standard catalog of colors.

2.5 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of Work.

B. Examine roughing-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by Architect, use selected permanent luminaires for temporary lighting. When construction is substantially complete, clean luminaires used for temporary lighting and install new lamps.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Comply with NECA 1.

B. Install lamps in each luminaire.

C. Fasten luminaire to structural support.

D. Wiring Method: Install cables in raceways. Conceal raceways and cables.

E. Install luminaires level, plumb, and square with finished grade unless otherwise indicated.

F. Coordinate layout and installation of luminaires with other construction.

G. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring north orientation.

H. Comply with requirements in Section 260519 "Low-Voltage Power Conductors and Cables" and Section 260533 "Raceways and Boxes" for wiring connections and wiring methods.

3.4 CORROSION PREVENTION

A. Steel Conduits: Comply with Section 260533 "Raceways and Boxes." In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with 50 percent overlap.

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification."

3.6 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. Perform following tests and inspections with assistance of factory-authorized service representative:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Verify operation of photoelectric controls.

C. Luminaire will be considered defective if it does not pass tests and inspections.

D. Prepare written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.7 DEMONSTRATION

A. Engage factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain luminaires and photocell relays.

END OF SECTION

SECTION 270000 – COMMUNICATIONS BASIC REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes general administrative and procedural requirements for Division 27 and 28, and is intended to supplement, not supersede, the requirements specified in Division 01.

B. General Contractor responsible for coordination of responsibilities between Division 26, 27, and 28 contractor scope. Refer to decision matrix for additional information.

C. Provide completely functioning communications systems.

D. Comply with FAR clause 52.236-21 in circumstances of a need for additional detail or conflict between drawings, specifications, reference standards or code.

E. The requirements described herein include the following:
1. References
2. Definitions
3. Submittals
4. Quality Assurance
5. Delivery, Storage, and Handling
6. Scheduling
7. Warranty
8. Product Substitutions
9. Project Management and Coordination Services
10. Permits and Inspections
11. Field Quality Control
12. Project Closeout and Record Documents

F. Related Items
1. General and Supplementary Conditions: General provisions of Contract and Division 01 apply to Division 27.

G. Consult other Divisions and Sections, determine the extent and character of related work, and coordinate Work of Division 27 with that specified elsewhere to produce a complete and operable installation.

1.3 RESPONSIBILITY MATRIX

CFOI – Contractor furnished/Owner installed
CFCI – Contractor furnished/Contractor installed
VFCI – Vendor furnished/Contractor installed
OFCI – Owner furnished/Contractor installed
OFVI – Owner furnished/Vendor installed
OFOI – Owner furnished/Owner installed
VFVI – Vendor furnished/Vendor installed

1.4 REFERENCES

A. General
1. Codes, standards, and industry manuals/guidelines listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Consider such codes and/or standards a part of this Specification as though fully repeated herein.
2. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.
3. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies shall mean that latest edition of such publications adopted and published prior to submittal of the bid unless otherwise specifically stated.

B. Codes: Perform Work and furnish materials and equipment under Division 27 in accordance with applicable requirements of the latest edition of governing codes, rules and regulations including but not limited to the following minimum standards, whether statutory or not:
1. United States Department Of Labor (DOL) Occupational Safety and Health Administration (OSHA) Regulations (Standards - 29 CFR)
   a. Part 1910, “Occupational Safety and Health Standards”
   b. Part 1926, “Safety and Health Regulations for Construction”
2. Texas Accessibility Standards (TAS)
3. Texas Administrative Code
4. National Fire Protection Agency (NFPA) 101 (Life Safety Code)
5. Code of Federal Regulations (CFR) Title 47 “Telecommunication”, Chapter I “Federal Communications Commission (FCC)”:
   a. Part 15, Radio Frequency Devices & Radiation Limits
   b. Part 24, Personal Communications Services
   c. Part 27, Miscellaneous Wireless Communications Services
   d. Part 68, Connection of Terminal Equipment to the Telephone Network
6. National Fire Protection Agency (NFPA)
   a. NFPA 70, “National Electrical Code” (NEC)
   b. NFPA 75, “Protection Of Information Technology Equipment”
   c. NFPA 262, “Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces”,

7. Other national, state, and local binding building and fire codes

C. Standards: Perform Work and furnish materials and equipment under Division 27 in accordance with the latest editions of the following standards as applicable:
   1. Underwriter's Laboratories (UL): Applicable listing and ratings, including but not limited to the following standards:
      a. UL 444, “Communications Cables”
      b. UL 497, “Protectors for Paired-Conductor Communication Circuits”
      c. UL 497A, “Secondary Protectors for Communications Circuits”
      d. UL 497B, “Protectors for Data Communications and Fire-Alarm Circuits”
      e. UL 1651, “Optical Fiber Cable”
      f. UL 1666, “Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts “
      g. UL 1690, “Data-Processing Cable “
      h. UL 1963, “Communications-Circuit Accessories”
      i. UL 2024A, “Optical Fiber Cable Routing Assemblies”
   2. ANSI/TIA/EIA-568 Series:
      a. “ANSI/TIA-568.0-D, Generic Telecommunications Cabling for Customer Premises, Ed. D, 09-2015”
      b. “ANSI/TIA-568.1-D, Commercial Building Telecommunications Cabling Standard, Ed. D, 09-2015”
      c. ANSI/TIA-568-C.2, “Balanced Twisted-Pair Telecommunication Cabling and Components Standard, Ed. C, Err. 04-2014”
      d. ANSI/TIA-568.3-D, “Optical Fiber Cabling And Components Standard, Ed. D, 10-2016”
      e. ANSI/TIA-568-C.4, “Broadband Coaxial Cabling and Components Standard, Ed. C, 07- 2011”
   3. ANSI/TIA-569-B, “Commercial Building Standard for Telecommunications Pathways and Spaces”
   4. ANSI/TIA/EIA-598, “Optical Fiber Cable Color Coding”
   5. ANSI/TIA/EIA-606-A, “Administration Standard for Commercial Telecommunications Infrastructure”
   6. ANSI/J-STD-607-A, “Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications”
   7. ANSI/TIA/EIA-758, “Customer-Owned Outside Plant Telecommunications Cabling Standard”, including the following addenda”
   8. ANSI/TIA-1005, “Telecommunications Infrastructure Standard for Industrial Premises”
   9. EIA testing standards
   10. Insulated Cable Engineers Association (ICEA):
      a. ANSI/ICEA S-80-576-2002, “Category 1 & 2 Individually Unshielded Twisted Pair Indoor Cables for Use in Communications Wiring Systems”
      b. ANSI/ICEA S-83-596-1994, “Fiber Optic Premises Distribution Cable”
      c. ANSI/ICEA S-87-640-1999, “Fiber Optic Outside Plant Communications Cable”
      d. ANSI/ICEA S-90-661-2002, “Category 3, 5, & 5e Individually Unshielded Twisted Pair Indoor Cable for Use In General Purpose and LAN Communication Wiring Systems”

e. ICEA S-102-700-2004, "ICEA Standard For Category 6 Individually Unshielded Twisted Pair Indoor Cables (With Or Without An Overall Shield) For Use In Communications Wiring Systems Technical Requirements"
f. ICEA S-104-696-2001, "Indoor-Outdoor Optical Cable"

11. Building Industry Consulting Services International (BICSI) :
    a. Telecommunications Distribution Methods Manual (TDMM)
    b. Customer-Owned Outside Plant Design Manual
    c. Wireless Design Reference Manual (WDRM)
    d. Network Design Reference Manual (NDRM)
12. IEEE-802 – Standards
    a. IEEE-802.3af Power Over Ethernet (PoE) Standard
    b. IEEE-802.3af Power Over Ethernet + (PoE+) Standard
    c. IEEE-802.3an Physical Layer and Management for 10Gbps – 10BASE-T
    d. IEEE-802.11 Wireless Standard

D. Make a copy of each document readily available during the course of construction for reference by field personnel.

1.5 DEFINITIONS

A. The Definitions of Division 01 shall apply to Division 27 sections.

B. Service Provider: The operator of a service that provides telecommunications transmission delivered over access provider facilities.

C. In addition to those Definitions of Division 01, the following list of terms as used in this specification defined as follows:
1. "As directed": As directed or instructed by the Owner, or their authorized representative
2. "Cabling": A system comprised of cables, wire, cords, and connecting hardware [e.g., cables, termination apparatus, patch panels, blocks, connectors, outlets, labeling, etc]
3. "Connect": To install required patch cords, equipment cords, crossconnect wire, etc. to complete an electronic or optical signal circuit
4. "Cord": a length of cordage having connectors at each end. The term "Cord" is synonymous with the term "Jumper" and "Lead"
5. "Engineer": MEPCE
6. "Furnish": To purchase, procure, acquire, and deliver complete with related accessories
7. "General Contractor": Manhattan/Byrne/3i
8. "Identifier": A unique code assigned to an element of the Telecommunications infrastructure that links it to its corresponding record
9. "Install": To set in place, join, unite, fasten, link, attach, set up or otherwise connect together and test before turning over to the Owner, parts, items, or equipment supplied by contractor or others. Make installation complete and ready for regular operation
10. "Owner/Owner's Representative": Weatherford
11. "Pigtail": a length of cordage having connectors at one end
12. "Provide": To furnish, transport, install, erect, connect, test and turn over to the Owner, complete and ready for regular operation

1.6 SUBMITTALS

A. Submit required submittals to the General Contractor in the quantities and formats as required under the general contract. In the absence of requirements, provide as described in the following with reference to quantity and format.

B. Failure to comply with requirements in part or whole shall constitute grounds for rejection.

C. Submittal Description: Product Data
   1. Obtain written approval from the Engineer for the product data submittal prior to materials and equipment purchase order and prior to installation.
   2. Quantity: Submit product data as described in Division 01. In the absence of requirements given, submit four product data submittals.
   3. Format:
      a. Submit each product data on letter size (8.5” x 11”) paper.
      b. Package product data using a 3-ring binder, plastic cover, or similar.
      c. Clearly label the cover and spine of each submittal with the following information (e.g., if in a 3-ring binder, insert the submittal information in the transparent front cover and spine pockets):
         1) Client Name
         2) Project Name and Address
         3) Project Submittal Number
         4) Submittal Name
         5) Specification Section Number
         6) Date of Submittal. Format: Month Day, Year
         7) Contractor Name
      d. Include a Table Of Contents at the beginning of the submittal that lists materials by article and paragraph number (e.g., “2.02 Equipment Racks”).
      e. Include tabbed separators for improved navigation through the submittal.
   4. Content:
      a. Cover Letter: Include a cover letter stating that the submittal is in full compliance with the requirements of the Contract Documents. Sign (and stamped, if applicable) cover letter and list items and data submitted.
      b. Product Information: Include manufacturer's technical data, product literature, "catalog cuts", data sheets, specifications, and block wiring diagrams (if necessary) to clearly describe the product’s characteristics, physical and dimensional information, electrical performance data, materials used in fabrication, material color & finish, and other relevant information such as test data, typical usage examples, independent test agency information, and storage requirements. Clearly indicate by arrows or brackets precisely what is being submitted on and those optional accessories, which are included and those which are excluded. At a minimum, include products listed in Division 27. Include relevant products that will be installed, which are not listed in the specifications.
      c. Resubmittals: Provide a cover letter with the resubmittal that lists the action taken and revisions made to each product submittal in response to Submittal Review Comments. No review shall take place for any resubmittal packages that is not accompanied by this cover letter. Failure to include this cover letter will constitute rejection of the resubmittal package.

D. Submittal Description: Shop Drawings
   1. Prior to the start of work, submit shop drawings and obtain written approval from the Engineer for the shop drawings submittal.
   2. Provide cable pulling plan in addition to other required shop drawings.
   3. Quantity and Media: Submit shop drawings as described in Division 01. In the absence of requirements given, submit four full-size sets of shop drawings on bond or "eco-bond".
   4. Format:
      a. Produce shop drawings using AutoDesk Revit, or other computer design application that can save files to AutoDesk Revit-compatible files.
      b. Use the same sheet size as the drawings of the Contract Documents.
      c. Use the project's title block – same as the drawings of the Contract Documents.
      d. Text: minimum of 3/32" high when plotted at full size.
      e. Use identical symbols as those in the drawings.
      f. Screen background information.
      g. Plot system components (devices, cable routes, etc.) and text at a sufficient line weight to stand out against background information.
      h. Label each sheet in the shop drawings set with the Specification Section Number (e.g., "271523").
      i. Scaling:
         1) Scale floor plans at 1/8"=1'-0"
         2) Scale enlarged room plans at 1/4"=1'-0"
         3) Scale wall elevations at 1"=1'-0"
         4) Scale rack elevations at 1"=1'-0"
   5. Content:
      a. Submit shop drawings if the proposed installation differs from the Contract Documents or the design intent.
      b. Cover Letter: Accompany each shop drawing submittal with a cover letter stating that the shop drawings have been thoroughly reviewed by the Contractor and are in full compliance with the requirements of the Contract Documents. Have the person who prepared the submittal sign (and stamped, if applicable) the cover letter and include a drawing index. Failure to comply with this requirement shall constitute grounds for rejection of submittal.
      c. Drawing Information: Shop drawing submittals shall consist of floor plans, enlarged room plans, wall and rack elevations, installation details, and other aspects of the system that differ from the Contract Documents or the design intent. Use the same scales as the Drawings (e.g., 1/4" = 1'-0" for enlarged room plans).
      d. Resubmittals: Accompany resubmittals with a cover letter that lists the revisions made to each drawing in response to Submittal Review Comments. Failure to include this cover letter will constitute rejection of the resubmittal package without review.

E. Submittal Description: As-Built Drawings
   1. Quantity and Media: Submit as-built drawings as described in Division 01. In the absence of requirements given, submit one full-size set of shop drawings on bond or "eco-bond" and submit one set of electronic files on DVD-ROM.
   2. Format:

a. Produce as-built drawings using AutoDesk Revit, or other computer design application that can save files to AutoDesk Revit -compatible files.
b. Use the same sheet size as the drawings of the Contract Documents.
c. Use the project's title block – same as the drawings of the Contract Documents.
d. Text: minimum of 3/32" high when plotted at full size.
e. Use symbols identical to the symbols shown on the Drawings.
f. Screen background information.
g. Plot system components (devices, cable routes, etc.) and text at a sufficient line weight to stand out against background information.

2. Content:
   a. Submit as-built drawings that fully represent actual installed conditions and that incorporate modifications made during the course of construction.
   b. Floor Plans: Scale floor plans at 1/8"=1'-0". Floor plans shall show:
      1) Locations and identifiers of telecommunications devices.
      2) Size, quantity, location, and routes of pathways (such as cable trays, cable basket, conduits 2" trade size or larger.,
   c. Rooms Drawings: Applicable rooms: EF, ER & TR. Room drawings shall show:
      1) Floor layouts – scaled at either 1/4"=1'-0" showing dimensioned placement of equipment cabinets/frames, rack bays, etc.
      2) Overhead layouts – scaled at either 1/4"=1'-0" showing dimensioned placement of overhead cable support (e.g., cable tray, cable runway, basketway, conduit sleeves, etc.)
      3) Rack elevations – scaled at 1"=1'-0", showing placement of termination apparatus and other equipment installed onto rack bays
      4) Wall Elevations – scaled at 1"=1'-0", showing dimensioned placement of termination apparatus (e.g., termination/crossconnect blocks)

F. Submittal Description: Operation and Maintenance (O&M) Manuals for Active Systems
   1. Quantity: Submit quantity of O&M Manuals as described in Division 01. In the absence of requirements given, submit four O&M Manuals.
   2. Format:
      a. Submit each O&M Manual in a white, 3-ring binder with front cover and spine clear pockets for insertion of the project information.
      b. Clearly label the cover of each O&M Manual with the following information:
         1) Client Name
         2) Project Name and Address
         3) Manual Name (e.g., "Operation And Maintenance Manual for Telecommunications Cabling System")
         4) Date of Submittal. Format: Month Day, Year (e.g., "January 1, 2010")
         5) Contractor Name
      c. Include a Table Of Contents at the beginning that lists the contents.
      d. Include tabbed separators for improved navigation through the manual.
   3. Content:
      a. Tabloid (17"x11") prints of as-built drawings, as described above
      b. Manufacturer's original catalog information sheets for each component provided under applicable Section (typically, this is similar to the accepted product data submittal)
      c. Warranty certificate from the manufacturer and the Contractor

d. Manufacturer's instructions for system or component use
e. Instructions and requirements for maintenance and warranty issues
f. Contents shall include requirements and methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.

G. Submittal Description: Operation and Maintenance (O&M) Manuals for Passive Systems
1. Quantity: Submit quantity of O&M Manuals as described in Division 01. In the absence of requirements given, submit four O&M Manuals.
2. Format:
a. Submit each O&M Manual in a white, 3-ring binder with front cover and spine clear pockets for insertion of the project information.
b. Clearly label the cover of each O&M Manual with the following information:
1) Client Name
2) Project Name and Address
3) Manual Name (e.g., "Operation And Maintenance Manual for Telecommunications Cabling System")
4) Date of Submittal. Format: Month Day, Year
5) Contractor Name
c. Include a Table Of Contents at the beginning that lists the contents.
d. Include tabbed separators for improved navigation through the manual.
3. Content:
a. Tabloid (17"x11") prints of as-built drawings, as described above
b. Manufacturer's original catalog information sheets for each component provided under applicable Section (typically, this is similar to the accepted product data submittal)
c. Warranty certificate from the manufacturer and the Contractor

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Installation Supervision: Installation shall be under the direct supervision of ITS Technician**,** who shall be present at all times when Work of this Section is performed at Project site.
2. Field Inspector: Currently registered by BICSI as a designer RCDD to perform the on-site inspection.

B. Manufacturer Qualifications
1. Five continuous years, minimum, design and manufacture of the materials and equipment specified herein.
2. Manufacturer(s) of products and equipment specified herein shall demonstrate that they have a quality assurance program in place to assure that the specifications are met. Include in the program, at a minimum, provisions for:
a. Incoming inspection of raw materials
b. In-process inspection and final inspection of the cable product

c. Calibration procedures of test equipment to be used in the qualifications of the product
d. Recall procedures in the event that out of calibration equipment is identified.

3. Conform to government standards on quality assurance for applications within these specifications.

C. Materials
1. Materials, support hardware, equipment, parts comprising units, etc., shall be new, unused, without defects and of current manufacturer, materials
2. Use specified products and applications, unless otherwise submitted and approved in writing.

D. Regulatory Requirements
1. Work and materials shall conform to the latest rules of National Board of Fire Underwriters wherever such standards have been established and shall conform to the regulations of the State Fire Marshal, OSHA and the codes of the governing local municipalities. Work under Division 27 shall confirm to the most stringent of the applicable codes.
2. Provide the quality identified within these Specifications and Drawings when codes, standards, regulations, etc. allow Work of lesser quality or extent. The Contract Documents address the minimum requirements for construction.

E. Drawings
1. Follow the general layout shown on the Drawings except where other Work may conflict with the Drawings.
2. Drawings for the Work within this Division are essentially diagrammatic within the constraints of the symbology applied.
3. The Drawings do not fully represent the entire installation for the Communications System. Drawings indicate the general route for the cables and the location of outlets. The Drawings might not expressly show every conduit, sleeve, hanger, etc., but a complete system is required.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Delivery
1. Do not deliver products to the site until protected storage space is available.
2. Coordinate materials delivery with installation schedule to minimize storage time at jobsite.
3. Deliver materials in manufacturer's original, unopened, undamaged packaging and containers with identification labels (name of the manufacturer, product name and number, type, grade, UL classification, etc.) intact.
4. Immediately replace equipment damaged during shipping at no cost to the Owner, so as not to impact the construction schedule.

B. Storage and Protection

1. Store materials in clean, dry, ventilated space free from temperature and humidity conditions (as recommended by manufacturer) and protected from exposure to harmful weather conditions.
2. Comply with manufacturer's storage requirements for each product. Comply with recommended procedures, precautions or remedies as described in the Material Safety Data Sheets (MSDS) as applicable.
3. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris, and traffic.
4. Storage outdoors covered by rainproof material is not acceptable.
5. Provide heat where required to prevent condensation or temperature related damage.

C. Handling
1. Handle materials and equipment in accordance with manufacturer's written instructions. Handle with care to prevent damage, breakage, denting, and scoring.
2. Do not install damaged materials and equipment. Replace damaged equipment at no cost to the Owner.

1.9 SCHEDULING

A. Unless otherwise specified, the construction schedules of the Sections within Division 27 may be combined into a single, overall schedule.

B. Do not proceed without written approval from the Owner or Owner’s Representative for schedule of this Work.

1.10 PROJECT MANAGEMENT AND COORDINATION

A. Project Management and Coordination Services
1. Provide a project manager for the duration of the project to coordinate this Work with other trades. Coordination services, procedures and documentation responsibility include, but are not limited to, the items listed in this section.
2. BIM Model Coordination:
a. Resolve conflicts with other trades during design assist phase of the projects. Obtain the assistance/approval of the engineer where the design deviates substantially from the contract drawings.

B. Concurrent Installation
1. The network will be installed concurrent with the work of Division 27. Coordinate your Work with the Owner’s/network integrator’s work. For example, coordinate scope and dates for rack and cabling (terminations) readiness to allow the network integrator to plan and schedule installation of the network equipment (for example, access switches).

C. Role of the Engineer
1. The Owner has retained the Engineer’s services through construction. During construction, the Engineer will work with and assist the Contractor as follows:

a. Review product data and shop drawings submittals for general compliance with the contract drawings and specifications.
b. Provide interpretation and clarification of project contract documents
c. Reply to (and 'process') relevant Requests for Information (RFIs)
d. Review changes as they arise, and confirm that the proposed solutions maintain the intended functionality of the system.
e. Interpret field problems for Owner, and translate between Owner and Construction Team.
f. Review the testing procedures to confirm compliance with industry-accepted practices.
g. Observe the work for general compliance with the Contract Documents and to ensure that the installation meets the design intent of the system, and report progress to the Owner.

D. Use of CAD Files
1. Should the Contractor require the Engineer's CAD files to produce shop drawings and/or as- built drawings, the Engineer requires the Contractor sign a CAD files release agreement.

1.11 WARRANTY

A. Warrant products and labor provided will, under normal use and service, be free from defects and faulty workmanship for period of 5 years from the date of acceptance. During the warranty period the entire system shall be kept in operating condition at no additional material or labor costs to the Owner.

B. Render service within two business days of system failure notification. Note deviations or improvements to this service at the time of bid and obtain written acceptance from the Owner, or Owner's Representative.

C. Manufacturers of the major system components shall maintain a replacement parts department and provide testing equipment when needed. Provide complete replacement parts within two business days during the warranty period.

D. Conformance to certain government standards on quality assurance may be required for some applications outlined in these specifications.

PART 2 - PRODUCTS

2.1 GENERAL

A. Materials used shall present no environmental or toxicological hazards as defined by current industry standards and shall comply with OSHA and EPA standards, other applicable federal, state, and local laws.

B. Product numbers are subject to change by the manufacturer without notification. Bid the most up to date version of product line proposed on plans. In the event a product number is invalid or conflicts with the written description, notify the Engineer in writing prior to ordering the material and performing installation work.

2.2 PRODUCT SUBMITTAL AT TIME OF BID

A. At the time of bid, include a list of major products in the Contract documenting the intended cabling system solution. Examples of major products may include: horizontal cable, modular jacks, faceplates, modular patch panels, backbone cable, termination block systems, fiber connectors, fiber patch panels.

2.3 SUBSTITUTIONS

A. Conform to the general requirements and procedure outlined in Division 01 in the Request For Substitution.

B. Substitutions to be approved though MEPCE.

C. Only one substitution allowed for each product specified.

D. Where products are noted as "or equal", a product of equivalent design, construction, and performance will be considered. Submit product data – catalog cuts, product information, and pertinent test data –required to substantiate that the product is in fact equivalent to that specified. The burden of proof that the substituted product is equivalent to the specified product rests with the Contractor. Whenever material, process or equipment is specified in accordance with an industry specification (ANSI, TIA, etc), UL rating, or other association standard, present an affidavit from the manufacturer certifying that the product complies with the particular standard specification. When requested by the Engineer, submit supporting test data to substantiate compliance.

E. Manufacturers' names and model numbers used in conjunction with materials, processes or equipment included in the Contract Documents are used to establish standards of quality, utility and appearance. Materials, processes or equipment that, in the opinion of the Engineer, are equivalent in quality, utility and appearance will be approved as substitutions to that specified when “or equal” follows the manufacturers' names or model number(s).

F. When the Engineer accepts a substitution in writing, it is with the understanding that the Contractor guarantees the substituted product, component, article, or material to be equivalent to the one specified and dimensioned to fit within the construction according to contract documents. Do not provide substituted material, processes, or equipment without written authorization from the Engineer. Assumptions on the acceptability of a proposed substitution, prior to acceptance by the Engineer, are at the sole risk of the Contractor.

G. Approved substitutions shall not relieve the Contractor of responsibilities for the proper execution of the work, or from provisions of the specifications.

H. Pay expenses, without additional charge to the Owner, in connection with substitution materials, processes and equipment, including the effect of substitution on self, subcontractor's or other Contractor's work.

PART 3 - EXECUTION

3.1 PERMITS AND INSPECTIONS

A. Obtain and pay for permits and inspections required for the work.

B. Furnish materials and execute workmanship for this work in conformance with applicable legal and code requirements.

C. Perform tests required herein, or as may be reasonably required to demonstrate conformance with the Specifications or with the requirements of legal authority having jurisdiction.

D. Arrange and pay for review/inspection from compliance officials responsible for enforcement of applicable codes and regulations to establish that the work is in compliance with requirements of reference codes indicated herein.

3.2 EXAMINATION

A. Verify existing conditions, stated under other sections, are acceptable for installation in accordance with manufacturer's instructions.

3.3 FIELD QUALITY CONTROL

A. Staffing: Provide a qualified foreman to supervise the crew performing the work and who is present at the job site at times work is being performed.

B. Construction Meetings: Participate in construction coordination meetings throughout the course of construction to review the progress and to resolve issues and conflicts. Prepare and distribute meeting agenda for telecommunication issues prior to, and meeting notes after meetings, in a format acceptable to the Owner. Publish meeting notes within 3 business days following the meeting.

C. Scheduling: Perform the work within the approved construction schedule. Keep the construction schedule current, based on the results of the construction meetings. At minimum, schedule shall document critical due dates, tasks, and milestones. Submit revised schedules for approval within 3 business days whenever there are modifications.

D. Inspection: Inspect the work after installation. Keep areas of work accessible and notify code authorities, or designated inspectors, of work completion released for inspection. Document completion and inspection as required.

3.4 INSTALLATION

A. Comply with NECA 1.

B. Comply with TIA-607-B.

C. Complete work in a neat, high-quality manner, relative to common industry practices, and in accordance to NECA “Standard of Installation”.

D. Complete work in conformance to applicable federal, state and local codes, and telephone standards.

E. Coordinate the entire installation throughout the construction team (general contractor and subcontractors).

F. Manufacturer's Instructions:
1. Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation.
2. Maintain jobsite file of Material Safety Data Sheets (MSDS) for each product delivered to jobsite packaged with an MSDS.

G. Adjusting:
1. Make changes and revisions to the system to optimize operation for final use.
2. Make changes to the system such that defects in workmanship are corrected and cables and the associated termination hardware pass the minimum test requirements.

H. Protection
1. Protect installed products and finish surfaces from damage during construction.

I. Repair/Restoration
1. Replace or repair work completed by others that you deface or destroy. Pay the full cost of this repair/replacement.
2. Repair defects prior to system acceptance.

3.5 CLEANING

A. Remove temporary coverings and protection of adjacent work areas. Remove unused, excess, and left over products, debris, spills, or other excess materials. Remove installation equipment.

B. Leave finished work and adjacent surfaces in neat, clean condition with no evidence of damage.

C. Repair or replace damaged installed products.

D. Legally dispose of debris.

E. Clean installed products in accordance with manufacturer's instructions prior to Owner's, or Owner’s Representative’s, final punch walk.

3.6 FINAL INSPECTION AND CERTIFICATION

A. Punch Walks and Punch Lists
   1. Punching the Work of individual Sections of Division 27 may be combined.
   2. Execute a punch walk with the Engineer and the Owner or Owner's Representative to observe Work.
   3. Develop a punch list for items needing correction. Issue this punch list to Engineer.
   4. Correct the Work as noted on punch list.
   5. Execute follow up punch walk with the Engineer and the Owner or Owner's Representative to verify punch list items have been corrected.

B. System Acceptance
   1. Complete corrections (punch list items) prior to submitting acceptance certificate.
   2. On completion of the acceptance test, submit system acceptance certificate to the Owner or Owner's Representative requesting their signature and return of the certificate. Issue copies of the signed certificate back to the Owner or Owner's Representative with copy to the Engineer.

C. Training
   1. After acceptance, schedule a time convenient with the Owner, or Owner's Representative, for instruction in the configuration, operation, and maintenance of the system.
   2. Provide 2 hours, minimum, UON in individual specification sections of on-site training by a factory-trained representative. Document dates and times of training, and submit a "sign in" sheet for individuals trained, as part of the close out documentation.

END OF SECTION 270000

SECTION 270526 - GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Grounding conductors.
2. Grounding connectors.
3. Grounding busbars.
4. Grounding rods.
5. Grounding labeling.

1.3 DEFINITIONS

A. BCT: Bonding conductor for telecommunications.

B. TGB: Telecommunications grounding busbar.

C. TMGB: Telecommunications main grounding busbar.

D. Service Provider: The operator of a service that provides telecommunications transmission delivered over access provider facilities.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For communications equipment room signal reference grid. Include plans, elevations, sections, details, and attachments to other work.

1.5 INFORMATIONAL SUBMITTALS

A. As-Built Data: Plans showing as-built locations of grounding and bonding infrastructure, including the following:

1. Ground rods.
2. Ground and roof rings.
3. BCT, TMGB, TGBs, and routing of their bonding conductors.

B. Qualification Data: For installer, installation supervisor, and field inspector.

C. Qualification Data: For testing agency and testing agency's field supervisor.

D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Result of the ground-resistance test, measured at the point of BCT connection.
b. Result of the bonding-resistance test at each TGB and its nearest grounding electrode.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Installation Supervision: Installation shall be under the direct supervision of ITS Technician who shall be present at all times when Work of this Section is performed at Project site.
2. Field Inspector: Currently registered by BICSI as a designer RCDD to perform the on-site inspection.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

C. Comply with TIA-607-B.

2.2 CONDUCTORS

A. Comply with UL 486A-486B.

B. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.

1. Ground wire for custom-length equipment ground jumpers shall be No. 6 AWG, 19-strand, UL-listed, Type THHN wire.
2. Cable Tray Equipment Grounding Wire: No. 6 AWG.

C. Cable Tray Grounding Jumper:

1. Not smaller than No. 6 AWG and not longer than 12 inches. If jumper is a wire, it shall have a crimped grounding lug with two holes and long barrel for two crimps. If jumper is a flexible braid, it shall have a one-hole ferrule. Attach with grounding screw or connector provided by cable tray manufacturer.
2. Not smaller than No. 10 AWG and not longer than 12 inches. If jumper is a wire, it shall have a crimped grounding lug with one hole and standard barrel for one crimp. If jumper is a flexible braid, it shall have a one- or two-hole ferrule. Attach with grounding screw or connector provided by cable tray manufacturer.

D. Bare Copper Conductors:

1. Solid Conductors: ASTM B3.
2. Stranded Conductors: ASTM B8.
3. Tinned Conductors: ASTM B33.
4. Bonding Cable: 28 kcmils, 14 strands of No. 17 AWG conductor, and 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Tinned-copper tape, braided conductors terminated with two-hole copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.3 CONNECTORS

A. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with NFPA 70 for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A-486B.

B. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.

1. Electroplated tinned copper, C and H shaped.

C. Signal Reference Grid Connectors: Combination of compression wire connectors, access floor grounding clamps, bronze U-bolt grounding clamps, and copper split-bolt connectors, designed for the purpose.

D. Busbar Connectors: Cast silicon bronze, solderless compression-type, mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch centers for a two-bolt connection to the busbar.

E. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.4 GROUNDING BUSBARS

A. TMGB: Predrilled, wall-mounted, rectangular bars of hard-drawn solid copper, 1/4 by 4 inches in cross section, length as indicated on Drawings (Minimum of 24”). The busbar shall be NRTL listed for use as TMGB and shall comply with TIA-607-B.

1. Predrilling shall be with holes for use with lugs specified in this Section.
2. Mounting Hardware: Stand-off brackets that provide a 4-inch clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

B. TGB: Predrilled rectangular bars of hard-drawn solid copper, 1/4 by 2 inches in cross section, length as indicated on Drawings (Minimum of 12”). The busbar shall be for wall mounting, shall be NRTL listed as complying with UL 467, and shall comply with TIA-607-B.

1. Predrilling shall be with holes for use with lugs specified in this Section.
2. Mounting Hardware: Stand-off brackets that provide at least a 2-inch clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

C. Rack and Cabinet Grounding Busbars: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with TIA-607-B. Predrilling shall be with holes for use with lugs specified in this Section.

1. Cabinet-Mounted Busbar: Terminal block, with stainless-steel or copper-plated hardware for attachment to the cabinet.
2. Rack-Mounted Horizontal Busbar: Designed for mounting in 19-inch equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.
3. Rack-Mounted Vertical Busbar: 36 inches long, with stainless-steel or copper-plated hardware for attachment to the rack.

2.5 GROUND RODS

A. Ground Rods: Copper-clad-steel; 3/4 inch by 10 feet in diameter.

2.6 IDENTIFICATION

A. Comply with requirements for identification products in Section 270553 "Identification for Communications Systems."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the AC grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of the electrical system.

B. Inspect the test results of the AC grounding system measured at the point of BCT connection.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with connection of the BCT only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Bonding shall include the AC utility power service entrance, the communications cable entrance, and the grounding electrode system. The bonding of these elements shall form a loop so that each element is connected to at least two others.

B. Comply with NECA 1.

C. Comply with TIA-607-B.

3.3 APPLICATION

A. Conductors: Install solid conductors for No. 8 AWG and smaller and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

1. The bonding conductors between the TGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.
2. The bonding conductors between the TMGB and structural steel of steel-frame buildings shall not be smaller than **No. 6** AWG.

B. Underground Grounding Conductors: Install bare copper conductor, No. 2 AWG minimum.

C. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

D. Conductor Support:

1. Secure grounding and bonding conductors at intervals of not less than 36 inches.

E. Grounding and Bonding Conductors:

1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
2. Install without splices.
3. Support at not more than 36-inch intervals.
4. Install grounding and bonding conductors in 3/4-inch PVC conduit until conduit enters a telecommunications room. The grounding and bonding conductor pathway through a plenum shall be in EMT. Conductors shall not be installed in EMT unless otherwise indicated.

    a. If a grounding and bonding conductor is installed in ferrous metallic conduit, bond the conductor to the conduit using a grounding bushing that complies with requirements in Section 270528 "Pathways for Communications Systems," and bond both ends of the conduit to a TGB.

3.4 GROUNDING ELECTRODE SYSTEM

A. The BCT between the TMGB and the AC service equipment ground shall not be smaller than No.6 AWG.

3.5 GROUNDING BUSBARS

A. Indicate locations of grounding busbars on Drawings. Install busbars horizontally, on insulated spacers 2 inches minimum from wall, 12 inches above finished floor unless otherwise indicated.

B. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

3.6 CONNECTIONS

A. Bond metallic equipment in a telecommunications equipment room to the grounding busbar in that room, using equipment grounding conductors not smaller than No. 6 AWG.

B. Stacking of conductors under a single bolt is not permitted when connecting to busbars.

C. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:

1. Use crimping tool and the die specific to the connector.
2. Pre-twist the conductor.
3. Apply an antioxidant compound to all bolted and compression connections.

D. Primary Protector: Bond to the TMGB with insulated bonding conductor.

E. Interconnections: Interconnect all TGBs with the TMGB with the telecommunications backbone conductor. If more than one TMGB is installed, interconnect TMGBs using the grounding equalizer conductor. The telecommunications backbone conductor and grounding equalizer conductor size shall not be less than 2 kcmils/linear foot of conductor length, up to a maximum size of No. 3/0 AWG unless otherwise indicated.

F. Telecommunications Enclosures and Equipment Racks: Bond metallic components of enclosures to the telecommunications bonding and grounding system. Install a rack grounding busbar unless the enclosure and rack are manufactured with the busbar. Bond the equipment grounding busbar to the TGB No. 2 AWG bonding conductors.

G. Structural Steel: Where the structural steel of a steel frame building is readily accessible within the room or space, bond each TGB and TMGB to the vertical steel of the building frame.

H. Electrical Power Panelboards: Where an electrical panelboard for telecommunications equipment is located in the same room or space, bond each TGB to the ground bar of the panelboard. Ensure racks are not located within 3’ directly in front of panelboards.

I. Shielded Cable: Bond the shield of shielded cable to the TGB in communications rooms and spaces. Comply with TIA-568-C.1 and TIA-568-C.2 when grounding shielded balanced twisted-pair cables.

J. Rack- and Cabinet-Mounted Equipment: Bond powered equipment chassis to the cabinet or rack grounding bar. Power connection shall comply with NFPA 70; the equipment grounding conductor in the power cord of cord- and plug-connected equipment shall be considered as a supplement to bonding requirements in this Section.

K. Access Floors: Bond all metal parts of access floors to the TGB. Ground access floor per manufacturers requirements. If manufacturer does not have grounding standard, contractor to ground every other pedestal.

L. Equipment Room Signal Reference Grid: Provide a low-impedance path between telecommunications cabinets, equipment racks, and the reference grid, using **No. 6** AWG bonding conductors.

1. Install the conductors in grid pattern on 4-foot centers, allowing bonding of one pedestal from each access floor tile.
2. Bond the TGB of the equipment room to the reference grid at two or more locations.

3. Bond all conduits and piping entering the equipment room to the TGB at the perimeter of the room.

M. Towers and Antennas:

1. Ground Ring: Buried at least 30 inches below grade and at least 24 inches from the base of the tower or mounting.
2. Bond each tower base and metallic frame of a dish to the ground ring, buried at least 18 inches below grade.
3. Bond the ground ring and antenna grounds to the equipment room TMGB or TGB, buried at least 30 inches below grade.
4. Bond metallic fences within 6 feet of towers and antennas to the ground ring, buried at least 18 inches below grade.
5. Special Requirements for Roof-Mounted Towers:

    a. Roof Ring: Meet requirements for the ground ring except the conductors shall comply with requirements in Section 264113 "Lightning Protection for Structures."
    b. Bond tower base footings steel, the TGB in the equipment room, and antenna support guys to the roof ring.
    c. Connect roof ring to the perimeter conductors of the lightning protection system.

6. Waveguides and Coaxial Cable:

    a. Bond cable shields at the point of entry into the building to the TGB and to the cable entrance plate, using No. 2 AWG bonding conductors.
    b. Bond coaxial cable surge arrester to the ground or roof ring using bonding conductor size recommended by surge-arrester manufacturer.

3.7 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.

B. Comply with IEEE C2 grounding requirements.

C. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches extends above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

D. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls.

Connect grounding conductors to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

3.8 IDENTIFICATION

A. Labels shall be preprinted or computer-printed type.

1. Label TMGB(s) with "fs-TMGB," where "fs" is the telecommunications space identifier for the space containing the TMGB.
2. Label TGB(s) with "fs-TGB," where "fs" is the telecommunications space identifier for the space containing the TGB.
3. Label the BCT and each telecommunications backbone conductor at its attachment point: "WARNING! TELECOMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!"

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
2. Test the bonding connections of the system using an AC earth ground-resistance tester, taking two-point bonding measurements in each telecommunications equipment room containing a TMGB and a TGB and using the process recommended by BICSI TDMM. Conduct tests with the facility in operation.

    a. Measure the resistance between the busbar and the nearest available grounding electrode. The maximum acceptable value of this bonding resistance is 100 milliohms.

3. Test for ground loop currents using a digital clamp-on ammeter, with a full-scale of not more than 10 A, displaying current in increments of 0.01 A at an accuracy of plus/minus 2.0 percent.

    a. With the grounding infrastructure completed and the communications system electronics operating, measure the current in every conductor connected to the TMGB and in each TGB. Maximum acceptable AC current level is 1 A.

D. Excessive Ground Resistance: If resistance to ground at the BCT exceeds 5 ohms, notify Architect promptly and include recommendations to reduce ground resistance.

E. Grounding system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION 270526

SECTION 270528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Optical-fiber-cable pathways and fittings.
4. Metal wireways and auxiliary gutters.
5. Nonmetallic wireways and auxiliary gutters.
6. Metallic surface pathways.
7. Nonmetallic surface pathways.
8. Boxes, enclosures, and cabinets.
9. Polymer-concrete handholes and boxes for exterior underground cabling.
10. Fiberglass handholes and boxes for exterior underground cabling.

1.3 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. EMT: Electrical metallic tubing.

C. GRC: Galvanized rigid conduit.

D. IMC: Intermediate metal conduit.

E. RNC: Rigid nonmetallic conduit.

F. RTRC: Reinforced thermosetting resin conduit.

1.4 ACTION SUBMITTALS

A. Product data for the following:
1. Surface pathways
2. Wireways and fittings.

3. Boxes, enclosures, and cabinets.
4. Underground handholes and boxes.

B. Shop Drawings:
1. For custom enclosures and cabinets and custom underground handholes and boxes. Include plans, elevations, sections, and attachment details.
2. Site conduit pathways and boxes.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Pathway routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of pathway groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.
3. Underground ducts, piping, and structures in location of underground enclosures and handholes.

B. Qualification Data: For testing agency.

C. Seismic Qualification Data: Provide seismic bracing for all pathway racks, enclosures, cabinets, equipment racks, and their mounting provisions, including those for internal components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which certification is based and their installation requirements.
4. Detailed description of conduit support devices and interconnections on which certification is based and their installation requirements.

D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Description: Metal raceway of circular cross section with manufacturer-fabricated fittings.

B. Manufacturers:
1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit; a part of Atkore International
3. Alpha Wire

4. Southwire Company
5. Thomas & Betts Corporation
6. Western Tube and Conduit
7. Hubbell

C. General Requirements for Metal Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
2. Comply with TIA-569-D.

D. GRC: Comply with ANSI C80.1 and UL 6.

E. ARC: Comply with ANSI C80.5 and UL 6A.

F. IMC: Comply with ANSI C80.6 and UL 1242.

G. PVC-Coated Steel Conduit: PVC-coated GRC.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch, minimum.

H. EMT: Comply with ANSI C80.3 and UL 797.

I. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
2. Fittings for EMT:

a. Material: Steel
b. Type: Compression

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, rated for environmental conditions where installed, and including flexible external bonding jumper.
4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

J. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS AND FITTINGS

A. Description: Nonmetallic raceway of circular section with manufacturer-fabricated fittings.

B. Manufacturers:

1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit; a part of Atkore International
3. Alpha Wire
4. Southwire Company
5. Thomas & Betts Corporation
6. Western Tube and Conduit
7. Hubbell

C. General Requirements for Nonmetallic Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
2. Comply with TIA-569-D.

D. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

E. Rigid HDPE: Comply with UL 651A.

F. Continuous HDPE: Comply with UL 651A.

G. RTRC: Comply with UL 2515A and NEMA TC 14.

H. Fittings: Comply with NEMA TC 3; match to conduit or tubing type and material.
   a. Or equal

2.3 OPTICAL-FIBER-CABLE PATHWAYS AND FITTINGS

A. Description: Comply with UL 2024; flexible-type pathway with a circular cross section, approved for plenum, riser, or general-use installation unless otherwise indicated.

   a. For Spaces Used for Environmental Air: EMT or Plenum-type optical-fiber-cable pathway in cable tray.
   b. For Cable Risers in Vertical Shafts: EMT or Riser-type innerduct/optical-fiber-cable pathway in cable tray.
   c. Pathways for Concealed General-Purpose Distribution of Optical-Fiber or Communications Cable: EMT or General-use innerduct/optical-fiber-cable pathway in cable tray.

B. Manufacturers:
   1. AFC Cable Systems, Inc.
   2. Allied Tube & Conduit; a part of Atkore International
   3. Alpha Wire
   4. Southwire Company
   5. Thomas & Betts Corporation
   6. Western Tube and Conduit

7. Hubbell
8. Panduit
9. CommScope
10. Corning

C. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

D. Comply with TIA-569-D.

2.4 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Description: Sheet metal trough of rectangular cross section fabricated to required size and shape, without holes or knockouts, and with hinged or removable covers.

B. General Requirements for Metal Wireways and Auxiliary Gutters:

1. Comply with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
2. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
3. Comply with TIA-569-D.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Screw-cover type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.5 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

A. Description: Fiberglass polyester, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil-resistant gaskets.

B. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.

C. General Requirements for Nonmetallic Wireways and Auxiliary Gutters:

1. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
2. Comply with TIA-569-D.

D. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

2.6 SURFACE METAL PATHWAYS

A. Description: Galvanized steel with snap-on covers, complying with UL 5.

B. Finish: Manufacturer's standard enamel finish in color selected by Architect

C. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

D. Comply with TIA-569-D.

2.7 SURFACE NONMETALLIC PATHWAYS:

A. Description: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC.

B. Finish: Texture and color selected by Architect from manufacturer's standard colors.

C. Product shall comply with UL 94 V-0 requirements for self-extinguishing characteristics.

D. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

E. Comply with TIA-569-D.

2.8 BOXES, ENCLOSURES, AND CABINETS

A. Description: Enclosures for communications.

B. General Requirements for Boxes, Enclosures, and Cabinets:

1. Comply with TIA-569-D.
2. Boxes, enclosures, and cabinets installed in wet locations shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for use in wet locations.
3. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
4. Device Box Dimensions: 4 inches square by 2-1/8 inches deep
5. Gangable boxes are allowed.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Metal Floor Boxes:

1. Material: Cast metal
2. Type: Fully adjustable.
3. Shape: Rectangular.
4. Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Nonmetallic Floor Boxes: Nonadjustable.

1. Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, [galvanized, cast iron] with gasketed cover.

I. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

J. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1(Indoors) / Type 3R (Outdoors), with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures:

   a. Material: Plastic
   b. Finished inside with radio-frequency-resistant paint.

3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

K. Cabinets:

1. NEMA 250, Type 1(Indoors) / Type 3R (Outdoors), galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

L. Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

2.9 PRECAST CONCRETE MAINTENANCE HOLES AND BOXES

A. Traffic-Rated Handhole:
1. Handholes to be factory-fabricated, reinforced-concrete, precast walls, and bottom, unless open-bottom enclosures are indicated. Frame and cover must form top of enclosure and must have load rating consistent with that of handhole or box, H-20 unless indicated otherwise.
2. Comply with ASTM C 858 for design and manufacturing processes.
3. Frame and Cover
   a. Weatherproof steel frame, with steel cover.
   b. Nonskid cover finish must have a minimum coefficient of friction of 0.50.
   c. Identification lettering on the cover, as indicated for each service. In this case COMMUNICATIONS.
4. Units must be designed with a closed bottom unless otherwise indicated.
5. Knockout panels in the walls must be included for each entering duct.
   a. Interstitial space around ducts entering through knockout panels must be sealed to prevent entry of rock, dirt, and water.
   b. Knockout panels must align with elevations of approaching duct and be located near interior corners of handholes to facilitate racking of cable.
   c. Include asphaltic-butyl joint sealant material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.
6. Handholes must have inserts for pulling-in irons included and installed.
7. Basis of Design
   a. Oldcastle Infrastructure 4’ x 4’ x 4’ pull box
   b. Owner Approved Equivalent

PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

A. Outdoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: IMC.
3. Underground Conduit: Type EPC-80-PVC.
4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT
2. Exposed, Not Subject to Severe Physical Damage: EMT
3. Exposed and Subject to Severe Physical Damage: GRC. Pathway locations include the following:
   a. Mechanical rooms.
   b. Gymnasiums
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Damp or Wet Locations: GRC or IMC.
6. Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, optical-fiber-cable /communications-cable pathway.
7. Pathways for Optical-Fiber or Communications-Cable Risers in Vertical Shafts: Riser-type, optical-fiber-cable or communications-cable pathway.
8. Pathways for Concealed General-Purpose Distribution of Optical-Fiber or Communications Cable: General-use, optical-fiber-cable/ communications pathway.
9. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel units in institutional and commercial kitchens and damp or wet locations.

C. Minimum Pathway Size: 3/4-inch trade size for copper and aluminum cables, and 1 inch for optical-fiber cables.

D. Pathway Fittings: Compatible with pathways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use [compression] fittings. Comply with NEMA FB 2.10.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface pathways only where indicated on Drawings.

G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with the following standards for installation requirements except where requirements on Drawings or in this Section are stricter:

1. NECA 1.
2. NECA/BICSI 568.
3. TIA-569-D.

4. NECA 101
5. NECA 102.
6. NECA 105.
7. NECA 111.

B. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

C. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

D. Comply with requirements in Section 270529 "Hangers and Supports for Communications Systems" for hangers and supports.

E. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling" for sleeves and sleeve seals for communications.

F. Keep pathways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.

G. Complete pathway installation before starting conductor installation.

H. Arrange stub-ups so curved portions of bends are not visible above finished slab.

I. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches of changes in direction. Utilize long radius ells for all optical-fiber cables.

J. Conceal rigid conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

K. Support conduit within 12 inches of enclosures to which attached.

L. Pathways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10-foot intervals.
2. Arrange pathways to cross building expansion joints at right angles with expansion fittings. Comply with requirements for expansion joints specified in this article.
3. Arrange pathways to keep a minimum of 1 inch of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
5. Change from nonmetallic conduit and fittings to GRC and fittings before rising above floor.

M. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for pathways.

2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

N. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.

O. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.

P. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.

Q. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus one additional quarter-turn.

R. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure, to assure a continuous ground path.

S. Cut conduit perpendicular to the length. For conduits of 2-inch trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.

T. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Secure pull wire, so it cannot fall into conduit. Cap pathways designated as spare alongside pathways in use.

U. Surface Pathways:

1. Install surface pathway for surface telecommunications outlet boxes only where indicated on Drawings.
2. Install surface pathway with a minimum 2-inch radius control at bend points.
3. Secure surface pathway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight pathway section. Support surface pathway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

V. Pathways for Optical-Fiber and Communications Cable: Install pathways, metal and nonmetallic, rigid and flexible, as follows:

1. 3/4-Inch Trade Size and Smaller: Install pathways in maximum lengths of 50 feet.
2. 1-Inch Trade Size and Larger: Install pathways in maximum lengths of 75 feet.
3. Install with a maximum of two 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

W. Install pathway-sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway-sealing fittings according to NFPA 70.

X. Install devices to seal pathway interiors at accessible locations. Locate seals, so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service pathway enters a building or structure.
3. Where otherwise required by NFPA 70.

Y. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.

Z. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F, and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT that is located where environmental temperature change may exceed 100 deg F, and that has straight-run length that exceeds 100 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
    d. Attics: 135 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

AA. Hooks:

1. Size to allow a minimum of 25 percent future capacity without exceeding design capacity limits.
2. Shall be supported by dedicated support wires. Do not use ceiling grid support wire or support rods.

3. Hook spacing shall allow no more than 6 inches of slack. The lowest point of the cables shall be no less than 6 inches adjacent to ceilings, mechanical ductwork and fittings, luminaires, power conduits, power and telecommunications outlets, and other electrical and communications equipment.
4. Space hooks no more than 5 feet o.c.
5. Provide a hook at each change in direction.

BB. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to bottom of box unless otherwise indicated. Match electrical outlet heights where possible.

CC. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

DD. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.

EE. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

FF. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

GG. Set metal floor boxes level and flush with finished floor surface.

HH. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

II. Contractor shall spray-paint all system junction boxes in rooms and two-foot (2') of conduits extending out of top wall with paint matching color-coding.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe of less than 6 inches in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."

4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete around conduit for a minimum of 12 inches on each side of the coupling.
    b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

6. Warning Planks: Bury warning planks approximately 12 inches above direct-buried conduits, but a minimum of 6 inches below grade. Align planks along centerline of conduit.
7. Underground Warning Tape: Comply with requirements in Section 270553 "Identification for Communications Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Install handholes with bottom below frost line.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.

F. Field cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR COMMUNICATIONS PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling."

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies.

B. Cable
   1. Cable tray penetration through fire rated construction must be filled after cable is installed to maintain fire rating of original construction as shown on architectural drawings.
      a. Intumescent sealants, fire blocks, caulking, and all other firestopping materials shall meet the UL standards and local code(s).
   2. Where a cable or bundle of cables exits a cable tray and penetrates a fire rated
      a. construction a conduit shall be provided to pass through that construction. Conduit must be sized for 250% of installed capacity.
   3. Where a cable or a bundle of cables penetrate a fire rated floor, a conduit shall be provided to pass through that construction. Conduit must be sized for 250% of installed capacity.
   4. Conduit may be filled with acceptable firestopping material or an acceptable Intumescent ring may be installed around conduit to maintain fire rating of original construction as shown on Architectural drawings.

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage or deterioration.

   1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 270528

SECTION 270529 - HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Steel slotted support systems for communication raceways.
2. Aluminum slotted support systems for communication raceways.
3. Nonmetallic slotted support systems for communication raceways.
4. Conduit and cable support devices.
5. Support for conductors in vertical conduit.
6. Structural steel for fabricated supports and restraints.
7. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
8. Fabricated metal equipment support assemblies.

B. Related Requirements:
1. Section 270548 "Seismic Controls for Communications Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

a. Slotted support systems, hardware, and accessories.
b. Clamps.
c. Hangers.
d. Sockets.
e. Eye nuts.
f. Fasteners.
g. Anchors.
h. Saddles.
i. Brackets.

2. Include rated capacities and furnished specialties and accessories.

B. Shop Drawings: For fabrication and installation details for communications hangers and support systems.
   1. Trapeze hangers. Include product data for components.
   2. Steel slotted-channel systems.
   3. Aluminum slotted-channel systems.
   4. Nonmetallic slotted-channel systems.
   5. Equipment supports.
   6. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated-Design Submittal: For hangers and supports for communications systems.
   1. Include design calculations and details of trapeze hangers.
   2. Include design calculations for seismic restraints.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Suspended ceiling components.
   2. Ductwork, piping, fittings, and supports.
   3. Structural members to which hangers and supports will be attached.
   4. Size and location of initial access modules for acoustical tile.
   5. Items penetrating finished ceiling, including the following:
      a. Luminaires.
      b. Air outlets and inlets.
      c. Speakers.
      d. Sprinklers.
      e. Access panels.
      f. Projectors.

B. Seismic Qualification Data: Certificates, for hangers and supports for communications equipment and systems, accessories, and components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Welding certificates.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame Rating: Class 1.
   2. Self-extinguishing according to ASTM D635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.

   1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
   2. Material for Channel, Fittings, and Accessories: Plain steel
   3. Channel Width: 1-5/8 inches.
   4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
   5. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
   6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
   7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
   8. Channel Dimensions: Selected for applicable load criteria.

B. Aluminum Slotted Support Systems: Extruded aluminum channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.

   1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
   2. Channel Material: 6063-T6 aluminum alloy.
   3. Fittings and Accessories Material: 5052-H32 aluminum alloy.
   4. Channel Width: 1-5/8 inches.
   5. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
   6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
   7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
   8. Channel Dimensions: Selected for applicable load criteria.

C. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c., in at least one surface.

1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
2. Channel Width: Selected for applicable load criteria
3. Fittings and Accessories: Products provided by channel and angle manufacturer and designed for use with those items.
4. Fitting and Accessory Materials: Same as those for channels and angles, except metal items may be stainless steel.
5. Rated Strength: Selected to suit applicable load criteria.
6. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

D. Conduit and Cable Support Devices: Steel clamps, hangers, and associated fittings, designed for types and sizes of raceway or cable to be supported.

E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored communications conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

F. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.

G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Powder-Actuated Fasteners: Threaded-steel stud for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
2. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
   1. NECA 1.
   2. NECA/BICSI 568.
   3. TIA-569-D.
   4. NECA 101.
   5. NECA 102.
   6. NECA 105.
   7. NECA 111.

B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

C. Comply with requirements for pathways specified in Section 270528 "Pathways for Communications Systems."

D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as scheduled in NECA 1, where its Table 1 lists maximum spacings that are less than those stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
   1. Secure raceways and cables to these supports with two-bolt conduit clamps.

F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC and RMC may be supported by openings through structure members, according to NFPA 70.

B. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten communications items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Use approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Use expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated-driven threaded studs, provided with lock washers and nuts, may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor communications materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements in Section 099113 "Exterior Painting" Section 099123 "Interior Painting" and Section 099600 "High-Performance Coatings" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION 270529

SECTION 27 05 53 - IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Color and legend requirements for labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes.
5. Signs.
6. Cable ties.
7. Fasteners for labels and signs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for communications identification products.

B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule:

1. Outlets: Scaled drawings indicating location and proposed designation.
2. Backbone Cabling: Riser diagram showing each communications room, backbone cable, and proposed backbone cable designation.
3. Racks: Scaled drawings indicating location and proposed designation.
4. Patch Panels: Enlarged scaled drawings showing rack row, number, and proposed designations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 70 and TIA 606-B.

B. Comply with ANSI Z535.4 for safety signs and labels.

C. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F , material surfaces

2.2 COLOR AND LEGEND REQUIREMENTS

A. Equipment Identification Labels:
1. Black letters on a white field. All labels will be permanent and machine generated. Hand-written labels are not allowed.
2. Equipment Labeling and Administration will be required for all equipment racks and frames, patch panels, fiber termination shelves, telecommunications grounding/bonding system
3. All equipment administration not addressed by ANSI/ TIA/EIA-606-A-2002 will be labeled by the Contractor per District standards
4. Cable and Pathway Administration
   a. Cable and pathway administration will comply with ANSI/TIA/EIA-606-A-2002.
   b. Format of cable, faceplate insert, and patch panel port label will be the same
   c. The MDF identifier is “MDF”
   d. Each IDF identifier will have a unique alpha character (e.g. IDF “A”)
   e. Numeric identifier will be determined by patch panel position
   f. Cable terminated to upper left port on first patch panel will be 001, cable terminated to upper left port on second patch panel will be 049 (presupposing the first patch panel is a 48 port patch panel)
      1) Examples: MDF 01, IDF A 56 Coordinate retained Section Text articles with "Installation" and "Identification Schedule" articles. See the Evaluations for discussion on self-adhesive products.

2.3 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

B. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters of raceway or cable they identify, that stay in place by gripping action.

C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil- thick, polyester flexible labels with acrylic pressure-sensitive adhesive.
   1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating protective shields over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
   2. Marker for Labels: Permanent, waterproof black ink marker recommended by tag manufacturer.
   3. Marker for Labels: Machine-printed, permanent, waterproof black ink recommended by printer manufacturer.

D. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3-mil- thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
   1. Minimum Nominal Size:
      a. 1-1/2 by 6 inches for raceway and conductors.
      b. 3-1/2 by 5 inches for equipment.
      c. As required by authorities having jurisdiction.

2.4 CABLE TIES

A. Velcro Cable
   1. Ties 1.Width: .75”.
   2. Color: Velcro cable ties the same color as the cable to which it is being applied.
   3. Manufacturers:
   4. Panduit “Tak-Ty” series cable ties
   5. Panduit
      a. 1) #HLS-15R-0; black, 15’ roll, cut to length.
      b. Or Equal

2.5 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying communications identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of communications systems and connected items.

G. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

H. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
3. Provide label 6 inches from cable end.

I. Snap-Around Labels:

1. Secure tight to surface at a location with high visibility and accessibility.
2. Provide label 6 inches from cable end.

J. Self-Adhesive Wraparound Labels:

1. Secure tight to surface at a location with high visibility and accessibility.

2. Provide label 6 inches from cable end.

K. Self-Adhesive Labels:

1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.

L. Snap-Around, Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

M. Underground-Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.
2. Limit use of underground-line warning tape to direct-buried cables.
3. Install underground-line warning tape for direct-buried cables and cables in raceways.

N. Cable Ties: General purpose, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.3 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations with high visibility. Identify by system and circuit designation.

C. Accessible Fittings for Raceways and Cables within Buildings: Identify covers of each junction and pull box with self-adhesive labels containing wiring system legend.

1. System legends shall be as follows:

a. Telecommunications.

D. Faceplates: Label individual faceplates with self-adhesive labels. Place label at top of faceplate. Each faceplate shall be labeled with its individual, sequential designation, numbered clockwise when entering room from primary egress, composed of the following, in the order listed:

1. Wiring closet designation.
2. Colon.

3. Faceplate number.

E. Equipment Room Labeling:

1. Racks, Frames, and Enclosures: Identify front and rear of each with self-adhesive labels containing equipment designation.
2. Patch Panels: Label individual rows in each rack, starting at top and working down, with self-adhesive labels.
3. Data Outlets: Label each outlet with a self-adhesive label indicating the following, in the order listed:

    a. Room number being served.
    b. Colon.
    c. Faceplate number.

F. Backbone Cables: Label each cable with a self-adhesive wraparound label indicating the location of the far or other end of the backbone cable. Patch panel or punch down block where cable is terminated should be labeled identically.

G. Horizontal Cables: Label each cable with a self-adhesive wraparound label indicating the following, in the order listed:

1. Room number.
2. Colon.
3. Faceplate number.

H. Locations of Underground Lines: Underground-line warning tape for copper, coaxial, hybrid copper/fiber, and optical-fiber cable.

I. Instructional Signs: Self-adhesive labels.

J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures: Baked-enamel warning signs or Metal-backed, butyrate warning signs.

1. Apply to exterior of door, cover, or other access.

K. Equipment Identification Labels:

1. Indoor Equipment: Laminated-acrylic or melamine-plastic sign.
2. Outdoor Equipment: Laminated-acrylic or melamine-plastic sign.
3. Equipment to Be Labeled:

    a. Communications cabinets.
    b. Uninterruptible power supplies.
    c. Computer room air conditioners.
    d. Fire-alarm and suppression equipment.
    e. Egress points.

END OF SECTION 270553

SECTION 271313 - COMMUNICATIONS TWISTED PAIR CABLING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Backbone and horizontal twisted pair cabling

B. Related Sections
   1. Comply with the Related Sections requirements of Section 27 00 00

1.02 REFERENCES

A. Comply with the References requirements of Section 27 00 00.

1.03 DEFINITIONS

A. Refer to Section 27 00 00 for Definitions.

B. In addition, define the following list of terms as used in this specification as follows:
   1. “ALVYN”: sheath type consisting of corrugated polymer-coated aluminum shield with and adhered flame retardant jacket
   2. “ARMM”: Bell system cable type (shielded riser)
   3. “CAT3”: Category 3 UTP performance grade
   4. “CAT5E”: Category 5 Enhanced UTP performance grade
   5. “CAT6”: Category 6 UTP performance grade
   6. “CAT6A”: Category 6 Augmented UTP performance grade
   7. “Channel”: End to end transmission path; e.g., the entire portion of the horizontal cabling to each outlet consisting of the Permanent Link, line cord (at the workstation), patch cord, and, if a full cross connection is implemented, the cross connect termination/connecting apparatus and equipment cord.
   8. “CMP”: Communications Media Plenum [NEC plenum rating]
   9. “CMR”: Communications Media Riser [NEC riser {non-plenum} rating]
   10. “FEP”: Fluorinated Ethylene Propylene
   11. “FTP”: Foiled Twisted Pair
   12. “ISP: - Inside Plant Cabling
   13. “OSP” Outside Plant Cabling
   14. “PE”: Polyethylene
   15. “Permanent Link”: Test configuration for a horizontal cabling link excluding patch cords, equipment cords, and line cords; e.g., the ‘permanent’ portion of the horizontal cabling to each outlet consisting of cable, consolidation point (if used), termination/connecting apparatus in the TRs and the connector at the outlet.
   16. “PIC” Plastic Insulated Conductor
   17. “PVC”: PolyVinyl Chloride
   18. “PVDF”: Polyvinylidene fluoride
   19. “UTP”: Unshielded Twisted Pair

1.04 SYSTEM DESCRIPTION

A. Work Covered Under Other Sections

1. Pathways: The communications pathways (cable tray, conduits, stubs, etc.) work will be covered under another Section. Refer to the Drawings for size/capacity and route information.
2. Rooms: Build out (e.g., backboards, overhead and vertical cable runway, etc.) of the telecommunications rooms will be covered under another Section. Refer to the Drawings for build out information.

B. Base Bid Work
1. Provide engineering, labor, materials, apparatus, tools, equipment, and transportation required to make a complete working communications Backbone and Horizontal Twisted Pair Cabling System installation described in this Section and shown on related Drawings. Consider Backbone and Horizontal Cabling as shown on Drawings as base bid work, unless otherwise noted. This includes terminations at both ends.
2. In general, the base bid work includes:
   a. Submittals
   b. Backbone and Horizontal cables, terminations, and outlets
   c. Cable management
   d. Patch cords and cross connections
   e. Cable identification tags and system labeling
   f. Record Documents
   g. Warranty

1.05 SUBMITTALS

A. Comply with the Submittals article of Section 27 00 00 for procedural, quantity, content, and format requirements.

B. Substitutions
1. Conform to substitutions requirements and procedure in Section 27 00 00.

C. Submittal Requirements at Start of Construction:
1. Product Data Submittal, indicating conformance with NEC, UL, TIA/EIA listings, certifications and specifications.
2. Sample Submittal, consisting of the following components:
   a. Type “A” Outlet Sample – one fully configured outlet including faceplate, modular jacks, and label
   b. Cable Label Sample
3. Schedule Submittal, consisting of proposed schedule of work. This schedule may be combined with the schedule developed for 27xxxx series Sections
4. Shop Drawings Submittal, consisting of proposed changes to cable routing, or termination locations/configurations

D. Submittal Requirements at Closeout:
1. As-Built Drawings
2. Cable ID –to– Office Number Key: Submit a “cable ID-to-Office number key” as an electronic file in an MS-Excel spreadsheet file format containing a list of every cable identifier associated with the final office number
3. Cross connection records/cut sheets
4. O & M Manuals per section 27 00 00

E. Posted Documentation

1. Post one full size plot of as-built drawings, specifically the floor plans and (as applicable) reflected ceiling plans, within TR's such that show the TR's serving area. Coordinate location with Owner.

1.06 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of Section 27 00 00.

B. Contractor Qualifications
1. In addition to the Contractor Qualifications requirements of Section 27 00 00, the Contractor shall be certified by the manufacturer to provide the cabling system (proposed, submitted, and approved) and to provide an extended warranty. Submit satisfactory evidence of certification in the form of a current letter or certificate from the manufacturer as part of the bid.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with the Delivery, Storage and Handling requirements of Section 270000.

1.08 WARRANTY

A. The horizontal cabling system, as specified in this section, shall carry a 15-year (minimum) extended system warranty. This extended warranty shall cover parts and labor for the duration of the extended warranty. This extended warranty shall also cover electrical performance of cabling system to the specific category per ANSI/TIA/EIA-568-C performance criteria for horizontal cabling.

PART 2 - PRODUCTS

2.01 TWISTED PAIR CABLING SYSTEM

A. Panduit (Basis for design)

B. CommScope

C. Belden

2.02 HORIZONTAL CABLE – CAT6 MINIMUM COMPLIANT, CAT6 AND CAT6A UTP, PLENUM (CMP) RATED (FOR USE THROUGHOUT)

A. Application: Suitable for indoor installation, within ceiling space in primary and secondary pathways, within access/raised floor space.

B. Conductors:
1. Insulated Conductors: 23 AWG solid copper, fully insulated with a flame retardant thermoplastic material (material = FEP, or equivalent).
2. Twisted Pairs: Two insulated conductors "twisted" into a "pair" (twisted pair) with individually color-coded twisted pairs to industry standards (ANSI/ICEA Publication S- 80-576-1994, and EIA-230).

C. Cable Sheath:
1. Outer Jacket: seamless outer jacket (material = LS-PVC, or similar) applied to and completely cover the internal components (twisted pairs).
2. Flame Rating: NEC (Article 800) rated as CMP, and UL listed as such.

D. Electrical Performance: Meet or exceed TIA/EIA-568-C.2, ISO 11801 Class E Edition 2.1, and IEEE Std. 802.3an channel requirements for supporting 10GBASE-T.

E. Color: See color table in Part 3 for cable colors

F. Manufacturer:
   1. Panduit
      a. #PUP6C04BU-WLPZ; Cat6
      b. #PUP6XHD04BU-G; Cat6A
      c. Or equal

2.03 MODULAR PATCH CORDS – CAT6 AND CAT6A 10 GIG RATED

A. Application: Suitable for indoor installation within a telecommunications room or workstation environment.

B. Cords assembled from a single, continuous length of cordage, homogenous in nature, and terminated at both ends via 8 position modular plugs. Splices are not permitted anywhere.

C. Cordage
   1. Insulated Conductors: 24AWG solid copper, fully insulated with a flame retardant thermoplastic material (such as PVC, or equivalent).
   2. Twisted Pairs: Two insulated conductors “twisted” into a “pair” (twisted pair), and individually color coded.
   3. Unshielded sheath and flame-retardant polyvinyl chloride (PVC) jacketed.
   4. Flame Rating: NEC CM (or higher) rated, and UL listed as such.

D. Electrical Performance: Meet or exceed TIA/EIA-568-C.2, ISO 11801 Class E Edition 2.1, and IEEE Std. 802.3an channel requirements for supporting 10GBASE-T.

E. Length: Refer to Outlet Schedule for length requirements.

F. Color: Per color table below

G. Manufacturer:
   1. Patch cable to match cable type listed in 2.02

H. Cable Counts:
   1. Provide 1’ patch cable for switch side
   2. Provide 7’ patch cable at workstation side
   3. Provide 25% additional (above # of cables installed) patch

2.04 CROSSCONNECT WIRE

A. Cross connect wire shall be suitable for installation within a telecommunication facility and fully compatible with the termination apparatus specified within this Section.

B. Cross connect wire shall be manufactured from a single, continuous length of insulated wire, homogenous in nature. Splices are not permitted anywhere. Factory splices of insulated conductors are expressly prohibited.

C. Conductors:

1. Insulated Conductors: 24 AWG conductors of solid copper. Fully insulated conductors with a flame retardant thermoplastic material (such as PVC, or equivalent).
2. Twisted Pairs: Two insulated conductors "twisted" into a "pair" (twisted pair), individually color-coded.

D. Manufacturer:
1. General Cable
   a. #7023864; cross connect wire, 1 pair, Whi-Red / Red-Whi
   b. #7023708; cross connect wire, 1 pair, Whi-Blu / Blu-Whi
2. Or equal

2.05 BEP PROTECTOR – FOR DATA CIRCUITS

A. Application: Protectors suitable for installation within a telecommunication facility for the termination of the Horizontal OSP/Underground cables intended for data circuits.

B. Protector shall be UL 497 listed.

C. Solid-state protection with clamping voltage of 16VDC

D. Protector shall have a 4-pair capacity (minimum) with 110-type input and 110-type output

E. Manufacturer:
1. CommScope SYSTIMAX
   a. #760028373; OSP protector, CAT6 rated, 2-cable capacity
   b. #760033951; OSP protector, CAT6 rated, for PoE circuits, 2-cable capacity
2. Or equal

2.06 MODULAR CONNECTOR / 8-POSITION JACK – CAT6 NET-KEY, CAT6 AND CAT6A 10GIG RATED

A. Application: Modular connectors shall be 8-position modular jacks and shall be compatible with the specified CAT6 and CAT6A UTP 4-pair cables both electrically and physically.

B. Mechanical Performance: Modular connectors shall meet or exceed TIA/EIA-568-C.2 5.7.
1. Electrical Performance: Modular connectors shall meet or exceed TIA/EIA-568-C.2 6.8 and ISO/IEC 11801 requirements for CAT6A UTP cabling.
2. Wiring: Modular connectors shall be T568B wired.

C. Manufacturer:
1. Panduit
   a. #NK688MBU; Cat6
   b. #NK6X88MBU; Cat6A
2. Or Equal

2.07 WORK AREA OUTLETS

A. Faceplates for Standard Flush-Mount Outlets
1. Application: Faceplates shall be suitable for indoor installation for standard 1-gang and 2- gang flush-mount devices.

2. Faceplates shall have 2, 3, 4, or 6 ports, and shall include required accessories, such as icons, blank inserts, label windows and labels.
3. Color: White
4. Manufacturer:
   a. Panduit
      1) NK#FWH (# - Port number indicated on drawings)
5. Or Equal

B. Surface Outlets
1. Application: Surface outlets shall be suitable for indoor installation for surface-mount device and shall be fully compatible with the specified modular connectors/jacks.
2. Color: White
3. Manufacturer:
   a. Panduit Netkey Series (Utilize surface mount for WAP's)
   b. Or Equal

2.08 CABLE LABELS

A. Labels shall be machine printable with a laser printer, ink jet printer, thermal transfer printer, or hand-held printer.

B. Label shall fully wrap around the cable's jacket, shall be adhesive-backed labels, and shall have a self-laminating feature.

C. Size: 1" x 0.5" printable area, minimum

D. Color: white

E. Manufacturer:
1. Panduit
   a. #S100X150YAJ; 1.0" x 1.5", for cable diameters 0.16"-0.32", white
   b. #S200X225YAJ; 2" x 2.25", for cable diameters 0.24"-0.48", white
   c. #S200X400YAJ; 2" x 4", for cable diameters 0.32"-0.95", white
2. Or equal

2.09 COPPER SPLICE HOUSING

A. Encapsulated or re-enterable splice housing, sized as required with bonding straps, accessories, end caps and encapsulate as required.

B. Splice modules (such as 710 series or MS2) for use within splice housing.
1. The splice closures for the portable buildings shall be of the cabinet type that will house enough splice bays for the particular installation. Splice tray shall accommodate at least twelve (12) mechanical or fusion splices.

2.10 TERMINATION BLOCKS

A. Provide termination punch blocks for termination of voice station cables and for backbone termination only. Supply 110 style punch block frames (100 Pair, 300 Pair, or 900 pair).

B. Approved Manufacturer: Panduit 110 Cross Connect System

C. Provide horizontal and vertical wiring troughs between MDF frame sections

2.11 LISTED BUILDING ENTRANCE PROTECTORS

A. Protect all copper cables run between buildings with approved over-current protection. Use the protector module with IDC type input and output terminals, 100-pair capacity and female mounting base, equipped with 230 volt gas protector modules. Provide sufficient protector modules to completely populate all building entrance terminals.
   1. (Note: Both ends of cables should be equipped with entrance protection systems)
   2. Primary Copper Protectors
      a. Circa 25-Pair 110 Style Lightning Protection Block
         1) Part Number 1880ENA1/NSC-25
      b. Circa 240-Volt Solid State Module with PTC
         1) Part Number 4B1FS-240
      c. Category 6 POE Rated Lightning Protection
         1) Field End
            a) DITEK Part Number - DTK-MRJPOES
      d. Equipment Room/Telecommunications Room End
         1) Rack Mount Face Plate up to 12 Ports
            a) DITEK Part Number DTK-VM12RM
         2) Wall Mount Face Plate up to 6 Ports
            a) DITEK Part Number DTK-VM6WM
         3) Face Plate Module – CAT 6 POE
            a) DITEK Part Number DTK-MRJPOEM

2.12 TERMINATION BLOCKS

A. Provide termination punch blocks for termination of voice station cables and for backbone termination only. Supply 110 style punch block frames (100 Pair, 300 Pair, or 900 pair).

B. Approved Manufacturer: Panduit 110 Cross Connect System

C. Provide horizontal and vertical wiring troughs between MDF frame sections

2.13 MISCELLANEOUS COMPONENTS

A. Velcro Cable Ties
   1. Width: .75”.
   2. Color: Velcro cable ties the same color as the cable to which it is being applied.
   3. Manufacturers:
      a. Panduit “Tak-Ty” series cable ties
      b. Panduit #HLS-15R-0; black, 15’ roll, cut to length.
   4. Or Equal

B. Plenum Cable Ties
   1. Application: for use in plenum or air handling spaces
   2. Color: maroon or other distinctive non-white color
   3. Manufacturer
      a. Panduit
         1) #PLT1M-xxxx
         2) #PLT2S-xxxx
         3) #PLT3S-xxxx
      b. Or equal.

2.14 OSP DUCT PLUGS

A. Multi-Port Duct plugs
   1. Manufacturer
      a. Tyco
         1) #40B167S; 4-inch triplex plug
         2) #40Q136S; 4-inch quadplex plug
      b. Carlon
      c. Condux
      d. Or equal

B. Port/Cable plugs, for securing one cable per duct plug port.
   1. Manufacturer:
      a. Tyco
         1) #10S035S; simplex plug for one fiber optic cable in 1-inch ID port
         2) #11S057SB; simplex plug for one fiber optic cable fiber in 1¼-inch ID port
         3) #10D104U; blank port plug for 1-inch ID port
         4) #12D148U; blank plug for 1¼-inch ID port
      b. Carlon
      c. Or equal

C. Blank Duct Plug for 4" Conduit
   1. Manufacturer
      a. Tyco
         1) #JM-BLA-40D402U; blank duct plug for 4" conduits
      b. Carlon
   2. Or equal

2.15 TERMINATION APPARATUS – MODULAR FACEPLATE PATCH PANELS

A. Modular patch panels shall be suitable for installation within a telecommunication room for the termination of the Horizontal Cables specified herein. Modular patch panels shall be horizontally oriented for a rack-mounted configuration. Modular patch panels shall be capable of supporting, organizing, labeling, and patching/ cross connection between the horizontal termination field and the equipment termination field. Modular patch panels shall be supplied with an integrated strain relief bar in the rear of the panel for cable management.

B. 48-port patch panel with labels, supplied with twelve factory installed CFFPL4 type front removable snap-in faceplates, populated with category 6A modular inserts per section 2.22.

C. Manufacturer:
   1. Panduit
      a. #NKPP48FMY; 48-Port Patch Panel
      b. #NKPP24FMY; 24-Port Patch Panel

PART 3 - EXECUTION

3.01 GENERAL

A. Comply with the Execution requirements of Section 270000.

3.02 EXAMINATION AND PREPARATION

A. Rooms: Prior to installation, verify equipment rooms are suitable to accept the horizontal cables and terminations.

B. Pathways: Prior to installation verify that pathways and supporting devices, provided under other sections, are properly installed, and that temporary supports, devices, etc., have been removed. Verify dimensions of pathways, including length (for example, “True Tape” the conduits).

C. Cable Integrity: Prior to installation, verify the cable’s integrity – both sheath and conductors. Documentation of pre-installation testing is not a close out requirement, and is the responsibility of the Contractor.

3.03 INSTALLATION

A. Backbone Cable Installation and Routing
   1. Cable runs shall have continuous sheath continuity, homogenous in nature. Splices are not permitted anywhere.
   2. Placement
      a. Place cables within designated pathways.
      b. Maintain a minimum bend radius of 6 times the cable diameter during and after installation.
      c. Maintain pulling tension within manufacturer's limits.
      d. Place and suspend cables in a manner to protect them from physical interference or damage. Place cables with no kinks, twists, or impact damage to the sheath. Replace cables if damaged during installation
      e. Cabling shall be suspended in the ceiling above air conditioning ducts, sprinkler piping, and electrical conduit where elevations allow. Cable Supports will be installed through which cables shall be routed. Ceiling grid, electrical conduit, and sprinkler pipes will not be used to secure communications cablingPlace a pull rope along with cables where run in conduit and spare capacity still exists in the conduit. Tie off ends of the pull rope.
   3. Routing
      a. When routing horizontally within telecommunications rooms, utilize the overhead cable support. When routing vertically within telecommunications rooms, utilize the vertical cable support and provide cable ties every 24 inches on center using.
      b. Route cables a minimum of 6" away from power sources to reduce interference from EMI.
      c. Termination
      d. Provide 15 feet cable slack loop at each end of the run. Store slack in overhead cable support or as noted on Drawings.
      e. Properly relieve strain from cables at termination points per manufacturer’s instructions.

f. Terminate twisted pairs onto the termination apparatus in accordance with manufacturer's latest instructions and TIA/EIA-568-B standard installation practices.
g. Perform post-installation testing as described below.

B. OSP Interbuilding Backbone Cable
1. Cable runs shall have continuous sheath continuity, homogenous in nature, between either termination points or designated splices points. Only splices as noted on the Construction Documents are permitted.
2. Placement
a. Place cables within designated pathways.
b. Maintain a minimum bend radius of 6 times the cable diameter during installation.
c. Maintain pulling tension within manufacturer's limits. Only use UL approved cable-pulling compounds when necessary to reduce pulling tensions.
d. Protect cable during installation. Place and suspend cables in a manner to protect them from physical interference or damage. Place cables with no kinks, twists, or impact damage to the sheath. Replace cable if damaged during installation.
e. Neatly dress and organize cables in the cable routing facilities, and fastened to support devices via tie wraps.
f. Place a pull rope along with cables where run in conduit and spare capacity still exists in the conduit. Tie off ends of the pull rope.
3. Routing:
a. When routing horizontally within telecommunications rooms, utilize the overhead cable support; route backbone cables to avoid crossing over horizontal cabling or horizontal cabling crossing backbone cabling. When routing vertically within telecommunications rooms, utilize the vertical cable support and provide cable ties every 24 inches on center using.
b. Route cables a minimum of 6" away from power sources to reduce interference from EMI.
4. Termination
a. Provide 15 feet cable slack loop at each end of the run. Store slack in overhead cable support or as noted on Drawings.
b. Properly strain relieve cables at designated points per manufacturer's instructions.
c. Terminate copper pairs at both ends on the specified <BEP> <termination apparatus>. Perform terminations in accordance with manufacturer's instructions and TIA/EIA-568-B standard installation practices.
5. Labeling
a. Provide labels on each end of the cable, no more than 4" from where the cable enters the specified splice closure or termination apparatus.
b. Place labels such that they are visible by a technician from a normal stance

C. Duct Plugs
1. Provide blank plugs in unused ducts.
2. Provide multi-port duct plugs at duct ends with cables.

3. Provide cable plugs for each cable. Secure each twisted pair cable at each telecommunications vault, building entrance, and MPOE/ER with a cable plug sized depending upon the outside diameter of the cable.
4. Provide blank port plug in each used duct port.

D. Horizontal Cable Installation and Routing
1. Cable runs shall have continuous sheath continuity, homogenous in nature. Splices are not permitted anywhere.
2. Place cables within designated pathways, such as cable tray,, cable hangers, etc. Do not fasten (such as with cable ties) or attach cables to other building infrastructure (such as ducts, pipes, conduits, etc), other systems (such as ceiling support wires, wall studs, etc), or to the outside of conduits, cable trays, or other non-approved pathway systems.
3. Place and suspend cables and conductors during installation and termination in a manner to protect them from physical interference or damage. Place cables with no kinks, twists, or impact damage to the sheath. Replace cables damaged during installation or termination at no additional cost.
4. Maintain minimum cable length of 15 meters from the termination in the TR to the termination at the user's faceplate (permanent link).
5. No cable length shall exceed 90 meters from the termination point in the TR to the termination point at the work area (permanent link).
6. Route cables at 90-degree angles, allowing for bending radius, along corridors for ease of access.
7. Do not exceed manufacturer's limits for pulling tension.
8. Do not use cable-pulling compounds for indoor installations.
9. Maintain a minimum bend radius of 6 times the cable diameter during and after installation.
10. Route cables under building infrastructure (such as ducts, pipes, conduits, etc); Do not route cables over building infrastructure. The installation shall result in easy accessibility to the cables in the future.
11. Place cables 6", minimum, away from power sources to reduce interference from EMI.
12. For 3" trade size conduits and larger, place a pull string along with cables where run in pathways and spare capacity in the pathway remains. Tie off ends of the pull string (to prevent the string from falling into the conduit).
13. Neatly dress and organize cables using designated cable routing facilities, and fasten to support devices via tie wraps or Velcro-type straps.
14. When exiting the primary pathway (such as cable tray) to the work area, exit via the top of the pathway. Secure the cables to the pathway using an approved cable tie.

E. Cable Color Table:

Data Cable Color Chart		
	Pink	N/A
	Red	N/A
	Orange	N/A
	Yellow	N/A
	Green	N/A

	Blue	General
	Purple	Security
	Brown	N/A
	Black	N/A
	White	Analog
	Grey	N/A
	Beige	N/A

F. Cable Routing and Dressing within the TR
   1. Place cables within the overhead cable support and, when routing vertically, fasten the cables onto wall-mounted vertical cable support every 24 inches on- center using cable ties.
   2. At the rack bay, route cables into the back of the vertical management sections. Divide the cables equally between both sides of an equipment rack such that a cable does not travel past the midpoint of the rack prior to termination.
   3. Provide 10 feet, minimum, sheathed cable slack – length not to exceed permanent link maximum length requirement. Place the slack in the overhead cable support.

G. Termination in the TR/ER
   1. Provide termination apparatus and accessories required for a complete installation. Install and assemble termination apparatus, accessories and associated management apparatus according to the manufacturer's instructions.
   2. Properly strain relieve cables to and at termination points per manufacturer's instructions.
   3. Terminate cables and twisted pairs in accordance with manufacturer's latest installation requirements and ANSI/TIA-568-C.0 standard installation practices. Terminate cable pairs onto the termination apparatus. Terminate twisted pairs compliant to T568Bwiring, per ANSI/TIA-568-C.0.
   4. Modular Patch Panels and Horizontal Management Panels
      a. Provide quantity of modular patch panels in the TR rooms to support termination of cables served from respective TR. Provide quantity ofhorizontal management panels as shown on the drawings.
      b. In the ER, provide one 2U horizontal manager in each server cabinet and one 2U horizontal manager between each patch panel in the network patching cabinets plus one manager at the top and bottom of each patching cabinet.
      c. Install and assemble modular patch panels and horizontal management panels according to the manufacturer's instructions.
      d. Install the patch panels and the horizontal management panels as shown on the Drawings.
   5. Termination Sequence
      a. Backbone Cables: Terminate the backbone multipair cables to the modular patch panels 2 pairs per port. Terminate the 1st pair to pins 5/4 and the 2nd pair to pins 3/6 of the 1st port, etc. Leave pairs 25, 50, 75, and 100 open/unterminated.

b. Horizontal Cables: Terminate the cables in sequential order using the link's identifier starting at the top left and completing a panel before moving to the next panel below.

H. Cable Routing and Dressing at the Work Areas
1. Provide 10 feet, minimum, sheathed cable slack – length not to exceed permanent link maximum length requirement. Place the slack within ceiling space neatly on a cable hanger
2. Routing to Furniture-feeds
   a. Route cables from primary or secondary pathway within ceiling through the furniture-feed pathway (stub within wall) into opening at bottom of furniture. Exercise caution to prevent scraping, cutting, or other damage to cable's jacket.
   b. Provide spiral wrap around cables from furniture-feed pathway to point where cables enter furniture.
   c. Route cables from under-floor through pre-cut access floor panel into opening at bottom of furniture. Exercise caution to prevent scraping, cutting, or other damage to cable's jacket.

I. Termination at the Work Areas
1. Provide device components, connectors, and accessories required for a complete installation. Install and assemble connectors, jacks, adapters, termination apparatus, accessories and associated management apparatus according to the manufacturer's instructions.
2. Provide six inches, minimum, sheathed cable slack behind each workstation outlet faceplate. Coil the slack cable inside the raceway, within the wall, or in the junction box (if used), per the cabling manufacturer's installation standards.
3.
4. Terminate cables and twisted pairs in accordance with manufacturer's latest installation requirements and ANSI/TIA-568-C.0 standard installation practices. Terminate cable pairs onto the connector compliant to T568B wiring, per ANSI/TIA-568-C.0.

J. Termination Apparatus (MPOE/EF)
1. Install the termination apparatus such that the bottom row of terminations is at a height as shown on the Drawings. If no height is shown, install bottom at 24" AFF (+/- 3").
2. Provide accessories required for a complete installation.
3. Mount blocks plumb and square.

K. Building Entrance Splicing Systems
1. Provide entrance splice system as shown on the Drawings, including closure, end caps, splice modules, grounding components, and accessories required for a complete installation. Install splice closure and splice modules per manufacturer's instructions using tools intended for the purpose.
2. Size enclosure based on splice bundle diameter, and size ends caps based on largest cable.
3. Include required accessories, such as collars, grommets, bushings, bonding connectors, etc. for a complete installation.
4. Thoroughly clean and separate binder groups prior to installing splice modules.

5. Apply sealant (such as B-sealant) to the end of the cable where the pairs exit the cable sheath – this to prevent water-blocking gel from leaking out the cable's sheath.
6. Provide labels on each splice module and binder group in splice closure.
7. Grounding and Bonding
8. Bond splice enclosure and cable shield to closet busbar using bonding conductor per manufacturer's instructions and/or TIA-607 requirements.
9. Provide 6 AWG bonding conductor up to 25 feet in length; if longer than 25 feet, size bonding conductor as 1000 circular mils per foot.
10. Fill unused end cap entry holes with appropriate plug (intended for purpose).
11. Attach splice enclosure to vertical cable runway on wall with metal straps.

L. Building Entrance Protection
1. Provide BEP system as shown on the Drawings, including terminals, modules, and accessories required for a complete installation. Install BEP per manufacturer's instructions.
2. Install BEP terminals plumb and square, and at height shown on Drawings. If no height is shown, install such that bottom row is at 24" AFF (+/- 3").
3. Grounding and Bonding
   a. Bond BEP terminal to TMGB in accordance with NEC Article 800, and follow the installation requirements described in Article 800.
   b. Provide 6 AWG bonding conductor up to 25 feet in length; if longer than 25 feet, size bonding conductor as 1000 circular mils per foot.
4. Labeling
   a. Provide and permanently affix label on the terminal's cover.
   b. Provide label in the label holder at the terminal's "outgoing" connection.
5. Provide quantity of protector modules to completely populate terminals..

M. Patching Cords
1. Provide the following number of fiber optic patch cords
   a. 125% of all ports = 1 MM Station Patch Cord per port
   b. 125% of all ports = Network Patch Cord per port
2. Neatly dress patch cords within the horizontal and vertical management components. Store cord slack within the vertical management section.
3. Provide the appropriate length patch cord at each location so there is not an abundance of slack or the patch cord is not pulled tight.
4. Label both ends of each installed patch cord
5. Turn over all unused patch cords to the owner at the end of the project

3.04 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with "Firestopping Systems" Article in BISCI's "Telecommunications Distribution Methods Manual."

3.05 GROUNDING

A. Install grounding according to the "Grounding, Bonding, and Electrical Protection" chapter in BICSI's "Telecommunications Distribution Methods Manual."

B. Comply with TIA-607-B and NECA/BICSI-607.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall, allowing at least a 2-inch clearance behind the grounding bus bar. Connect grounding bus bar to suitable electrical building ground, using a minimum No. 4 AWG grounding electrode conductor.

D. Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

3.06 FIELD QUALITY CONTROL

A. Site Test, Inspection
   1. ARCHITECT OR DESIGNER retains the right to be present at any or all cable certification. The Contractor shall provide written notice 48 hours prior to the beginning of the certification process.
   2. The Contractor shall provide a copy of the unaltered certification test reports to the Engineer in both hardcopy and electronic format. The Contractor shall also provide a copy of the associated Cable Tester's Database Management Software with unedited soft copy.
   3. Independent System Certified testing may be required, at the discretion of the Engineer, provided at the expense of the Contractor, in the event of non-performance of the specified testing procedures, submittals and/or installation procedures.
   4. The extent and logistics of the independent testing shall be arranged by the Engineer.
   5. Copper Cabling
      a. Upon completion of the cable installation, the Contractor shall perform complete copper cable certification tests on every cable, included but not limited to:
         1) For PE-89 Cabling:
            a) Length
            b) Attenuation
            c) Continuity
            d) Polarity
         2) For Category 6 Cabling, additional tests shall be:
            a) Line Map
            b) Resistance
            c) Attenuation
            d) Length
            e) Near End Cross Talk (NEXT)
            f) Equal Level Far End Cross Talk (ELFEXT)
            g) Propagation Delay and Delay Skew
            h) Return Loss
            i) Power Sum Near End Cross Talk (PSNEXT)
            j) Power Sum Equal Level Far End Cross Talk (PSELFEXT)
            k) Insertion Loss
      b. Test shall be performed to published standards, including but not limited to, the latest revisions of EIA/TIA 568, ISO/IEC 11802 and other applicable standards at the time of installation.
      c. All tests shall be performed with Fluke VERSIV cable analyzer.
      d. A hard copy of all test results shall be submitted to owner / architect.

e. All UTP field tester shall be factory calibrated each calendar year by the field test equipment manufacturer as stipulated by the manuals provided with the field test unit. The calibration certificate shall be provided to the Engineer for review prior to the start of testing.
f. New test leads and/or calibration of testing instruments shall be provided at the beginning of each project.
g. Autotest settings provided in the field tester for testing the installed cabling shall be set to the default parameters.
h. Test settings from options provided in the field testers shall be compatible with the installed cable under test.
i. Contractor shall submit these test reports to the designer within (2) business days of completion of testing.

3.07 LABELING

A. General Requirements
1. Labeling, identifier assignment, and label colors shall conform to ANSI/TIA/EIA-606-AAdministration Standard and as approved by the Owner before installation.
2. Permanent labels with machine-generated text (hand written labels will not be accepted).

B. Label Formats
1. Horizontal Cable Labels
a. Text Attributes: Black, 1/8” high, minimum, or #12 font size.
b. Install labels on both ends of cables no more than 4" from the edge of the cable jacket. Install labels such that they are visible by a technician from a normal stance.
2. Backbone Cable Labels
a. Text Attributes: Black, 1/8” high, minimum, or #12 font size.
b. Install labels on both ends of cables no more than 4" from the edge of the cable jacket. Install labels such that they are visible by a technician from a normal stance.
3. Patch Panel Labels
a. Use modular patch panel labels included in the product packaging. Request approval by the Engineer for other labels.
b. Use a label color for the respective field type, per TIA/EIA-606.
c. Text Attributes: Black, 3/32” high, minimum, or #10 font size.
4. Termination Block Labels
a. Use labels included in the product packaging. Any deviation from this requirement must be approved in writing by the Owner.
b. Use a label color for the respective field type, per TIA/EIA-606-A.
c. Text Attributes: Black, 3/32” high, minimum, or #10 font size.
5. Outlet Labels
a. Use outlet labels included in the product packaging. Any deviation from this requirement must be approved in writing by the Owner.
b. Label Background: White.
c. Text Attributes: Black, 1/8” high, minimum, or #12 font size.
d. Install label in the top label window. Leave the bottom label window blank.

C. Identifier Assignment

1. General: Separate label fields as specified by Owner.
2. Horizontal Cables
   a. Request standard from the Owner at the time of installation
3. Outlets
   a. Request standard from the Owner at the time of installation
4. Individual Ports at the Outlets
   a. Request standard from the Owner at the time of installation
5. Individual Termination Positions at Termination Blocks
   a. Request standard from the Owner at the time of installation
6. Individual Ports at Patch Panels
   a. Request standard from the Owner at the time of installation

3.08 FINAL INSPECTION AND CERTIFICATION

A. Punch the Work of this Section compliant to the requirements of Section 27 00 00.

B. Remove cables and replace with new those failing to meet the indicated standards and not passing the testing requirements above with no impact to cost and schedule. The Owner, will not accept the installation until testing has indicated a 100% availability of all cables and conductors. Any deviation from this requirement must be approved in writing by the Owner.

C. Comply with system acceptance and certification requirements of Section 27 00 00.

END OF SECTION 27 1313

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SECTION 27 13 23 - COMMUNICATIONS OPTICAL FIBER CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Multimode optical fiber cable (OM4), 850 nanometer laser-optimized, 50/125 micrometer
2. Single-mode optical fiber cable (OS2), 1310/1550 nanometer
3. Optical fiber cable connecting hardware, patch panels, and cross-connects.
4. Cabling identification products.

1.3 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

C. RCDD: Registered Communications Distribution Designer.

1.4 OPTICAL FIBER CABLING DESCRIPTION

A. Optical fiber cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for cross-connection.

B. Cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling but may be used for branch runs.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Reviewed and stamped by RCDD.

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
3. Cabling administration drawings and printouts.
4. Wiring diagrams to show typical wiring schematics including the following:

    a. Telecommunications rooms plans and elevations.
    b. Telecommunications pathways.
    c. Telecommunications system access points.
    d. Telecommunications grounding system.
    e. Cross-connects.
    f. Patch panels.
    g. Patch cords.

5. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.

C. Optical fiber cable testing plan.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For RCDD, installation supervisor, and field inspector.

B. Source quality-control reports.

C. Product Certificates: For each type of product.

D. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For optical fiber cable, splices, and connectors to include in maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Patch-Panel Units: One of each type.
2. Plugs: Ten of each type.
3. Jacks: Ten of each type.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings Cabling Administration Drawings, and field testing program development by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Testing Agency Qualifications: Testing agency must have personnel certified by BICSI on staff.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test optical fiber cable to determine the continuity of the strand end to end. Use optical loss test set
2. Test optical fiber cable while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector, including the loss value of each. Retain test data and include the record in maintenance data.

1.11 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.12 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

1.13 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning with Substantial Completion, provide software support for two years.

B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion.

Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

PART 2 - PRODUCTS

2.1 OPTICAL FIBER CABLING SYSTEM

A. Acceptable Manufacturers
   1. Panduit
   2. Corning
   3. Or equal

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Fiber cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 50 or less.

C. Telecommunications Pathways and Spaces: Comply with TIA-569-D.

D. Grounding: Comply with TIA-607-B.

E. The Contractor shall provide, via the manufacturer, a minimum 20-year system and applications warranty on all parts and labor. Warranty commences at the time of project completion and acceptance by OWNER.

2.3 SINGLEMODE OPTICAL FIBER CABLE (OS2), 1310/1550 NANOMETER

A. Description: Single mode, 9/125-micrometer, 12-fiber, indoor/outdoor, armored, loose tube, optical fiber cable.
   1. Provide 10 ft service loop.

B. Approved products (where "xxx" = strand count):
   1. Corning MIC® Interlocking Armored Cable
      a. xxxE8P-31131-A1, Indoor/Outdoor OFCP
   2. Owner approved equivalent

C. Standards:
   1. Comply with ICEA S-83-596 for mechanical properties.
   2. Comply with TIA-568-C.3 for performance specifications.
   3. Comply with TIA-492CAAA for detailed specifications.
   4. Comply with ICEA S-104-696 for indoor/outdoor fiber optic cables.

D. Conductive cable shall be aluminum armored type, rated for both indoor and outdoor use.

E. Maximum Attenuation:
   1. 0.65 dB/km at 1310 nm
   2. 0.65 dB/km at 1550 nm

F. Minimum Cable Bandwidth:
   1. Designed for operation over distances exceeding 10 km at 1310 nm and 40 km at 1550 nm
   2. Compatible with CWDM and DWDM systems

G. Jacket:
   1. Jacket Color: Yellow
   2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-D.
   3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

H. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with for the following types:
   1. UL 444, UL 1651, and UL 1666
   2. NFPA 70, including Article 770 and Article 300.22
   3. Listed as:
      a. Indoor/Outdoor Riser: Type OFCR or OFNR
      b. Indoor/Outdoor Plenum (if specified): Type OFCP or OFNP
      c. Listed for use in metallic conduit, riser shafts, or plenum spaces
      d. Compliant with ICEA S-104-696 and flame tests per NFPA 262 (plenum) or UL 1666 (riser).

I. Innerduct
   1. Provide outside plant rated fabric innerduct, for all exterior fiber runs.
   2. Innerduct to be constructed of polyethylene terephthalate and nylon 6 in a fabric mesh.
   3. Must be resistant to ground chemicals and petroleum products.
   4. Includes color-coded, pre-installed 1250 lb. pull tape in each cell.
   5. Refer to the drawing set for the number of cells and their size.
   6. Basis of design.
      a. MaxCell Edge MXE series
      b. Owner approved equivalent.

2.4 OPTICAL FIBER CABLE HARDWARE

A. Fiber Enclosures – Standard Density

1. Provide standard density rack mount modular fiber enclosures for horizontal fiber cable outlets, typically consisting of 6-strand cables.
2. Enclosures must accept splice modules and fiber adapter modules.
3. Populate unused fiber adapter panel openings with blank filler plates.
4. Refer to the drawing set to determine exact size and configuration.
5. Acceptable Products:
    a. Panduit FCE1U Rack Mount Fiber Enclosure 1RU
    b. Owner approved equivalent.

B. Fiber Optic Splice Module
1. Provide fusion splice modules for standard density fiber enclosures as required.
2. Modules must accept up to 24 fusion splices.
3. Modules must be designed to install in rack mount fiber enclosures.
4. Provide a quantity of modules to accommodate every splice within each enclosure.
5. Acceptable products:
    a. Panduit FOSMH4U Fiber Optic Splice Module
    b. Panduit FOSMF Fiber Optic Splice Module for 24 Fusion Splices
    c. Owner approved equivalent.

C. Fiber Adapter Panel
1. Provide duplex fiber adapter panels for standard density enclosures as required.
2. Panels must contain LC/UPC adapters.
3. Panels must be designed to install in rack mount fiber enclosures.
4. Provide a quantity to accommodate every fiber within each enclosure, meticulously organized in a logical manner consistent with the manufacturer's recommendation.
5. Acceptable products:
    a. Panduit FAP6WBUDLCZ Fiber Adapter Panel, 6 duplex single mode LC
    b. Panduit FAPB Blank Fiber Adapter Panel
    c. Owner approved equivalent.

D. LC Fiber Optic Connectors
1. Provide LC/UPC pigtail connectors to fusion splice all single-mode optical fiber cables for 12-strand or greater cables which terminate into the standard density enclosures.
2. Quick-connect, simplex or duplex, type LC connectors.
3. Connector to comply with FOCIS specifications of TIA-604-10A.
4. Total insertion loss of not more than 0.75 dB.
5. Acceptable Products:
    a. Panduit F91BN1NNNSNM001 LC To Pigtail PC, Single mode, 9µm Simple Buffered, 1m
    b. Owner approved equivalent.

E. Fiber Optic Patch Cords
1. Provide factory-made, duplex fiber jumpers for all connections excluding high density enclosure connections.
2. Single mode jumpers must be constructed of 9/125µm (OS1) fiber.
3. Allow for one patch cord for every fiber strand installed, but coordinate the exact quantity of patch cords, their lengths and connector types, with the OAR prior to purchase.

4. Acceptable Products (where “xxx” = length):
   a. Panduit F92ERLNLNSNMxxx LC to LC Fiber Jumper, Duplex, Single mode
   b. Panduit F92ERLNSNSNMxxx SC to LC Fiber Jumper, Duplex, Single mode
   c. Owner Approved Equivalent

F. Fiber Optic Patch Cords - High-Density Enclosures
1. Provide push-pull, duplex fiber jumpers for all connections to a high density enclosure.
2. Single mode jumpers must be constructed of 9/125µm (OS1) fiber.
3. Allow for one patch cord for every fiber strand installed, but coordinate the exact quantity of patch cords, their lengths and connector types, with the OAR prior to purchase.
4. Acceptable Products (where “xxx” = length):
   a. Panduit F92ERQ1Q1SNMxxx LC to LC Push-Pull Jumper, Duplex, Single mode
   b. Owner Approved Equivalent

2.5 GROUNDING

A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

B. Comply with TIA-607-B.

2.6 IDENTIFICATION PRODUCTS

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.7 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test multimode optical fiber cables according to TIA-526-14-B and TIA-568-C.3.

C. Factory test pre-terminated optical fiber cable assemblies according to TIA-526-14-B and TIA-568-C.3.

D. Cable will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

A. Coordinate fiber cabling with the protectors and demarcation point provided by communications service provider.

3.2 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, in attics, and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for pathways specified in Section 270528 "Pathways for Communications Systems."

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.3 INSTALLATION OF OPTICAL FIBER CABLES

A. Comply with NECA 1, NECA 301, and NECA/BICSI 568.

B. General Requirements for Optical Fiber Cabling Installation:

1. Comply with TIA-568-C.1 and TIA-568-C.3.
2. Comply with BICSI ITSIMM, Ch. 6, "Cable Termination Practices."
3. Terminate all cables; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
5. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
6. Bundle, lace, and train cable to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.

8. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
9. In the communications equipment room, provide a 10-foot- long service loop on each end of cable.
10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
11. Cable may be terminated on connecting hardware that is rack or cabinet mounted.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable 6 feet long not less than 12 inches in diameter below each feed point.

E. Group connecting hardware for cables into separate logical fields.

3.4 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with BICSI ITSIMM, "Firestopping" Chapter.

3.5 GROUNDING

A. Install grounding according to BICSI ITSIMM, "Grounding (Earthing), Bonding, and Electrical Protection" Chapter.

B. Comply with TIA-607-B and NECA/BICSI-607.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."

1. Administration Class: Class 2
2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.

B. Paint and label colors for equipment identification shall comply with TIA-606-B for Class 2 level of administration including optional identification requirements of this standard.

C. Comply with requirements in Section 271523 "Communications Optical Fiber Horizontal Cabling" for cable and asset management software.

D. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

E. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

F. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
4. Label each unit and field within distribution racks and frames.
5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

G. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA 606-B, for the following:

1. Flexible vinyl or polyester that flexes as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections with the assistance of a factory-authorized service representative.

D. Tests and Inspections:

1. Visually inspect optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Network Performance
    a. All specified cable shall meet the transmission standards set forth by the TIA/EIA.
    b. All specified network connectivity components (inserts, patch panels, etc.) shall meet the transmission standards set forth by the TIA/EIA.
    c. All installed and terminated cabling shall be tested to verify that the performance meets specifications set forth by the TIA/EIA.
4. Contractor Quality Assurance
    a. Testing
        1) The network consultant is responsible for the review of the copper and fiber channel tests at the completion of installation. Network consultant must ensure that all test results meets or exceeds the performance levels specified at the projects inception. Should any results fall below specified performance levels, consultant shall follow up with contractor to rectify. All results falling below specified performance levels shall be reported in electronic format (e.g. Excel, Acrobat, Word, etc.) to the Architect and Owner IT staff. Any failed channels shall be retested after repair.
        2) The Owner reserves the right to test or have an outside consultant test all fiber and/or copper channel installations.

5. Optical Fiber Cable Tests:
    a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
    b. Link End-to-End Attenuation Tests:

        1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in one direction according to TIA-526-14-B, Method B, One Reference Jumper.
        2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than those calculated according to equation in TIA-568-C.1.

E. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

F. Remove and replace cabling where test results indicate that it does not comply with specified requirements.

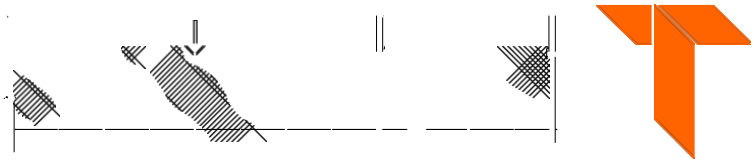
G. End-to-end cabling will be considered defective if it does not pass tests and inspections.

H. Prepare test and inspection reports.

END OF SECTION 271323

Specification Section 32 31 00

TYM-HYD-VF2/3 STRUCTURAL CANTILEVER SLIDE GATE SYSTEM WITH HYDRAULIC OPERATOR (CHAIN LINK)



PART 1 - GENERAL

1.01 SECTION INCLUDES:

The work in this section shall include furnishing all labor, materials, equipment and appliances necessary to complete all Fortress Structural Gate and Hydraulic Operator System(s) required for this project in strict accordance with this specification section and drawings.

1.02 REFERENCES:

A. Underwriters Laboratory Gate Operator Requirements (UL 325).

1) Operators shall be built to UL325 standards and be listed by a testing laboratory. Complete all electrical work according to local codes and National Electrical code. All fieldwork shall be performed in a neat and professional manner, completed to journeyman standards.
2) Current safety standards require the use of multiple external sensors to be capable of reversing the gate in either direction upon sensing an obstruction. Also see 2.02 D.
3) Vehicle gates should never be used by pedestrians. Separate pedestrian gates must always be provided when foot traffic is present.
4) Current safety standards require gate operators to be designed and labeled for specific usage classes. Hydraulic Operator TYM-HYD-VF2/3 gate operators are to be used on Class III and Class IV installations only.

B. ASTM F 2200 – Standard Specification for Automated Vehicular Gate Construction.

C. ASTM F 1184 – Standard Specification for Industrial and Commercial Horizontal Slide Gates, Type II, Class 2.

D. American Welding Society AWS D1.2 Structural Welding Code.

E. American Society of Civil Engineers – ASCE-7 Wind Load. (See 103 C (i)).

1.03 SUBMITTAL:

A. Product Data:

1. Provide manufacturer's catalog cuts with printed specifications and installation instructions.
2. Deliver two (2) copies of operation and maintenance data covering the installed products, including name, address and telephone number of the nearest fully equipped service center.
3. Each operator shall bear a label indicating that the operator mechanism has been tested for full power and pressure of all hydraulic components, full stress tests of all mechanical components and electrical tests of all overload devices.

B. Shop drawings:

1. Supply shop drawings showing the relationship of operating systems with gate components, including details of all major components.
2. Include complete details of gate construction, gate height and post spacing dimensions.

C. Certification of Performance Criteria:

1. Manufacturer of gate system shall provide certification stating the gate system includes the following material components that provide superior performance and longevity. Alternate designs built to minimum standards that do not include these additional structural features shall not be accepted.
    a. Gate track system shall be keyed to interlock into gate frame member (providing 200% additional strength when compared to weld only keyless systems). When interlocked with and welded to the "keyed" frame top member, gate track forms a composite structure.
    b. Gate shall have a minimum counterbalance length of 50% opening width which provides a 36% increase in lateral resistance (when compared to ASTM minimum of 40% counterbalance). If gate is ever to be automated, counterbalance section shall be filled with fabric or other specified material.
    c. To provide superior structural integrity, intermediate vertical members shall be used - with spacing between verticals to be less than 50% of the gate frame height.
    d. Entire gate frame (including counterbalance section) shall include 2 adjustable stainless steel cables (minimum 3/16”) per bay to allow complete gate frame adjustment (maintaining strongest structural square and level orientation).
    e. Gate truck assemblies shall be tested for continuous duty and shall have precision ground and hardened components. Bearings shall be pre-lubricated and contain shock resistant outer races and captured seals.
    f. Gate truck assemblies shall be supported by a minimum 5/8” plated steel bolt with self aligning capability, rated to support a 2,000 # reaction load.
    g. Hanger brackets shall be hot dipped galvanized steel with a minimum 3/8” thickness that is also gusseted for additional strength.
    h. Gate top track and supporting hangar bracket assemblies shall be certified by a licensed professional engineer to withstand a 2,000 lb. vertical reaction load without exceeding allowable stresses.
    i. Gate is to be designed to meet specified ASCE-7 wind load requirements with the gate in the closed and latched condition only. Typical gate design is expected to operate satisfactorily in winds up to 30 MPH. Depending on gate panel infill, winds higher than 30MPH may cause gate operational problems (operator entrapment sensing may trigger; gate panel may not engage receiver). For sites with higher operational, non-typical, or specified wind loadings, manufacturer should be advised of the site conditions and a specifically engineered design will be offered.

D. Certifications:

1. The Structural Cantilever Slide Gate must be cycle-tested and certified per section 2.04 B.
2. The aluminum welders and welding process for gate manufacture must be certified per section 2.04 C.

3. Operator Manufacturer: A company specializing in the manufacture of hydraulic gate operators of the type specified, with a minimum of ten years experience.
4. Manufacturer shall supply gate design performance certification as per section 1.03C.

PART 2 - PRODUCTS:

2.01 HYDRAULIC GATE OPERATORS:

A. Hydraulic Gate Operator TYM-HYD-VF2/3 with controller to be supplied by Tymetal Corp., 678 Wilbur Avenue, Greenwich, NY 12834 – (800)-328-4283.

2.02 OPERATION:

B. Operation shall be by means of a metal rail passing between a pair of aluminum alloy wheels with polyurethane treads. Operator drive wheels will be driven using hydraulic motors, and system shall not include belts, gears, pulleys, roller chains or sprockets to transfer power from operator to gate panel. The operator shall generate a minimum horizontal pull of 300 lb (136 kg) without the drive wheels slipping and without distortion of supporting arms. Operator shall be capable of handling gates weighing up to 5,000 lb (2,200 kg). The operator shall be speed controlled by an electronic Variable Frequency Drive (VFD) which will accelerate and decelerate the gate gradually to prevent shock loads to the gate and operator assembly. The maximum gate velocity of the TYM-HYD-VF2/3 shall be selectable between 2.2 ft/s (670 mm/s) and 3 ft/s (914 mm/s). The operator shall contain an Emergency Fast Operation (EFO) mode wherein a separate continuous input allows the operator to override all safety inputs and run at the EFO speed. The gate velocity during Emergency Fast Operation (EFO) shall not be less than 3 ft/s (914 mm/s). Upon starting, the VFD will gradually accelerate the gate to its operating speed. When at the slow down limit, the VFD will gradually reduce gate velocity to 1 ft/s (304 mm/s), thereafter, at the stop limit, the VFD will slow the electric motor and gate to a gradual stop. Two adjustable hydraulic brake valves (one for each direction) assist in slowing the gate to a precise stop.

C. Standard mechanical components shall include as a minimum:

1. Supporting arms: Cast aluminum. Arms shall incorporate a low-speed sleeve bearing acting on arm pivot pins. (item 2 below)
2. Arm pivot pins: 3/4" (19 mm) diameter, stainless steel, with integral tabs for ease of removal.
3. Tension spring: 2 – 2 1/2" (51mm - 63 mm) medium to heavy duty, minimum 500 lb (226 kg) capacity.
4. Tension adjustment: Finger tightened nut, not requiring the use of tools.
5. Drive release: Must instantly release tension on both drive wheels and disengage them from contact with drive rail in a single motion, for manual operation.
6. Limit sensors or switches: Fully adjustable,
   a. Switches - toggle types, with stripped ends to VFD.
   b. Sensors – hall effect, jacketed cable, stripped ends to VFD.
7. Chassis: 1/4" (6 mm) steel base plate and 12 Ga. (3 mm) sides and back welded and ground smooth.
8. Cover: 10 Ga. zinc plated steel with textured TGIC gray polyester powder coat finish. All joints welded, filled and ground smooth. Finished corners square and true with no visible joints.
   a. The cover shall have a detention quality mogul lock.
9. Finish: Zinc substrate with textured powder coat finish, tested to withstand 1,000 hour salt spray test.

10. Drive wheels: Two 8" diam (203 mm) AdvanceDrive™ wheels. Aluminum alloy with polyurethane over mold.
11. Drive rail: Shall be extruded 6061 T6, not less than 1/8" (3 mm) thick. Drive rail shall incorporate roll pins for ease of replacement or splicing. Pins shall enable a perfect butt splice.
12. Hydraulic hose: Shall be 3/8” (9.5 mm) reinforced, synthetic, abrasion resistant, rated to 3,000 psi or greater (20.6 MPa).
13. Hydraulic valves: Shall be individually replaceable cartridge type, in an integrated hydraulic manifold.
14. Hose fittings: At manifold shall be quick-disconnect type, others shall be swivel type.
15. Hydraulic fluid: High performance type with a viscosity index greater than 375 and temperature range -40° F to 158° F (-40° C to 70° C).
16. 0 – 3000 psi pressure transducer with a digital readout on the control board shall be standard. The hydraulic fluid reservoir shall be formed from a single piece of metal, non-welded, and shall be powder painted on the inside and the outside, to prevent fluid contamination.

D. Minimum standard electrical components:

1. Pump motor: 2 hp, 3450 RPM, three phase. (Note, the VFD converts single phase input power to drive the three phase motor)
2. VFD: 2 hp, Modbus monitored and controlled.
3. All components shall have overload protection.
4. Electrical enclosure: metal, with hinged plastic lid for protection from intrusion of foreign objects.
5. 1 directional valve control solenoid.
6. Multi-function button to wake menu screen without opening the lid.
7. Controls: SmartTouch 725 Controller containing:
    a. inherent entrapment monitoring (UL 325, Type A);
    b. built in audible “warn before operate” system;
    c. built in timer to close;
    d. 32 character OLED display for reporting of functions and codes with 7 button user interface;
    e. multiple programmable options for output relays or sensor inputs;
    f. two user programmable inputs;
    g. two user programmable monitored sensor inputs;
    h. anti-tailgate mode;
    i. menu configuration, event logging and system diagnostics easily accessible with a USB flash drive or HySecurity’s Installer Phone App;*
    j. embedded web server capable of sending alerts, faults and errors via e-mail;*
    k. web based user interface allowing secure login to operator for remote operations and diagnostics;
    l. four inputs for Hy5B vehicle detector loops;
    m. OXI antenna/receiver input for use with NICE OXI receivers and fobs;
    n. one electromechanical and two solid state relays;
    o. HS-1 for I/O Expansion Module;
    p. HS-2 for ModBus to VFD;
    q. RS485 and ethernet for network connections;*
    r. USB port for firmware updates and troubleshooting logs;
    s. sequenced and dual gate connections;
    t. BlueBUS input for use with NICE BlueBUS devices;
    u. emergency input programmable for emergency open or close remote or radio input;

v. open, close, stop inputs for remote or radio inputs.Transformer: 75 VA, non-jumpered taps, for all common voltages.

8. Power supply, 24 VDC, 5 A output, variable voltage input.

E. Required external sensors: See 1.02 A2. Specify photo eyes or gate edges or a combination thereof to be installed such that the gate is capable of reversing in either direction upon sensing an obstruction.

F. Optional control devices: (consider one or more of the following: card reader, key-switch, radio control, pushbuttons, vehicle detectors, keypads or seven day timers).

G. 208-230 60 hz VAC single phase, 220 50 hz VAC single phase, 208-230/460 60 hz VAC three phase, and 220/380/440 50 hz VAC three phase available. 115 VAC single phase is not available.

2.03 FACTORY TESTING

A. Fully assemble and test, at the factory, each gate operator to assure smooth operation, sequencing and electrical connection integrity. Apply physical loads to the operator to simulate field conditions. Tests shall simulate physical and electrical loads equal to the fully rated capacity of the operator components.

B. Check all operator mechanical connections for tightness and alignment. Check all welds for completeness and continuity. Check welded corners and edges to assure they are square and straight.

C. Inspect operator painted finish for completeness and gloss. Touch up imperfections prior to shipment.

D. Check all hydraulic hoses and electrical wires to assure that chafing cannot occur during shipping or operation.

2.04 STRUCTURAL CANTILEVER SLIDE GATE MANUFACTURERS:

A. The cantilever sliding gate shall be manufactured by Tymetal Corp., 678 Wilbur Avenue, Greenwich, NY 12834 - (800) 328 - 4283.

B. Cantilever Slide Gate manufacturer shall submit test results upon request stating that the gate panel has been tested in an operated system for 200,000 cycles.

C. Gate manufacturer shall provide independent certification as to the use of a documented Welding Procedure Specification and Procedure Qualification Record to insure conformance to the AWS D1.2 welding code. Upon request, Individual Certificates of Welder Qualification documenting successful completion of the requirements of the AWS D1.2 code shall also be provided.

2.05 STRUCTURAL CANTILEVER SLIDE GATE:

A. Fortress Structural Cantilever Slide Gate System dimensions shall be as shown on the detail drawings.

B. Structural Gate Frame:

1. The gate frame shall be fabricated from 6005A-T61 or 6005A-T5 aluminum alloy extrusions. The top member shall be a 3" x 5" aluminum structural channel/tube extrusion weighing not less than 3.0 lb/lf (4.4kg/m). To maintain structural integrity this frame member shall be "keyed" to interlock with the "keyed" track member. If fabricated as a single horizontal piece, the bottom member shall be a 2" x 5" aluminum structural tube weighing not less than 2.0 lb/lf. If fabricated in two horizontal pieces, the bottom member shall be a 5" aluminum structural channel weighing not less than

2.3 lb/lf (3.4kg/m) and the two horizontal pieces or sections shall be spliced in the field (the gate frame shall be fabricated in one or multiple sections depending on size requirements or project constraints).

2. Vertical Members:

   a. The vertical members at the ends of the opening portion of the frame shall be "P" shaped in cross section with a nominal base dimension of no less than 2” x 2” (51mm x 51mm) and weighing not less than 1.6 lb/lf (2.3kg/m). The intermediate vertical members shall alternate between 2” x 2” (51mm x 51mm) and 1” x 2” (25mm x 51mm) in cross section weighing not less than 1.1 lb/lf (1.6kg/m) and 0.82 lb/lf (1.2kg/m) respectively.

   b. Intermediate 1” x 2” (25mm x 51mm) vertical members weighing not less than .82 lb/lf (1.2kg/m) shall alternate between 2” x 2” major members.

C. Splicing:

1. A ¼" x 5" x 24" galvanized steel splice plate shall be used to secure the two bottom channel members together utilizing eight (8) plated carriage bolts with lock nuts. The top members will be spliced together using a ¼" x 2" x 24" aluminum splice plate secured with six (6) drive rivets on one side and welded to the top member on the other side. The track is overlapped onto the opposing section in an alternating fashion, interlocking with the top primary member.

D. Gate Track:

1. The gate shall have a separate semi-enclosed “keyed” track, extruded from 6005A-T61 or 6005A-T5 aluminum alloy, weighing not less than 2.9 lb/lf (4.3kg/m). Track members are to be located on each side of the top member. When interlocked and welded to the “keyed” top member, it forms a composite structure with the top of the gate frame. Welds are to be placed alternately along the top and side of the track at 9" centers with welds being a minimum of 2" long.

E. All welds on the gate frame shall conform to Welding Procedure Specification and Procedure Qualification Record to insure conformance to the AWS D1.2 Structural Welding Code. All individual welders shall be certified to AWS D1.2 welding code. See 1.02 D.

F. Gate Mounting:

1. The gate frame is to be supported from the track by four (4) swivel type, self-aligning, 4-wheeled, sealed lubricant, ball-bearing truck assemblies.

2. The bottom of each support post shall have a bracket equipped with a pair of 3” (76mm) UHMW guide wheels Wheel cover protectors shall be included with bottom guides to comply with UL325.

3. Gap protectors shall be provided and installed, compliant with ASTM F 2200.

G. Diagonal Bracing:

1. Diagonal "X" bracing of 3/16" (5mm) minimum diameter stainless steel aircraft cable shall be installed throughout the entire gate frame.

H. Gate Filler:

1. Chain Link: 2” x 2” x 9 gauge aluminized steel chain link fabric shall extend the entire length of the gate (if operated gate, counterbalance must also have fabric to prevent reach through and comply with ASTM F 2200) Fabric shall be attached at each end of the gate frame by standard fence industry tension bars and tied at each 2” x 2” (51mm x 51mm) vertical member with standard fence industry ties. ASTM F 2200 requires

attachment method that leaves no leading or bottom edge protrusions (cannot exceed 0.5 inch).

I. Posts (by others):

1. Double sets of support posts shall be minimum 4" O.D. (102mm) round Schedule 40 or 4” x 4” x 3/16” wall square steel tubing, grade 500. Gate posts shall be galvanized or coated and supported in concrete footings as specified by the design team.

J. Finish:

1. Gate to be mill finish aluminum or color coated with polyester powder as specified. If powder coated, the gate (including track member) and all accessories shall be pretreated chemically by sand blasting or other acceptable method to ensure proper coating adherence.

K. Gate Lock:

1. Gate system shall be furnished with a secure gate catcher. The catcher shall prevent the gate panel from being pried open while the gate is in the closed and locked position.

PART 3 - EXECUTION

3.01 SITE INSPECTION:

A. Final grades and installation conditions shall be examined. Installation shall not begin until all unsatisfactory conditions are corrected.

B. Locate concrete mounting pad in accordance with approved shop drawings.

C. Make sure that gate is level and operating smoothly under manual conditions before installation of gate operators. Do not proceed until gate panel is aligned and operates without binding.

3.02 INSTALLATION:

A. Equipment in this section shall be installed in strict accordance with the company’s printed instructions, current at the time of installation (unless otherwise shown on the contract drawings).

B. Coordinate locations of operators with contract drawings, other trades and shop drawings.

C. Installer shall ensure that the electrical service to the operator is at least 20A for 3 phase and 30A for 1 phase. Electrical wiring to conform to NEC and manufacturer’s installation instructions.

D. The gate and installation shall conform to:

1. ASTM F 1184 standards for aluminum cantilever slide gates, Type II, Class 2.
2. ASTM F 2200 standard specification for automated vehicular gate construction.
3. UL325 standards.

E. The installing contractor shall be responsible to ensure that appropriate external primary entrapment safety devices be installed for the specific site conditions to protect against all potential entrapment zones. Proper operation of these safety devices shall be verified and training as to the operation and maintenance of these devices for the users and owners shall be documented.

3.03 SYSTEM VALIDATION:

A. The complete system shall be adjusted to assure it is performing properly. Test gate operator through a minimum of ten full cycles and adjust to ensure operation without binding, scraping or uneven motion. Test limit switches for proper "at rest" gate position.

B. Gate lock shall be aligned properly to lock and unlock without binding. Test gate lock through a minimum of ten full cycles and verify secure locking.

C. All anchor bolts shall be fully concealed in the finished installation.

D. Test and Explain Safety Features:

1. Each system feature and device is a separate component of the gate system.
2. Read and follow all instructions for each component.
3. Ensure that all instructions for mechanical components, safety devices and the gate operator are available for everyone who will be using the gate system.
4. The warning signs shipped with the gate operator must be installed in prominent position on both sides of the gate.

E. Ensure the owner is clear with regard to the safety points concerning the basic operational guidelines of the safety features of the gate operator system. These safety points are listed in the operator manual and must be read prior to system use.

Note: Tymetal Corp. reserves the right to modify and/or make changes as deemed necessary without previous notice.

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PART 1 – GENERAL

1.1 SUMMARY

A. Provide all labor, materials, and equipment for the complete installation of Work called for in the Contract Documents.

B. Work of this Section includes all labor, materials, installation, and integration of

1. Slide gate operators.

1.2 DEFINITIONS AND TERMS

A. Trade association names and communications terminology are frequently abbreviated. The following acronyms or abbreviations may be referenced within this Section:

1. ANSI American National Standards Institute
2. ASTM American Society for Testing and Materials
3. AWG American Wire Gauge
4. DFW Dallas Fort Worth International Airport
5. NEMA National Electric Manufacturers Association
6. NFPA National Fire Protection Association
7. RFP Request for Proposal
8. UL Underwriters Laboratories

1.3 QUALITY ASSURANCE

A. All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner.

B. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where “approved equal” is stated, or a substitution is requested, equipment shall be equivalent in every way to that of the equipment specified. All substitutions are subject to the control and approval of the Owner.

C. Contractor’s Qualifications:

1. Firms regularly engaged in the installation of high security gates and barriers and that have five (5) years of installation experience with structures similar to that required for this project.
2. Provide references to include client names, phone numbers and a summary of project details. These references will be checked, and the clients will be asked questions relative to the performance of your company.
3. Provide full time project manager with a minimum of ten (10) years field experience in the installation and construction of vehicle gates. Project manager shall be assigned for the duration of the project and shall not be replaced without written consent from the Owner.

D. Manufacturer’s Qualifications:

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1. Firms regularly engaged in manufacture of products of the types, ratings and capacities required for this project; whose products have been in satisfactory use in similar service for not less than five (5) years, with production capabilities per applicable NEMA standards.

E. Material and Work specified herein shall comply with the applicable requirements of:

1. NECA 1 – Standard Practice of Good Workmanship in Electrical Construction, 2015
2. ANSI/TIA-607-D – Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises, 2019
3. ANSI/CAN/UL 325, Edition 7 – Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems, 2017
4. NFPA 70 – National Electric Code (currently adopted edition)
5. DFW Airport Design Criteria Manual
6. Applicable codes and directives of authorities having jurisdiction

F. Work:

1. The Work shall be performed in compliance with the applicable manufacturer's installation instructions, Standards, and certifications listed herein, the Contract Documents, and governing codes and regulations of the authorities having jurisdiction.
2. The drawing and specification requirements govern where they exceed Code and Regulation requirements.
3. Where requirements between governing Codes and Regulations vary, the more restrictive provision applies.
4. Nothing in the Contract Documents grants authority or permission to disregard or violate any legal requirements.

1.4 CONFLICTS

A. This installation shall be made in strict accordance with the Specifications, Drawings, any applicable codes, referenced publications and standards. In case of conflicts between the aforementioned, notify the Owner in writing prior to commencement of affected work.

1.5 PERMITS

A. The Contractor shall secure and pay for all necessary permits and fees required for the execution of this Work. Work will not start until all permit applications are approved.

1.6 SCHEDULING

A. The Contractor shall comply with all scheduling requests established by the Owner, both prior to commencing Work, and during construction. The Contractor shall provide a detailed schedule of work to be performed. This schedule shall be submitted with the bid and, if accepted, will be used to track work status.

B. Work should be scheduled not to interfere with day-to-day operations within the facility. Operations vary by area and should be given careful consideration in relation to the

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schedule.

C. The successful Contractor for all or any portion of the work described by this RFP package will be responsible for achieving a complete and fully functional installation on or before the contract scheduled completion date.

1.7 REQUIREMENTS

A. All references to manufacturers, model numbers and other pertinent information herein are intended to establish standards of performance and quality of construction. The Owner must approve material submittal and substitutions in writing.

B. Verification that all the components specified and installed meet the criteria specified by the respective component manufacturer, supplier and designer is the responsibility of the Contractor.

C. All installation tools, special equipment and testing apparatus required to accomplish field connections and related work as described herein shall be furnished by the Contractor at no additional cost.

D. The requirements as given in this document are to be adhered to unless revised by the Owner in writing.

E. The Owner reserves the right to waive these requirements at any time.

1.8 SUBMITTALS

A. Comply with provisions of Division 01.

B. Produce site Shop Drawings for that include integration of all systems, including site/foundation work, conduit routing and stub-ups, electrical service connections and Security and IT systems integration details.

1. Contractor shall not utilize the Consultants' original design drawings in the submittal or shop drawing process. Contractor shall develop their own original shop drawings.

C. Provide all submittal requirements under this section as a single package.

D. Provide product data for the following:

1. Product data consisting of specifications and manufacturer's written installation instructions.

1.9 CONTRACTOR CLOSE OUT SUBMITTALS

A. Submit Closeout documentation in accordance with Division 01 of the Project Manual and any applicable supplements. The number of submittal sets are to be per the requirements outlined in Division 01 of the Project Manual.

1. Segregate documents into separate binders containing data relevant to operational, maintenance, and warranty issues.
2. As built documentation of the site conditions.
3. Test reports:
    a. Drive unit shall bear a label indicating that the gate controller/operator mechanism has been tested certified to UL 325 and CSA C22.2 No. 247 standards for all electrical components.

B. Warranty and Maintenance:

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1. Record Drawings

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials factory-packaged in containers or reels and handle in accordance with manufacturer's recommendations. Store in a clean, dry space and protect products from damaging fumes and traffic. Handle materials carefully to avoid damage.

B. Storage space on project site may be limited. Contractor shall coordinate delivery and arrange storage of materials and equipment with the Owner.

C. Components sensitive to damage in a harsh environment shall be stored off-site and delivered as needed.

D. Provide protective covering during construction to prevent damage or entrance of foreign matter.

E. Contractor is responsible for on-site security of tools, test equipment and materials.

F. Replace at no expense to Owner, product damaged during storage, handling, or the course of construction.

1.11 PROJECT CONDITIONS

A. Verify conditions on the job site are applicable to this Work. Notify the designer in writing of discrepancies, conflicts, or omissions promptly upon discovery.

B. The Drawings diagrammatically show utilities and arrangements of equipment fitting the space available without interference. If conditions exist which make it impossible to install Work as shown, recommend solutions and/or submit drawings to the designer for approval, showing how the Work may be installed.

1.12 WARRANTY

A. Warrant labor and product to be free of defects and deficiencies, and to conform to the drawings and specifications as to kind, quality, function, and characteristics, following Contractor Warranty requirements defined in Division 01. Repair or replace defects occurring in labor or product within the Warranty period without charge.

B. All surplus parts and pieces to the installation shall be maintained as a spare parts inventory at the building site. Parts replaced during the warranty period shall have a warranty matching that of the original part from date of replacement.

PART 2 – PRODUCTS

2.1 GENERAL

A. The products specified in this document do not necessarily constitute the exhaustive list of products required to complete the statement of work. Except where described in the SUMMARY subpart of this document, the contractor is responsible for providing any other parts and materials needed to deliver a complete and working system.

2.2 VEHICLE GATE OPERATORS

A. High-Speed Sliding Gate Operator

1. Furnish a high-speed slide gate operator.

2. Operator shall have the following attributes and features:

a. Hydraulic operator with a 2 horsepower Motor

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b. Up to 5000 lb gate capacity.
c. Rate of travel shall be 2 feet/second or greater.
d. Designed for Class IV use.
e. Concealed drive system.
f. 208/230 VAC, single phase or 208-230/460V three phase powered.
1) Refer to the electrical drawings for available power.
g. Emergency override for manually opening and closing the gate, in the event of a power failure.
h. Listed to UL 325, Classes 1 through 4.
i. UL 325 entrapment protection.

3. Include a mechanical fire and emergency release for each operator.
4. Acceptable products:
a. HySecurity SlideDriver II SD50F
b. Owner approved equivalent.

2.3 SIGNAGE

A. Reflective Signage

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify the site and foundation work is complete.
B. Verify the required conduits are installed and stubbed up in the correct locations.
C. Verify an electrical service ground is provided and installed in the correct location.

3.2 INSTALLATION

A. Install the gates according to their respective manufacturer's written instructions, by a contractor certified by the respective manufacturer(s).
B. Submit certificate of installation to the respective manufacturers upon completion of installation, for warranty validation.

3.3 TESTING

A. Test the entrapment and obstruction detection.

3.4 TRAINING

A. Provide (2) training sessions with the Owner on the routine maintenance and operation of the gates and barriers.

3.5 ACCEPTANCE

A. Perform an in-person witness test with the Owner’s authorized representative.

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PART 4 – MEASUREMENT AND PAYMENT

4.1 ITEM 323133-1 – HYDRAULIC SLIDE GATE OPERATOR

A. Method of Measurement

1. This item includes the procurement and installation of the following components from Part 2 above.

   a. 2.2.A High-Speed Sliding Gate Operator

2. Measurement for this item will be per each, installed complete and accepted by the OAR.

B. Basis of Payment

1. Payment for item 323133-1 will be made at the contract unit price per each installed. The price shall be full compensation for furnishing all materials and for preparation, assembly, installation, and for all labor, equipment, tools, and incidentals necessary to complete this item as accepted by the OAR.

- END OF SECTION -

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SECTION: 32 92 19

SEEDING AND SODDING

PART 1 – GENERAL

1.01 SUMMARY

A. This Section covers furnishing of all labor, materials, equipment, tools, supervision, and incidentals necessary for seeding or sodding. Turf materials must address the elimination and/or mitigation of materials that could attract hazardous wildlife on and/or around an airport.

1.02 REFERENCES

A. Federal Aviation Administration (FAA) Advisory Circular 150/5200-33A, Hazardous wildlife Attractants on or Near Airports

B. FAA Advisory Circular 150/5370-10G, Standards for Specifying Construction of Airports (Specifically Part 10, Turfing)

C. Wildlife Hazard Management at Airports, A Manual for Airport Personnel available at: Wildlife Hazard Management at Airports

D. Texas Commission on Environmental Quality (TCEQ) Stormwater Construction General Permit TXR150000 (specifically Final Stabilization criteria)

E. TxDOT approved product list: TxDOT s162.pdf

1.03 DEFINITIONS

A. Adequate Grass Stand (FAA): A good stand of grass of uniform color and density, and when inviable or bare spots are one square foot or less, randomly dispersed, and do not exceed 3% of the area sodded.

B. Airside: The airside consists of all areas within the AOA fence at the completion of the project, all areas extending 20 ft from the AOA fence, and all Runway Protection Zones (RPZ).

C. Cool season: The cool season is October 1st through March 31st.

D. Final Stabilization (TCEQ): All soil disturbing activities at the site have been completed and uniform (evenly distributed without large bare areas) perennial vegetative cover with a density of at least 70% approved vegetative cover for the area has been established on all unpaved areas and areas not covered by permanent structures. In addition, Airside areas have established “Adequate Grass Stand.”

E. Non-public area: All non-Airside areas greater than 30 feet from a leased area, not mowed, and not landscaped.

F. Permanent Seed: approved perennial grass species/varieties for final stabilization

G. PLS: Pure Live Seed (Gross Weight x Purity x Germination / 100 = PLS)

H. Public area: All non-Airside areas within 30 feet of a leased area, mowed, or landscaped.

I. Sun Area: An area receiving greater than 4 hours of direct sunlight daily.

J. Shade area: An area receiving 4 or less hours of direct sunlight daily.

K. Temporary Seed: approved annual grass species/varieties

L. TxDOT: Texas Department of Transportation

M. Warm season: The warm season is April 1st through September 30th.

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1.04 SUBMITTALS

A. Seed/Sod Plan: Submit a seed/sod plan for approval. Plan shall include number of acres/square yards to seed/sod, application method, grass species/variety (Latin name), supplier name and location, sod type/quality designation, seed vendor certification, total quantity of seed to be applied, tackifier SDS, mulch selected from TxDOT approved list, soil retention blanket selected from TxDOT approved list, soil retention blanket's manufacturer installation instructions, topsoil source and quantity.

B. Fertilizer Plan: Submit a fertilizer plan for approval. The plan shall include the soil analysis laboratory results, laboratory fertilizer recommendation based on soil results, and grass species/variety, proposed fertilizer mix and application rate.

PART 2 – PRODUCTS

2.01 SEED

A. Provide and install seed as shown on the plans or as directed by OAR. All seed must be from previous season's crop and meet the requirement of the Texas Seed Law.

B. All seed weight shall be per PLS pounds. Minimum application rate is indicated per acre.

C. Only seed meeting the land use, season, and sun exposure requirements may be applied. Refer to charts below for permanent and temporary seed options. Seed shall be applied at the application rate specified in the table below.

TEMPORARY SEED OPTIONS					
Land Use	**Season During Application**		**Sun Exposure**		**Application Rate**
	Warm	**Cold**	**Sun**	**Shade**	
Airside					
No seed options available					
Public					
No seed options available					
Non-public					
Teff Grass *Eragrostis tef*	x	x	x	x	10 lbs PLS
Creeping red fescue *Festuca ruba*		x	x	x	220 lbs PLS
Western Wheatgrass *Passcopyrum smithii*		x	x	x	20 lbs PLS

PERMANENT SEED OPTIONS					
Land Use	**Season During Application**		**Sun Exposure**		**Minimum Application Rate**
	Warm	**Cold**	**Sun**	**Shade**	
Airside					
No seed options available (Sod only)					
Public					
Unhulled Bermuda *Cynadon dactylon*	x		x	x	50 lbs PLS
Hulled Bermuda *Cynadon dactylon*	x		x	x	50 lbs PLS
Zoysia Grass *Zoysia japonica*	x			x	100 lbs PLS

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Non-public					
Unhulled Bermuda *Cynadon dactylon*	x		x	x	20 lbs PLS
Hulled Bermuda *Cynadon dactylon*	x		x	x	20 lbs PLS
Buffalo Grass *Bouteloua dactyloides*/ Blue Grama Grass (native) *Bouteloua gracilis*	x		x	x	50 lbs PLS/ 100 lbs PLS
Buffalo Grass *Bouteloua dactyloides* w/ Sand Drop *Sporobolus cryptandrus*	x		x	x	50 lbs PLS/ 2 lbs PLS
Buffalo Grass *Bouteloua dactyloides* w/ Hooded Windmill *Chloris cucullata*	x		x	x	50 lbs PLS/ 1.5 lbs PLS
Blue Grama Grass (native) *Bouteloua gracilis*	x		x	x	4 lbs PLS
TxDOT Permanent Urban Seed Mix (District 18 Clay Soils) Green Sprangletop- *Leptochloa dubia*, Sideoats Grama (El Reno)- *Boutelous curtipendula*, Buffalograss (Texoka)- *Bouteloua dactyloides*, Bermudagrass- *Cyando dactylon*	x		x	x	1lbs PLS/ 7lbs PLS/ 3lbs PLS/ 5lbs PLS

2.02 SOD

A. Use grass sod with a healthy root system and dense matted roots throughout the soil of the sod for a minimum thickness of 1in.

B. Keep sod moist from the time it is dug, until it is planted. Grass sod with dried roots is unacceptable.

C. Sod shall be relatively free of weeds or other undesirable foreign plants, large stones, roots, or other materials.

D. Sod must be green and have evidence of 99% root establishment to achieve final stabilization. Sod that is placed during the cool season will require an inspection in the warm season to confirm viability.

E. Sod will be considered under warranty for one year after final stabilization is achieved or as detailed in paragraph 3.05 below with an approved transfer to DFW.

F. Approved sod options vary based on season, sunlight, and location on Airport property. Refer to the chart below for sod options. Only sod meeting the land use, season, and sun exposure requirements may be utilized.

SOD OPTIONS				
Land Use	**Season During Application**		**Sun Exposure**	
	Warm	**Cold**	**Sun**	**Shade**
Airside				
Bermuda *Cynadon dactylon*	x	x	x	x
Public				
Bermuda *Cynadon dactylon*	x	x	x	x
Non-public				

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Bermuda *Cynadon dactylon*	x	x	x	x
Zoysia *Zoysia japonica*	x	x		x
Buffalo Grass *Bouteloua dactyloides*	x		x	x

2.03 FERTILIZER

A. Provide and distribute fertilizer over all areas to be seeded or sodded.

B. Fertilizer is subject to testing by the Texas A&M Feed and Fertilizer Control Service or another approved lab in accordance with the Texas Fertilizer Law.

2.04 WATER

A. Use water that is clean and free of industrial wastes and other substances harmful to the growth of vegetation.

B. Water may be from a Potable Water source or Reclaimed Water source, but never pumped directly from a creek, stream, or pond.

C. The water source and supply location are subject to approval by the OAR prior to use.

2.05 MULCH

A. Mulch is required to cover all seeded areas.

B. See chart below for the approved mulch types and minimum application rates.

MULCH OPTIONS	
Type	**Application Rate**
Wheat Straw Mulch	2 tons per acre
TxDOT Approved Cellulose Fiber Mulch	per manufacturer rate but no less than 2000lbs. per acre

1. Wheat straw mulch must be crimped into the soil using an approved Straw Mulch Crimper.
2. Recycled paper based cellulose mulches are prohibited.

2.06 TACKIFIER

A. Use a tacking agent for all hydroseed applications. Apply per manufacturer's recommendations.

2.07 SOIL RETENTION BLANKET

A. Soil retention blanket is required on all seeded areas with a slope of 3:1 or greater, and in any area where concentrated flow occurs.

B. Use a soil retention blanket from the TxDOT Approved Product List.

2.08 TOPSOIL

A. Use easily cultivated, screened fertile topsoil that is free from objectionable material and resistant to erosion.

B. Utilize existing topsoil from the project site.

C. If necessary to obtain additional topsoil, adhere to the soil transfer requirements in 01 33 29.06.01 Contaminated Media Management Plan.

PART 3 – EXECUTION

3.01 GENERAL

A. All seed or sod applications must adhere to all applicable TCEQ or FAA Circulars including most recent versions of 150/5200-33, and 150/5370-10.

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B. All seed or sod applications will be considered under warranty for one year after final stabilization is achieved or as detailed in 4.03 below with an approved transfer to DFW.

3.02 SEED

A. General
   1. Submit a seed/sod plan for approval by the OAR prior to application.
   2. Seed may be applied by the following methods: broadcast, drill seeding, hydroseeding.
   3. All seed applications will require soil prep, topsoil, fertilizer, and mulch. Tackifier and soil retention blankets are required based on application method and site conditions.

B. Soil Prep
   1. After grading of the area has been completed, thoroughly loosen and work soil to a depth of not less than 5 inches and break any clods greater than 1” in diameter.
   2. The area shall be raked or otherwise cleared of stones, sticks, stumps, and other debris greater than 1" in diameter. The surface shall be prepared in a manner that is loose and level without voids, openings, or pores.

C. Topsoil
   1. Complete soil prep prior to placing topsoil.
   2. Spread the topsoil to a uniform loose cover with a minimum depth of 4 inches.

D. Inspection
   1. Once soil is prepped and topsoil is placed, request a DFW environmental inspection.
   2. Soil prep and topsoil placement must be inspected and approved by a DFW environmental inspector prior to seed application.

E. Fertilizer
   1. Submit a Fertilizer Plan for OAR approval.
   2. Fertilizer mix and application rate shall be determined based on a soil laboratory analysis.
   3. A soil sample shall be submitted to Texas A&M AgriLife Extension or equivalent laboratory certified in soil analysis. Follow the laboratory's procedure for collecting a soil sample. Soil sample may be collected at any point post-grading and prior to seed application.
   4. Submit the lab results and proposed fertilizer for review and approval by OAR prior to application.
   5. Apply fertilizer at the approved application rate.

F. Installation
   1. Broadcast Application
      a. If broadcast application method is selected, contractor shall evenly distribute seed across the entire area at the approved application rate.
   2. Drill seed Application
      a. If drill seed application is selected, contractor shall evenly distribute seed in rows no further than 7” apart, utilizing an industry approved grass seed drill.
   3. Hydroseed Application
      a. If hydroseed application method is selected, contractor must evenly apply seed, and tackifier at approved application rates.
      b. All equipment shall be clean and free of contaminants prior to use.

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G. Mulch

1. The Contractor is required to apply an approved mulch at the rates specified over the planted seed bed.
2. If wheat straw mulch is utilized, it must be crimped into the soil using an approved Straw Mulch Crimper.

H. Soil retention Blanket

1. All areas with a slope of 3:1 or greater, and any area where concentrated flow occurs will require soil retention blanket.
2. Install and anchor the soil retention blanket according to the manufacturer's installation instructions.

I. Water

1. Water as needed until final stabilization is achieved and approved by the OAR.
2. Seeded areas shall be thoroughly watered immediately after they are planted. Seeded areas shall be watered as directed by the OAR at least twice daily for at least 14-days after seeding in such a manner as to prevent washing of the slopes or dislodgement of the seed. Water shall be applied to the cultivated areas until a minimum depth of 6- inches is thoroughly moistened. Contractor shall re-seed washed areas. The Contractor shall be responsible for proper watering until final acceptance.
3. Seeded areas shall be maintained, including watering and mowing, at such time and in a manner and quantity directed by the Owner until completion and final acceptance of the project by the Owner. At minimum, the Contractor shall maintain the seeded area until each of the following conditions are achieved: vegetation is evenly distributed, without bare areas, and covers 70% of the seeded area.

J. Mowing

1. Mowing is required when the grass reaches 6" in height.
2. Additional mowing may be required by the OAR until final stabilization is achieved.

K. Reseeding

1. The area may require reseeding to achieve final stabilization. Reseeding is considered incidental to the cost of seeding and will be done at no additional expense to the owner.
2. If final stabilization is not achieved in the warm season, reseeding will be required in the next warm season.
3. At a minimum, reseeding consists of seed, fertilizer, and water application. Mulch, tackifier and soil retention blankets may be utilized.

3.03 SOD

A. General

1. Submit a seed/sod plan for approval by the OAR prior to application.

B. Soil Prep

1. After grading of the area has been completed, thoroughly loosen and work soil to a depth of not less than 5 inches and break any clods greater than 1" in diameter.
2. The area shall be raked or otherwise cleared of stones, sticks, stumps, and other debris greater than 1" in diameter. The surface shall be prepared in a manner that is loose and level without voids, openings, or pores.

C. Topsoil

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1. Complete soil prep prior to placing topsoil.
2. Spread the topsoil to a uniform loose cover with a minimum depth of 4 inches.

D. Inspection
1. Once soil is prepped and topsoil is placed request a DFW Environmental Inspection.
2. Soil prep and topsoil placement must be inspected and approved by a DFW Environmental Inspector prior to sod installation.

E. Fertilizer
1. If placing sod in a warm season, submit a fertilizer plan for approval.
2. If placing sod in a cool season, OAR may require fertilizer in the warm season.
3. Fertilizer mix shall contain primarily Nitrogen and be applied at a rate of 100 lbs. of Nitrogen per acre.

F. Installation
1. Place sod over the prepared area and roll or tamp to create a solid mat.
2. Sod placed on the Airside, in ditches, or on slopes greater than 4:1 will require staples. Use 12” wood staples to secure the sod.
3. Fill all gaps with additional topsoil.

G. Water
1. Water as needed until final stabilization is achieved and approved by the OAR.
2. Ponding is not allowed. Do not water to the point of ponding.

H. Mowing
1. Mowing may be required by the OAR until final stabilization is achieved.
2. Mowing will be conducted within the time frame specified by the OAR.

3.04 FINAL STABILIZATION

A. All areas shall be maintained until final stabilization is achieved unless clause 3.05 below is invoked.

B. Final stabilization is achieved when the following conditions are met:
1. All soil disturbing activities at the site have been completed.
2. Uniform (evenly distributed without large bare areas) perennial vegetative cover with a density of at least 70% approved vegetative cover for the area has been established on all unpaved areas and areas not covered by permanent structures.
3. All Airside areas achieved a good stand of grass of uniform color and density, and when inviable or bare spots are one square foot or less, randomly dispersed, and do not exceed 3% of the area sodded.

C. Final stabilization will be determined during the warm season (April 1st thru September 31st)

3.05 TRANSFER OF FINAL STABILIZATION TURF ESTABLISHMENT TO DFW AFTER SUBSTANTIAL COMPLETION OF CONSTRUCTION PROJECT

A. Due to seasonal delays in achieving final stabilization of turf, ongoing maintenance of newly planted turf and/or establishment of warm season turf may be transferred to DFW ETAM contingent upon the following.
1. Contractor may request transfer as defined below.

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2. The contractor has complied with all requirements of Section: 32 92 19 Seeding and Sodding.
3. The newly planted turf must be healthy and growing satisfactorily at the time of transfer.
4. Temporary irrigation systems will be left in place for use by DFW until final establishment. These systems remain the property of the contractor, but DFW will operate and maintain this equipment. At the final establishment, the contractor may pick up the equipment or release it to DFW.
5. Irrigation by contractor water truck will be continued by DFW using a DFW water truck.
6. Provided the contractor complied with all sod and turf planting specifications, DFW will replant areas which fail to establish in a timely manner. DFW will mow, provide weed control, and fertilization as required to bring newly planted areas to final stabilization.
7. Sodded and seeded turf is under warranty for one year after substantial completion unless failure was caused by inadequate maintenance by DFW.
8. Seed and Sod inspections noted above must be completed and approved.
   a. Section 3.2 d & 3.3 D, Seeding and/or Sodding must be placed and within specification detailed above.
9. Final approval of this transfer will be completed after a site visit is scheduled with ETAM & EAD representatives after installation.
10. After final inspection, the Board may assume responsibility for SWPP closeout.

3.06 MEASUREMENT AND PAYMENT

A. Measurement

1. The area to be seeded/sodded is measured by the square yard/acre as indicated by the limits of disturbance on the design plans. Any additional area of disturbance will be seeded/sodded by the Contractor at no additional cost to the Owner.
2. Seed is measured by the square yard or by the acre.
3. Sod is measured by the square yard in its final position.
4. Fertilizer is measured by the acre of surface area covered or by the ton (2,000 lb.) Measurement by ton will use guaranteed weight of bags or containers as shown by the manufacturer.
5. Hydro mulch or straw mulch is measured by the square yard or by the acre.
6. Tackifier is measured by the acre.
7. Soil retention blanket is measured by the square yard of surface area covered.

B. Payment

1. Unit Price Contracts
   a. The Contractor will be paid for 90% of the sod installed during the monthly estimate period based on the actual quantities installed using the unit price amount for the pay item. The remaining 10% will be paid once the owner has made final acceptance of the sodded areas. The unit price bid is full compensation for securing a source, excavation, loading, hauling, rolling, finishing, furnishing materials, equipment, labor, tools, supplies, and incidentals. Sod is under warranty for one year after final stabilization is achieved.
   b. The contractor will be paid for 75% of the seeding installed during the monthly period based on the actual quantities installed using the unit price amount for the pay item.

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The remaining 25% will be paid once the Owner has made final acceptance of the seeded areas.

c. Fertilizer is considered subsidiary to the seed and sod bid items of the contract. Work performed, materials furnished, equipment, labor, tools, and incidentals will not be paid for directly unless otherwise specified in the contract.
d. The contractor will be paid for 100% of Hydro mulch or straw mulch installed during the monthly estimate period based on the actual quantities installed using the unit price amount for the pay item.
e. Tackifier is considered subsidiary to the Hydro mulch or straw mulch bid items of the contract. Work performed, materials furnished, equipment, labor, tools, and incidentals will not be paid unless otherwise specified in the contract.
f. The Contractor will be paid for 100% of the erosion blanket installed during the monthly estimate period based on the actual quantities installed using the unit price amount for the pay item.
g. Protective barriers, mowing and other maintenance activities are considered subsidiary to the seed or sod unit price. Work performed, materials furnished, equipment, labor, tools, and incidentals will not be paid for directly unless otherwise specified in the contract.
h. 100% payment will be made for Seeding and Sod if transfer to DFW as accepted per terms in 3.05 above.

2. Lump Sum Contracts
   a. The Contractor will be paid for 90%, less applicable retainage, of the sod installed during the monthly pay application period based on the approved Schedule of Values. The remaining 10% will be paid once Final Stabilization of the sodded areas is achieved. Sod that is placed during the cool season will require an inspection in the warm season to confirm viability for final stabilization. Areas where sod has failed to thrive shall be replaced with living green sod at the contractor's expense.
   b. The Contractor will be paid for 75%, less applicable retainage, of the seeding installed during the monthly pay period based on the percentage of work installed assessed against the approved Schedule of Values pay item. The remaining 25% will be paid once final stabilization of the seeded areas is achieved.
   c. 100% payment will be made for Seeding and Sod if transfer to DFW as accepted per terms in 3.05 above.

C. Project Specific Pay Item Payment Procedures Requirements:

1. To be defined within each contract by the OAR/DOR on a project specific basis. Section 01 22 00 – Measurement and Payment shall align with the Schedule of Values (SOV) and each Pay Item shall be listed accordingly. Refer to Section 01 22 00 for specific requirements and detailed payment procedures applicable to this section.

- END OF SECTION -

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PART 1 – GENERAL

1.1 SUMMARY

A. Provide all labor, materials, and equipment for the complete installation of Work called for in the Contract Documents.

B. This section includes the minimum requirements for the installation of infrared emergency vehicle preemption systems at the DFW Airport DPS Headquarters facility.

C. Included in this section are the minimum composition requirements and installation methods for the following:

1. Infrared Detectors
2. Discriminators
3. Auxiliary Interfaces
4. Enclosures and Support Structures
5. Cabling and Terminations

1.2 DEFINITIONS AND TERMS

A. Trade association names and communications terminology are frequently abbreviated. The following acronyms or abbreviations may be referenced within this Section:

1. ANSI American National Standards Institute
2. AWG American Wire Gauge
3. DCM Design Criteria Manual
4. DFW Dallas/Fort Worth International Airport
5. EIA Electronics Industries Association
6. EVP Emergency Vehicle Preemption
7. FCC Federal Communications Commission
8. IEEE Institute of Electrical and Electronics Engineers
9. ISO International Standards Organization
10. NEMA National Electric Manufacturers Association
11. NFPA National Fire Protection Association
12. RFP Request for Proposal
13. STD Standard
14. UL Underwriters Laboratories

1.3 QUALITY ASSURANCE

A. All cable and equipment shall be installed in a neat and skillful manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner.

B. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Were

"approved equal" is stated, or a substitution is requested, equipment shall be equivalent in every way to that of the equipment specified. All substitutions are subject to the control and approval of the Owner.

C. Contractor's Qualifications:

1. Firms that are regularly engaged in the installation of traffic control systems and have five (5) years of installation experience with systems similar to that required for this project.
2. Provide references to include client names, phone numbers and a summary of project details. These references will be checked, and the clients will be asked questions related to the performance of your company.
3. Provide verification that installation personnel responsible have been professionally trained to install the products described in this Section.
4. Provide full time project manager with a minimum of ten (10) years field experience in installation of traffic control systems and infrastructures. Project manager shall be assigned for the duration of the project and shall not be replaced without written consent from the Owner.

D. Manufacturer's Qualifications:

1. Firms regularly engaged in manufacture of products of the types, ratings and capacities required for this project; whose products have been in satisfactory use in similar service for not less than five (5) years, with production capabilities per applicable NEMA standards.

E. Material and Work specified herein shall comply with the applicable requirements of:

1. NECA 1 – Standard Practice of Good Workmanship in Electrical Construction
2. ANSI/TIA-607-D – Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
3. NFPA 70 – National Electric Code
4. UL 13 – Standard for Safety for Power-Limited Circuit Cables
5. UL 444 – Standard for Safety for Communications Cable
6. DFW Airport Design Criteria Manual
7. Applicable codes and directives of authorities having jurisdiction.

F. Work:

1. The Work shall be performed in compliance with the applicable manufacturer's installation instructions, Standards, and certifications listed herein, the Contract Documents, and governing codes and regulations of the authorities having jurisdiction.
2. The drawing and specification requirements govern where they exceed Code and Regulation requirements.
3. Where requirements between governing Codes and Regulations vary, the more restrictive provision applies.
4. Nothing in the Contract Documents grants authority or permission to disregard or violate any legal requirements.

1.4 CONFLICTS

A. This installation shall be made in strict accordance with the Specifications, Drawings, any applicable codes, referenced publications and standards. In case of conflicts between the aforementioned, notify the Owner in writing prior to commencement of affected work.

1.5 PERMITS

A. The Contractor shall secure and pay for all necessary permits and fees required for the execution of this Work. Work will not start until all permit applications are approved.

1.6 SCHEDULING

A. The Contractor shall comply with all scheduling requests established by the Owner, both prior to commencing Work, and during construction. The Contractor shall provide a detailed schedule of work to be performed. This schedule shall be submitted with the bid and, if accepted, will be used to track work status.

B. Work should be scheduled not to interfere with day-to-day operations within the facility. Operations vary by area and should be given careful consideration in relation to the schedule.

C. The successful Contractor for all or any portion of the work described by this RFP package will be responsible for achieving a complete and fully functional installation on or before the contract scheduled completion date.

1.7 REQUIREMENTS

A. All references to manufacturers, model numbers and other pertinent information herein are intended to establish standards of performance and quality of construction. The Owner must approve material submittal and substitutions in writing.

B. Verification that all the components specified and installed meet the criteria specified by the respective component manufacturer, supplier and designer is the responsibility of the Contractor.

C. All installation tools, special equipment and testing apparatus required to accomplish field connections and related work as described herein shall be furnished by the Contractor at no additional cost.

D. The requirements as given in this document are to be adhered to unless revised by the Owner in writing.

E. The Owner reserves the right to waive these requirements at any time.

1.8 SUBMITTALS

A. Comply with provisions of Division 01.

B. Comply with provisions of Section 27 05 00.

C. Produce Shop Drawings for all systems, to include but not limited to, proposed placement of equipment and routing of pathway relative to other site work.

D. Provide product data for the following:

1. Product data consisting of manufacturers specifications for each type of product to be installed, all applicable certifications and elevation/plan documents supporting compliance with stated Specifications.

2. Manufacturer's certificate of acceptance of the qualifications of the installing Contractor to install, test and maintain the manufacturer's equipment.
3. Outline of administration labeling scheme for systems cabling and terminations, per ANSI/EIA/TIA-606 and DFW/DCM.
4. Proposed format of as-built documentation.

1.9 CONTRACTOR CLOSE OUT SUBMITTALS

A. Submit Closeout documentation in accordance with Division 01 of the Project Manual and any applicable supplements. The number of submittal sets required is the greater of either the requirements of Division 01 of the Project Manual, or a minimum of four (4) sets.

1. Segregate documents into separate binders containing data relevant to operational, maintenance, and warranty issues.
2. As built documentation of all systems.
3. As built documentation of equipment layout within enclosures
4. Provide wire-by-wire diagrams showing all field-installed interconnections. The wire color and identification on the diagrams shall agree with the wire and wire markers installed on the equipment.

B. Warranty and Maintenance:

1. Test Reports
2. Record Drawings

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials factory-packaged in containers or reels and handle them in accordance with manufacturer's recommendations. Store in a clean, dry space and protect products from damaging fumes and traffic. Handle materials carefully to avoid damage.

B. Storage space on the project site may be limited. Contractor shall coordinate delivery and arrange storage of materials and equipment with the Owner.

C. Components sensitive to damage in a harsh environment shall be stored off-site and delivered as needed.

D. Provide protective covering during construction to prevent damage or entrance of foreign matter.

E. The contractor is responsible for on-site security of tools, testing equipment and materials.

F. Replace at no expense to Owner, product damaged during storage, handling, or the course of construction.

1.11 PROJECT CONDITIONS

A. Verify conditions on the job site are applicable to this Work. Notify Architect in writing of discrepancies, conflicts, or omissions promptly upon discovery.

B. The Drawings diagrammatically show cabling and arrangements of equipment fitting the space available without interference. If conditions exist which make it impossible to

install Work as shown, recommend solutions and/or submit drawings to the Architect for approval, showing how the Work may be installed.

1.12 WARRANTY

A. Warrant labor and product to be free of defects and deficiencies, and to conform to the drawings and specifications as to kind, quality, function, and characteristics, following Contractor Warranty requirements defined in Division 01. Repair or replace defects occurring in labor or product within the Warranty period without charge.

B. All surplus parts and pieces from the installation shall be maintained as a spare parts inventory at the building site. Parts replaced during the warranty period shall have a warranty matching that of the original part from the date of replacement.

PART 2 – PRODUCTS

2.1 GENERAL

A. The products specified in this document do not necessarily constitute the exhaustive list of products required to complete the statement of work. Except where described in the SUMMARY subpart of this document, the contractor is responsible for providing any other parts and materials needed to deliver a complete and working system.

2.2 SYSTEMS

A. Infrared Detector

1. Provide infrared detectors at each vehicle gate.
2. The detector is to have the following capabilities:
    a. Transform optical energy detected from an approaching, vehicle-mounted infrared emitter to an electrical signal.
    b. Be of a modular design, with adjustable turrets.
    c. Be capable of being pole mounted.
    d. Have a single output.
3. Acceptable products:
    a. GTT Opticom Model 711
    b. GTT Opticom Model 721
    c. Owner approved equivalent.

B. Phase Selector

1. Provide a phase selector for each vehicle gate.
2. Phase selector shall be compatible with encoded and non-encoded emitters.
3. Shall provide user range setting.
4. Acceptable products
    a. GTT Opticom Model 762
    b. Owner approved equivalent.

C. Card Rack

1. Provide a card rack for each vehicle gate.
2. Card rack shall be designed to accept a phase selector/discriminator.
3. Rack shall be equipped with an input for an infrared detector and an output relay for a gate opener.
4. Acceptable products:
    a. GTT Opticom Model 770
    b. Owner approved equivalent.

D. Enclosure

1. Provide a pad mounted enclosure to house the card rack and related electronics and cable terminations.
2. Furnish a grounding busbar, for grounding of the cabinet and equipment.
3. Approved product combination:
    a. Hoffman manufactured part number T503020FTTXDA-MOD; 50” x 30” x 20”, 22 Rack Unit Dual-Access
    b. Hoffman® Cage Nut Package, P1032CN
    c. Hoffman® Screw Package, AS1032
    d. Hoffman® label kit, 2 units, ARULABEL
    e. Hoffman® light kit, LF120V18
    f. Hoffman® Top Solar Shield, TSS3020D
    g. Panduit RGRB19B

PART 3 – EXECUTION

3.1 PREPARATION

A. Evaluate the site to determine the optimal location of the detector(s).

1. Detectors shall be mounted 8 feet to 10 feet from grade.
2. Detectors shall be positioned behind the gate, in the interior fenced area.
3. The sight path of each detector shall be free of obstructions, such as signs, buildings, and vegetation.
4. The EVP shall activate 150 feet from the gate.

B. Coordinate with the Owner regarding the vehicle class and codes that will trigger the EVP.

3.2 INSTALLATION

A. Installation of electronics shall comply with project specifications and meet all applicable manufacturer’s recommendations, local, city and national codes.

B. The contractor shall integrate the EVP with the vehicle gate controller, such that it will override the gate operation and cause the gate to open, when triggered.

3.3 ACCEPTANCE

A. Acceptance will be withheld until the successful completion of the following:

1. Acceptance of all submittals.
2. Delivery of final documentation (including as-built documents)
3. Successful Testing.
4. Successful demonstration.

3.4 LABELING

A. The Contractor shall develop and submit for approval a labeling system consistent with that used on the DFW Airport Consolidated System.

B. All label printing will be machine generated using indelible ink ribbons or cartridges. Self-laminating labels will be used on cable jackets, appropriately sized to the OD of the cable, and affixed six inches from the termination point on each end. (All labelling and printing shall be the responsibility of the Contractor).

3.5 ASSET TAGGING

A. All equipment of greater than $2000 value, and otherwise as directed by OWNER, asset tagged in the DFW Airport Inventory System. Asset tags and inventory control sheet are to be obtained from OWNER. Signed, completed inventory control sheet detailing equipment description, location, serial number, label name, if any, and asset number assigned shall be included in as-built documents.

3.6 TEST REPORTS AND AS-BUILT DRAWINGS

A. Submit results of all test results (PDF file format and hard copy) and other required submittals to the OWNER or Owner's representative for review and final acceptance. Include schedule of installed equipment, description, locations installed, serial number and asset tag number XLS file format and hard copy).

B. The intent of this Section is to require complete drawing documentation of the EVP System for the purpose of system operation and maintenance during and after the warranty period. It is intended that the operation and maintenance manuals be exhaustive in the coverage of the system to the extent that they may be used as the sole guide to the troubleshooting, identification, and repair of defective parts.

C. The Contractor shall provide four (4) complete drawing books, and four (4) copies in CD form in PDF format of all maintenance and operation manuals on the completed system. These manuals shall include basic wiring diagrams, schematics, and functional details such that any component, wire, or piece of equipment in the system may be easily identified by going to the actual equipment and referring to this manual. It is required that everything in the system be neatly labeled and easily identifiable. Every terminal, wire, fiber, component or piece of equipment, and other such items shall have a number or letter designation. All of these identification characteristics shall be included in the maintenance and operation manuals. The Contractor shall provide one (1) set of all Drawings as reproducible, and where the Drawings are CAD generated, provide files in PDF format. Provide one (1) set of all schedules and tables in machine-readable text format.

D. Maintenance Manual Requirements: The maintenance manual requirement of this section is in addition to Shop Drawing requirements. Maintenance manuals and

drawing sets shall be compiled after system fabrication and testing and shall incorporate any changes made after Shop Drawing submittal. The maintenance manuals and drawing books shall be permanently bound in durable plastic covers.

E. Maintenance Manuals, Manufacturer's Literature: Provide manufacturer's standard literature, covering all equipment included in the system. The maintenance manuals shall contain specifications, adjustment procedures, circuit schematics, component location diagrams, and replacement parts identification. All references to equipment not supplied on this project shall be crossed out.

F. Drawing Books: All Drawings developed specifically for this project shall be reduced to 11" X 17", folded and bound with durable plastic covers. The Drawings shall be easily readable after reduction, even if this requires Drawings to be broken into multiple sheets. Under no circumstances shall text be smaller than 1/16-inch after reduction. Provide component identification and cross reference on the Drawings to allow the maintenance department to understand the function of each item (the block diagram), find the room where the device is mounted (Contract Document Plans), find its location in a rack (arrangement drawings), find how it is wired (wiring diagrams), and its detailed Specifications (vendor data sheets), and how to repair it (spare parts list). Include the following drawings as a minimum.

G. Functional Block Diagram: Provide an overall block diagram showing the major interconnections between subsystem components.

H. Arrangement Drawings: Provide Drawings showing the physical arrangement of all major system components.

I. Elevation Drawings: Provide elevation Drawings of all equipment enclosures showing the location of each component in the enclosures. Components in the enclosures shall be identified as in the functional block diagrams. Drawing shall show the routes of all cables connecting its components.

J. Wiring Diagrams: Provide wiring diagrams showing all interconnecting wiring. Wire identification on the diagrams shall agree with the wire markers installed on the equipment.

3.7 CLEANING

A. Upon completion of the installation, make all components free of any oil, grease, dust, and debris.

3.8 ACCEPTANCE

A. Review test results and inspect installation with the Owner's Authorized Representative and obtain concurrence. Concurrence does not waive the responsibility of the Contractor to correct deficiencies.

PART 4 – MEASUREMENT AND PAYMENT

4.1 ITEM 314116-1 – OPTICOM SYSTEM

A. Method of Measurement

1. This item includes the procurement, assembly, and installation of the following components from Part 2 above.

a. 2.2.A. Infrared Detector

b. 2.2.B. Phase Selector

c. 2.2.C. Card Rack

d. 2.2.D. Enclosure

B. Basis of Payment

1. Payment for item 314116-1 will be made at the contract each price installed. The price shall be full compensation for furnishing all materials and for preparation, assembly, installation, and for all labor, equipment, tools, and incidentals necessary to complete this item as accepted by the OAR.

- END OF SECTION -

Item 100
Preparing Right of Way

1. DESCRIPTION

Prepare the right of way and designated easements for construction operations by removing and disposing of all obstructions when removal of such obstructions is not specifically shown on the plans to be paid by other Items.

2. MATERIALS

Furnish materials in conformance with the plans and Specifications.

3. CONSTRUCTION

Protect designated features on the right of way and prune trees and shrubs as directed. Do not park equipment, service equipment, store materials, or disturb the root area under the branches of trees designated for preservation. Follow all local and state regulations when burning. Pile and burn brush at approved locations as directed. Spread mulched material at approved locations as directed. Handle hazardous materials in accordance with Article 6.10., "Hazardous Materials."

Clear areas shown on the plans of all obstructions, except those landscape features that are to be preserved. Such obstructions include remains of houses and other structures, foundations, floor slabs, concrete, brick, lumber, plaster, septic tank drain fields, basements, abandoned utility pipes or conduits, equipment, fences, retaining walls, and other items as specified on the plans. Remove vegetation and other landscape features not designated for preservation, curb and gutter, driveways, paved parking areas, miscellaneous stone, sidewalks, drainage structures, manholes, inlets, abandoned railroad tracks, scrap iron, and debris, whether above or below ground. Remove culverts, storm sewers, manholes, and inlets in proper sequence to maintain traffic and drainage. Removal of live utility facilities is not included in this Item.

Perform tree and brush removal and trimming in accordance with Article 752.4, "Work Methods."

Notify the Engineer in writing when items not shown on the plans and not reasonably detectable (buried with no obvious indication of presence) are encountered and required to be removed. These items will be handled in accordance with Article 4.5., "Differing Site Conditions."

Remove obstructions not designated for preservation to 2 ft. below natural ground in areas receiving embankment. Remove obstructions to 2 ft. below the excavation level in areas to be excavated. Remove obstructions to 1 ft. below natural ground in all other areas. Remove trees and stumps to 6 in. below ground level. Plug the remaining ends of abandoned underground structures over 3 in. in diameter using concrete to form a tight closure. Backfill, compact, and restore areas where obstructions have been removed unless otherwise directed. Use approved material for backfilling. Dispose of wells in accordance with Item 103, "Disposal of Wells."

Accept ownership, unless otherwise directed, and dispose of removed materials and debris at locations off the right of way in conformance with local, state, and federal requirements.

3.1. **Tree Protection**. Install tree protection for trees designated for preservation. Unless otherwise shown on the plans, install tree protection along the drip line of the trees using 4-ft. tall chain link fencing with line posts no more than 10 ft. apart. Install tree protection before beginning work.

4. MEASUREMENT

This Item will be measured by the acre; by the 100-ft. station, regardless of the width of the right of way; or by each tree removed.

Tree removal diameter will be measured in accordance with Article 752.5, "Measurement."

Tree protection will be measured by the acre of trees protected, by the foot of fencing, or by each tree protected.

5. PAYMENT

For "acre" and "station" measurement, the work performed in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Preparing Right of Way." For "each" measurement, the work performed in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Preparing Right of Way (Tree)" of the diameter specified. This price is full compensation for removal and trimming of designated trees and shrubs; removal and disposal of structures and obstructions; backfilling of holes; furnishing and placing concrete for plugs; and equipment, labor, tools, and incidentals.

Total payment of this Item will not exceed 10% of the original Contract amount until final acceptance. The remainder will be paid on the estimate after final acceptance in accordance with Article 5.12., "Final Acceptance."

5.1. **Tree Protection**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid as follows.

5.1.1. **Subsidiary Work**. The following will not be measured or paid for directly, but will be subsidiary to "Tree Protection":

- protection for Contractor project-specific locations inside and outside the right of way;
- repair to areas to be protected that are damaged by Contractor operations;
- removal and re-installation of devices and features needed for the convenience of the Contractor;
- finish grading and dressing upon removal of the protection; and
- minor adjustments, including, but not limited to, plumbing posts and re-attaching protection.

5.1.2. **Installation**. Installation will be paid for as "Tree Protection (Install)." This price is full compensation for furnishing and operating equipment and for labor, materials, tools, and incidentals.

5.1.3. **Removal**. Removal will be paid for as "Tree Protection (Remove)." This price is full compensation for furnishing and operating equipment and for proper disposal, labor, materials, tools, and incidentals.

Item 104
Removing Concrete

1. DESCRIPTION

Break, remove, and salvage or dispose of existing hydraulic cement concrete.

2. CONSTRUCTION

Remove existing hydraulic cement concrete from locations shown on the plans. Avoid damaging concrete that will remain in place. Saw-cut and remove the existing concrete to neat lines. Replace any concrete damaged by the Contractor at no expense to the Department. Accept ownership and properly dispose of broken concrete in conformance with federal, state, and local regulations unless otherwise shown on the plans.

3. MEASUREMENT

Removing concrete pavement, floors, porches, patios, riprap, medians, foundations, sidewalks, driveways, and other appurtenances will be measured by the square yard (regardless of thickness) or by the cubic yard of calculated volume, in its original position.

Removing curb, curb and gutter, and concrete traffic barrier will be measured by the foot in its original position. The removal of monolithic concrete curb or dowelled concrete curb will be included in the concrete pavement measurement.

Removing retaining walls will be measured by the square yard along the front face from the top of the wall to the top of the footing.

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., “Plans Quantity Measurement.” Additional measurements or calculations will be made if adjustments of quantities are required.

4. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Removing Concrete” of the type specified. This price is full compensation for breaking the concrete; loading, hauling, and salvaging or disposing of the material; and equipment, labor, tools, and incidentals.

Removing retaining wall footings will not be measured or paid for directly but will be subsidiary to this Item.

Item 105

Removing Treated and Untreated Base and Asphalt Pavement

1. DESCRIPTION

Break, remove, and store or dispose of existing asphalt pavement, including surface treatments, and treated or untreated base materials.

2. CONSTRUCTION

Break material retained by the Department into pieces not larger than 24 in. unless otherwise shown on the plans. Remove existing asphalt pavement before disturbing stabilized base. Avoid contamination of the asphalt materials and damage to adjacent areas. Repair material damaged by operations outside the designated locations.

Stockpile materials designated salvageable at designated sites when shown on the plans or as directed. Prepare stockpile site by removing vegetation and trash and by providing for proper drainage. Material not designated to be salvaged will become the property of the Contractor. When this material is disposed of, do so in conformance with federal, state, and local regulations.

3. MEASUREMENT

This Item will be measured by the 100-ft. station along the baseline of each roadbed, by the square yard of existing treated or untreated base and asphalt pavement in their original position, or by the cubic yard of existing treated or untreated base and asphalt pavement in their original position, as calculated by the average end area method or as shown on the plans. Square yard and cubic yard measurement will be established by the widths and depths shown on the plans and the lengths measured in the field.

4. PAYMENT

The work performed in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Removing Treated and Untreated Base and Asphalt Pavement” of the depth specified. This price is full compensation for breaking the material, loading, hauling, unloading, and stockpiling or disposing; repair to areas outside designated locations for removal; and equipment, labor, tools, and incidentals.

Item 110
Excavation

1. DESCRIPTION

Excavate areas as shown on the plans or as directed. Remove materials encountered to the lines, grades, and typical sections shown on the plans and cross-sections.

2. MATERIALS

Accept ownership of unsuitable or excess material and dispose of material in conformance with local, state, and federal regulations, at locations outside the right of way.

3. CONSTRUCTION

Maintain drainage in the excavated area to avoid damage to the roadway section. Correct any damage to the subgrade caused by weather at no additional cost to the Department.

Shape slopes to avoid loosening material below or outside the proposed grades. Remove and dispose of slides or slope failures as directed.

Excavate to the grade and sections shown on the plans. Manipulate and compact subgrade in accordance with Section 132.3.4., "Compaction Methods," unless excavation is to clean homogenous rock at final grade.

Correct unsuitable material encountered at or below subgrade as directed.

3.1. **Rock Cuts**. Use approved embankment material compacted in accordance with Section 132.3.4., "Compaction Methods," to replace undercut material at no additional cost if excavation extends below the grade shown on the plans.

3.2. **Earth Cuts**. Scarify remaining material to a depth at least 6 in. below the grade shown on the plans in areas where pavement structure will be placed. Compact subgrade in accordance with Section 132.3.4., "Compaction Methods."

3.3. **Acceptance Criteria**.

3.3.1. **Grade Tolerances.**

3.3.1.1. **Staged Construction**. Grade to within 1.25 in. in the cross-section and 1.25 in. in 16 ft. measured longitudinally.

3.3.1.2. **Turnkey Construction**. Grade to within 0.5 in. in the cross-section and 0.5 in. in 16 ft. measured longitudinally.

4. MEASUREMENT

This Item will be measured by the cubic yard in its original position as computed by the method of average end areas or as shown on the plans.

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

Limits of measurement for excavation in retaining wall areas will be as shown on the plans.

Shrinkage or swelling factors will not be considered in determining the calculated quantities.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Excavation (Roadway)," "Excavation (Channel)," "Excavation (Special)," or "Excavation (Roadway and Channel)." This price is full compensation for authorized excavation; drying; undercutting subgrade in rock cuts and reworking or replacing the undercut material; hauling; disposal of material not used elsewhere on the project; scarification and compaction; and equipment, labor, materials, tools, and incidentals.

Drying subgrade deeper than 6 in. below grade as shown on the plans will be paid for in accordance with Article 9.7., "Payment for Extra Work and Force Account Method." Excavation and replacement of unsuitable material below grade as shown on the plans will be performed and paid for in conformance with the applicable bid items. However, if Item 132, "Embankment," is not included in the Contract, payment for replacement of unsuitable material will be paid for in accordance with Article 9.7., "Payment for Extra Work and Force Account Method."

Removing, reworking, reshaping, or re-laying existing pavement structure will be paid for in conformance with the appropriate Item.

When a slide or slope failure not due to the Contractor's negligence or operation occurs, payment for removal and disposal of the slide material will be in accordance with Article 9.7., "Payment for Extra Work and Force Account Method."

Excavation in backfill areas of retaining walls will not be measured or paid for directly, but will be subsidiary to pertinent Items.

Item 132
Embankment

1. DESCRIPTION

Furnish, place, and compact materials for construction of roadways, embankments, levees, dikes, or any designated section of the roadway where additional material is required.

2. MATERIALS

Furnish approved material capable of forming a stable embankment from required excavation in the areas shown on the plans or from sources outside the right of way. Provide one or more of the following types as shown on the plans.

- **Type A**. Granular material that is free of vegetation or other objectionable material and meets the requirements shown in Table 1.

Table 1
Testing Requirements

Property	Test Method	Specification Limit
Liquid limit	Tex-104-E	≤45
Plasticity index (PI)	Tex-106-E	≤15
Bar linear shrinkage	Tex-107-E	≥2

Perform the linear shrinkage test only as indicated in Tex-104-E.

- **Type B**. Materials such as rock, loam, clay, or other approved materials.
- **Type C**. Material meeting the specification requirements shown on the plans. Type C may be further designated as Type C1, C2, etc.
- **Type D**. Material from required excavation areas shown on the plans.

Meet the requirements of the pertinent retaining wall Items for retaining wall backfill material.

3. CONSTRUCTION

Meet the requirements of Item 7, “Legal Relations and Responsibilities,” when off right of way sources are used. Notify the Engineer before opening a material source to allow for required testing. Complete preparation of the right of way in accordance with Item 100, “Preparing Right of Way,” for areas to receive embankment.

Backfill tree-stump holes or other minor excavations with approved material and tamp. Restore the ground surface, including any material disked loose or washed out, to its original slope. Compact the ground surface by sprinkling in accordance with Item 204, “Sprinkling,” and by rolling using equipment complying with Item 210, “Rolling,” when directed.

Scarify and loosen the unpaved surface areas, except rock, to a depth of at least 6 in. unless otherwise shown on the plans. Bench slopes before placing material. Begin placement of material at the toe of slopes. Do not place trees, stumps, roots, vegetation, or other objectionable material in the embankment. Simultaneously recompact scarified material with the placed embankment material. Do not exceed the layer depth specified in Section 132.3.4., “Compaction Methods.”

Construct embankments to the grade and sections shown on the plans. Construct the embankment in layers approximately parallel to the finished grade for the full width of the individual roadway cross-sections unless otherwise shown on the plans. Ensure that each section of the embankment conforms to the detailed sections or slopes. Maintain the finished section, density, and grade until the project is accepted.

3.1. **Earth Embankments**. Earth embankment is mainly composed of material other than rock. Construct embankments in successive layers, evenly distributing materials in lengths suited for sprinkling and rolling.

Obtain approval to incorporate rock and broken concrete produced by the construction project in the lower layers of the embankment. Place the rock and concrete outside the limits of the completed roadbed when the size of approved rock or broken concrete exceeds the layer thickness requirements in Section 132.3.4., "Compaction Methods." Cut and remove all exposed reinforcing steel from the broken concrete.

Move the material dumped in piles or windrows by blading or by similar methods and incorporate it into uniform layers. Featheredge or blend abutting layers of dissimilar material for at least 100 ft. to ensure there are no abrupt changes in the material. Break down clods or lumps of material.

Apply water free of industrial wastes and other objectionable matter to achieve the uniform moisture content specified for compaction.

Roll and sprinkle each embankment layer in accordance with Section 132.3.4.1., "Ordinary Compaction," when ordinary compaction is specified. Compact the layer to the required density in accordance with Section 132.3.4.2., "Density and Moisture Control," when density control is specified.

3.2. **Rock Embankments**. Rock embankment is mainly composed of rock. Construct rock embankments in successive layers for the full width of the roadway cross-section with a depth of 18 in. or less. Increase the layer depth for large rock sizes as approved. Do not exceed a depth of 2-1/2 ft. in any case. Fill voids created by the large stone matrix with smaller stones during the placement and filling operations.

Ensure the depth of the embankment layer is greater than the maximum dimension of any rock. Do not place rock greater than 2 ft. in its maximum dimension, unless otherwise approved. Construct the final layer with graded material so that the density and uniformity are in accordance with Section 132.3.4., "Compaction Methods." Break up exposed oversized material as approved.

Roll and sprinkle each embankment layer in accordance with Section 132.3.4.1., "Ordinary Compaction," when ordinary compaction is specified. Compact each layer to the required density in accordance with Section 132.3.4.2., "Density and Moisture Control," when density control is specified. Proof-roll each rock layer as directed, where density testing is not possible, in accordance with Item 216, "Proof Rolling," to ensure proper compaction.

3.3. **Embankments Adjacent to Culverts and Bridges**. Compact embankments adjacent to culverts and bridges in accordance with Item 400, "Excavation and Backfill for Structures."

3.4. **Compaction Methods**. Begin rolling longitudinally at the sides and proceed toward the center, overlapping on successive trips by at least 1/2 the width of the roller. Begin rolling at the lower side and progress toward the high side on superelevated curves. Alternate roller trips to attain slightly different lengths. Compact embankments in accordance with Section 132.3.4.1., "Ordinary Compaction," or Section 132.3.4.2., "Density and Moisture Control," as shown on the plans.

3.4.1. **Ordinary Compaction**. Use approved rolling equipment complying with Item 210, "Rolling," to compact each layer. Use specific equipment when required by the Engineer or as shown on the plans. Do not allow the loose depth of any layer to exceed 8 in., unless otherwise approved. Bring each layer to the moisture content directed before and during rolling operations. Compact each layer until there is no evidence of further consolidation. Maintain a level layer to ensure uniform compaction. Recompact and refinish the subgrade at no additional expense to the Department if the required stability or finish is lost for any reason.

3.4.2. **Density and Moisture Control**. Compact each layer to the required density using equipment complying with Item 210. Determine the maximum lift thickness based on the ability of the compacting operation and equipment to meet the required density. Do not exceed layer thickness of 16 in. loose or 12 in. compacted material unless otherwise approved. Maintain a level layer to ensure uniform compaction.

The Engineer will use Tex-114-E to determine the maximum dry density (D_a) and optimum moisture content (W_{opt}). Meet the requirements for field density and moisture content shown in Table 2 unless otherwise shown on the plans.

Table 2
Field Density Control Requirements

Description	Density	Moisture Content
	Tex-115-E	
PI ≤15	≥98% D_a	–
15 <PI ≤35	≥98% D_a and ≤102% D_a	≥$W_{opt.}$
PI> 35	≥ 95%D_a and ≤100% D_a	≥$W_{opt.}$

Each layer is subject to testing by the Engineer for density and moisture content. Each layer must be brought to the moisture content necessary to obtain the required density and placed in a manner to ensure uniform compaction over the entire layer. The density and moisture contents for the descriptions shown in Table 2 are illustrated in the Moisture-Density Curve of Tex-114-E.

Provide the Engineer with the beginning and ending station numbers of the area completed for testing. The Engineer will determine roadway density and moisture content of completed sections in accordance with Tex-115-E, Part I. The Engineer will determine random locations for testing in accordance with Tex-115-E, Part IV. When the density is less than the required density shown in Table 2, the Engineer may perform additional testing to determine the extent of the area to correct.

Remove small areas of the layer to allow for density tests as required. Replace the removed material and recompact at no additional expense to the Department. Proof-roll in accordance with Item 216, when shown on the plans or as directed. Correct soft spots as directed.

3.5. **Maintenance of Moisture and Reworking**. Maintain the density and moisture content once all requirements shown in Table 2 are met. Maintain the moisture content no lower than 4% below optimum for soils with a PI greater than 15. Rework the material to obtain the specified compaction when the material loses the required stability, density, moisture, or finish. Alter the compaction methods and procedures on subsequent work to obtain specified density as directed.

3.6. **Acceptance Criteria**.

3.6.1. **Grade Tolerances**.

3.6.1.1. **Staged Construction**. Grade to within 1.25 in. in the cross-section and 1.25 in. in 16 ft. measured longitudinally.

3.6.1.2. **Turnkey Construction**. Grade to within 0.5 in. in the cross-section and 0.5 in. in 16 ft. measured longitudinally.

3.6.2. **Gradation Tolerances**. Ensure no more than one of the five most recent gradation tests is outside the specified limits on any individual sieve by more than 5% when gradation requirements are shown on the plans.

3.6.3. **Density Tolerances**. Ensure no more than one of the five most recent density tests for compaction work is outside the specified density limits and no test is outside the limits by more than 3 pcf.

3.6.4. **Plasticity Tolerances**. Ensure no more than one of the five most recent PI tests for material is outside the specified limit by more than 2 points.

4. MEASUREMENT

Shrinkage or swell factors are the Contractor's responsibility. When shown on the plans, factors are for informational purposes only.

Measurement of retaining wall backfill in embankment areas will be paid for as embankment unless otherwise shown on the plans. Limits of measurement for embankment in retaining wall areas are shown on the plans.

Embankment will be measured by the cubic yard. Measurement will be further defined for payment as follows.

4.1. **Final**. The cubic yard will be measured in its final position using the average end area method or as shown on the plans. The volume is computed between the original ground surface or the surface upon which the embankment is to be constructed and the lines, grades, and slopes of the embankment. In areas of salvaged topsoil, payment for embankment will be made in accordance with Item 160, "Topsoil." Shrinkage or swell factors will not be considered in determining the calculated quantities.

When measured by the cubic yard in its final position, this is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

4.2. **Original**. The cubic yard will be measured in its original and natural position using the average end area method or as shown on the plans.

4.3. **Vehicle**. The cubic yard will be measured in vehicles at the point of delivery.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Embankment (Final)," "Embankment (Original)," or "Embankment (Vehicle)" of the compaction method and type specified. This price is full compensation for furnishing embankment; hauling; placing, compacting, finishing, and reworking; disposal of waste material; and equipment, labor, tools, and incidentals.

When proof rolling is directed, it will be paid for in accordance with Item 216.

All sprinkling and rolling, except proof rolling, will not be paid for directly, but will be subsidiary to this Item, unless otherwise shown on the plans.

In fill sections, excavation and replacement of unsuitable material below existing elevations will be performed and paid for in conformance with the applicable bid items. However, if Item 110, "Excavation," is not included in the Contract, payment for replacement of unsuitable material will be paid for in accordance with Article 9.7., "Payment for Extra Work and Force Account Method."

Where subgrade is constructed under this Contract, correction of soft spots in the subgrade will be at the Contractor's expense. Where subgrade is not constructed under this Contract, correction of soft spots in the subgrade will be paid for in accordance with Article 9.7., "Payment for Extra Work and Force Account Method."

When rework, removal, or scarification is required for existing pavement structure that will remain, it will be measured and paid for as shown on the plans for the appropriate type.

Item 134
Backfilling Pavement Edges

1. DESCRIPTION

Backfill pavement edges in conformance with the typical sections shown on the plans.

2. MATERIALS

2.1. **Backfill Materials**. Use backfill material capable of sustaining vegetation unless otherwise specified on the plans. Furnish backfill material of one of the following types.

2.1.1. **Type A.** Backfill secured from a source outside the right of way and in accordance with the requirements as shown on the plans.

2.1.2. **Type B**. Backfill secured from within the existing right of way as shown on the plans or as directed.

2.1.3. **Type C**. Mulch sodding backfill secured from an approved source in accordance with Section 162.2.2., "Mulch Sod."

2.2. **Emulsified Asphalt**. Furnish erosion control material in accordance with Article 300.4., "Construction," or as shown on the plans. Furnish material meeting the requirements of Item 300, "Asphalts, Oils, and Emulsions."

2.3. **Fertilizer**. Furnish fertilizer in accordance with Article 166.2., "Materials," if specified on the plans.

2.4. **Water**. Furnish water required for proper compaction, promotion of plant growth, or emulsion dilution in accordance with Article 168.2., "Materials."

3. CONSTRUCTION

Haul the backfill material to the required location before placing the finish surface course unless directed otherwise. Spread, compact, and shape the backfill material in conformance with the typical sections after placing the finish surface course. Do not drag, push, or scrape material across completed pavement.

3.1. **Type A and Type B Backfill**. Bring the backfill material to the approved moisture content. Shape to the lines and grades shown on the plans and compact as directed. Blade the roadway side-slopes to a smooth surface after compacting the backfill.

3.2. **Type C Backfill**. Place mulch sod in a uniform windrow and keep moist as directed. Cultivate the area to receive mulch sod to a depth of 4 in. Blade and shape the mulch sod across the area in varying depths as shown on the typical sections to produce a smooth and uniform slope. Roll with a light roller or other suitable equipment. Moisten to the maximum depth of the backfill, after applying fertilizer, as directed.

3.3. **Fertilizer**. Distribute fertilizer uniformly in accordance with Article 166.3., "Construction," after final finishing of the backfill material when fertilizer is specified on the plans. Moisten to a depth of 4 in. or to the maximum depth of the backfill, whichever is less, after applying fertilizer.

3.4. **Emulsified Asphalt**. Apply the emulsified asphalt in accordance with Item 314, "Emulsified Asphalt Treatment," after backfill material is placed as shown on the plans. Evenly distribute at the rate selected shown on the plans.

4. MEASUREMENT

This Item will be measured by the 100-ft. station along the baseline of each roadbed, the foot along the pavement edge, or the cubic yard in vehicles of uniform capacity at the point of delivery.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Backfill" of the type specified. This price is full compensation for furnishing the emulsified asphalt, water, fertilizer, and backfill material, and for equipment, labor, materials, tools, and incidentals.

Item 161
Compost

1. DESCRIPTION

Furnish and place compost as shown on the plans.

2. MATERIALS

Furnish compost that has been produced by aerobic (biological) decomposition of organic matter and meets the requirements shown in Table 1. Compost feedstock may include, but is not limited to, leaves and yard trimmings, biosolids, food scraps, food-processing residuals, manure or other agricultural residuals, forest residues, bark, and paper. Ensure compost and wood chips do not contain any visible refuse, other physical contaminants, or any substance considered harmful to plant growth. Do not use materials that have been treated with chemical preservatives as a compost feedstock or as wood chips. Do not use mixed municipal solid waste compost. Provide compost in accordance with 40 CFR 503 for Class A biosolids and TCEQ health and safety regulations as defined in the TAC, Chapter 332, including the time and temperature standards in Subchapter B, Part 23. Meet the requirements of the United States Composting Council (USCC) Seal of Testing Assurance (STA) program.

Before delivery of the compost, provide quality control documentation that includes the following:

- the feedstock by percentage in the final compost product,
- a statement that the compost meets federal and state health and safety regulations,
- a statement that the composting process has met time and temperature requirements,
- a copy of the producer's STA certification, and
- a copy of the lab analysis, performed by an STA-certified lab, verifying that the compost meets the requirements shown in Table 1.

Provide a copy of the current TCEQ compliance statement signed by the facility manager when furnishing biosolids compost.

Table 1
Physical Requirements for Compost

Property	Test Method	Requirement
Particle Size	TMECC[1] 02.02-B, "Sample Sieving for Aggregate Size Classification"	95% passing 5/8" 70% passing 3/8"
Heavy Metals Content	TMECC 04.06, "Heavy Metals and Hazardous Elements": 04.06-As, Arsenic 04.06-Cd, Cadmium 04.06-Cu, Copper 04.06-Pb, Lead 04.06-Hg, Mercury 04.06-Mo, Molybdenum 04.06-Ni, Nickel 04.06-Se, Selenium 04.06-Zn, Zinc	Pass
Salinity	TMECC 04.10-A, "1:5 Slurry Method, Mass Basis"	5.0 dS/m Max[2]
pH	TMECC 04.11-A, "1:5 Slurry pH"	5.5–8.5
Maturity	TMECC 05.05-A, "% Emergence and Relative Seedling Vigor"	>80%
Organic Matter Content	TMECC 05.07-A, "Loss-On-Ignition Organic Matter Method"	25–65% (dry mass)
Stability	TMECC 05.08-B, "Carbon Dioxide Evolution Rate"	≤8
Fecal Coliform	TMECC 07.01-B, "Fecal Coliforms"	1,000 MPN/g Max

1. *Test Methods for the Examination of Composting and Compost,* published by the United States Department of Agriculture and USCC.
2. A soluble salt content up to 10.0 dS/m for compost used in compost-manufactured topsoil will be acceptable.

Maintain compost in designated stockpiles at the producer's site. The Department reserves the right to sample compost at the jobsite. Material may be tested to verify compliance with this Specification by an STA-certified laboratory. Make payment to the STA-certified laboratory approved by the Department. Submit laboratory invoices for passing tests to the Department for reimbursement. Maintain a complete record of all test reports for the previous and current calendar years.

2.1. **Compost Manufactured Topsoil (CMT)**. Use CMT consisting of 75% topsoil blended with 25% compost measured by volume. Use topsoil in accordance with Article 160.2., "Materials."

2.2. **Erosion Control Compost (ECC)**. Use ECC consisting of 50% untreated wood chips blended with 50% compost measured by volume. Use wood chips less than or equal to 5 in. in length with 95% passing a 2-in. screen and less than 30% passing a 1-in. screen.

2.3. **General Use Compost (GUC)**. Use GUC consisting of 100% compost.

3. CONSTRUCTION

Prepare the types of compost for use on the project, and stockpile at the jobsite.

3.1. **Compost Manufactured Topsoil (CMT)**. After excavation and embankment work is complete, remove and dispose of objectionable material from the topsoil before blending. Use equipment capable of blending CMT uniformly to the full depth as specified. Roll the CMT using a light corrugated drum.

3.2. **Erosion Control Compost (ECC)**. Use only on slopes 3:1 or flatter. Apply a 2-in. uniform layer after excavation and embankment work is complete unless otherwise shown on the plans or directed. Use a light roller or other suitable equipment when rolling is specified.

3.3. **General Use Compost (GUC)**. Apply in a uniform layer as a top dressing on established vegetation to the depth shown on the plans. Do not bury existing vegetation. Apply GUC as a backfill ingredient, in a planting soil mixture, for planting bed preparation, or as mulch, when shown on the plans.

4. MEASUREMENT

This Item will be measured by the 100-ft. station along the baseline of each roadbed, by the square yard, or by the cubic yard in vehicles at the point of delivery.

For ECC cubic yard measurement, the quantity will be the composite material, compost and topsoil or wood chips.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Compost Manufactured Topsoil," "Erosion Control Compost," and "General Use Compost" as follows.

- For measurement by the station and square yard, payment will be for the depth specified.
- For measurement by the cubic yard, payment will be made for material measured in vehicles.

This price is full compensation for loading, hauling, stockpiling, blending, placing, rolling, sprinkling, equipment, labor, materials (including topsoil for CMT and wood chips for ECC), tools, and incidentals. Costs associated with passing quality assurance testing will be paid for in accordance with Article 9.7., "Payment for Extra Work and Force Account Method," at invoice price with no markups.

Item 162
Sodding for Erosion Control

1. DESCRIPTION

Provide and install grass sod as shown on the plans or as directed.

2. MATERIALS

Use live, growing grass sod of the type specified on the plans. Use grass sod with a healthy root system and dense matted roots throughout the soil of the sod for a minimum thickness of 1 in. Do not use sod from areas where the grass is thinned out. Keep sod material moist from the time it is dug until it is planted. Grass sod with dried roots is unacceptable.

2.1. **Block Sod**. Use block, rolled, or solid sod free of noxious weeds, Johnson grass, other grasses, or any matter deleterious to the growth and subsistence of the sod.

2.2. **Mulch Sod**. Use mulch sod from an approved source, free of noxious weeds, Johnson grass, other grasses, or any matter deleterious to the growth and subsistence of the sod.

2.3. **Fertilizer**. Furnish fertilizer in accordance with Article 166.2., "Materials."

2.4. **Water**. Furnish water in accordance with Article 168.2., "Materials."

2.5. **Mulch**. Use straw mulch consisting of oat, wheat, or rice straw or hay mulch of either Bermudagrass or prairie grasses. Use straw or hay mulch free of Johnson grass and other noxious and foreign materials. Keep the mulch dry and do not use molded or rotted material.

2.6. **Tacking Methods**. Use a tacking agent applied in conformance with the manufacturer's recommendations or by a crimping method on all straw or hay mulch operations. Use tacking agents as approved or as specified on the plans.

3. CONSTRUCTION

Scarify the area to a depth of 4 in. before placing the sod. Plant the sod specified and mulch, if required, after the area has been completed to lines and grades as shown on the plans. Apply fertilizer uniformly over the entire area in accordance with Article 166.3., "Construction," and water in accordance with Article 168.3., "Construction." Plant between the average date of the last freeze in the spring and 6 weeks before the average date for the first freeze in the fall in accordance with the *Texas Almanac* for the project area.

3.1. **Sodding Types**.

3.1.1. **Spot Sodding**. Use only Bermudagrass sod. Create furrows parallel to the roadway, approximately 5 in. deep and on 18-in. centers. Sod a continuous row not less than 3 in. wide in the two furrows adjacent to the roadway. Place 3-in. squares of sod on 15-in. centers in the remaining furrows. Place sod so that the root system will be completely covered by the soil. Firm all sides of the sod with the soil without covering the sod with soil.

3.1.2. **Block Sodding**. Place sod over the prepared area. Roll or tamp the sodded area to form a thoroughly compacted, solid mat filling all voids in the sodded area with additional sod. Trim and remove all visible netting and backing materials. Keep sod along edges of curbs, driveways, and walkways trimmed until acceptance.

3.1.3. **Mulch Sodding**. Mow sod source to no shorter than 4 in., and rake and remove cuttings. Disk the sod in two directions, cutting the sod to a minimum of 4 in. Excavate the sod material to a depth of no more than 6 in. Keep excavated material moist, or it will be rejected. Distribute the mulch sod uniformly over the area to a depth of 6 in. loose, unless otherwise shown on the plans, and roll using a light roller or other suitable equipment.

Add or reshape the mulch sod to meet the requirements of Section 162.3.2., "Finishing."

3.2. **Finishing**. Smooth and shape the area after planting to conform to the desired cross-sections. Spread any excess soil uniformly over adjacent areas or dispose of the excess soil as directed.

3.3. **Straw or Hay Mulch**. Apply straw or hay mulch for "Spot Sodding" and "Mulch Sodding" uniformly over the area as shown on the plans. Apply straw or hay mulch in accordance with Section 164.3.6., "Straw or Hay Mulching." Apply tack in accordance with Section 162.2.6., "Tacking Methods."

4. MEASUREMENT

"Spot Sodding," "Block Sodding," and "Straw or Hay Mulch" will be measured by the square yard in its final position. "Mulch Sodding" will be measured by the square yard in its final position or by the cubic yard in vehicles as delivered to the planting site.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Spot Sodding," "Block Sodding," "Straw or Hay Mulch," or "Mulch Sodding." This price is full compensation for securing a source, excavation, loading, hauling, placing, rolling, finishing, furnishing materials, equipment, labor, tools, supplies, and incidentals.

Fertilizer will not be paid for directly but will be subsidiary to this Item.

Water for irrigating the sodded area, when specified, will be paid for in accordance with Item 168, "Vegetative Watering." Water for maintaining and preparing the sod before planting will not be paid for directly but will be subsidiary to this Item.

Item 168
Vegetative Watering

1. DESCRIPTION

Provide and distribute water to promote growth of vegetation as directed.

2. MATERIALS

Use water that is clean and free of industrial wastes and other substances harmful to the growth of vegetation.

3. CONSTRUCTION

Apply water when directed. Furnish and operate equipment to distribute water at a uniform and controllable rate. Ensure that watering does not erode soil or plantings. Apply water in the required quantity where shown on the plans or as directed.

4. MEASUREMENT

This Item will be measured by the 1,000 gal. as applied.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Vegetative Watering." This price is full compensation for furnishing and operating watering equipment and measuring devices and for furnishing and applying water, including hauling, equipment, labor, and incidentals.

Item 170
Irrigation System

1. DESCRIPTION

Furnish and install an irrigation system as shown on the plans or as directed.

2. MATERIALS

Unless otherwise shown on the plans, use materials that meet the following:

2.1. **Irrigation Pipe**. Use polyvinyl chloride (PVC) pipe meeting ASTM D2241, SDR 13.5, SDR 17, SDR 21; or ASTM D1785, Schedule 40.

2.2. **Fittings**. Furnish fittings as shown on the plans. PVC fittings must be in accordance with ASTM D2466.

2.3. **Encasement Pipe**. Use PVC pipe in accordance with ASTM D1785, Schedule 40, with an inside diameter at least 1 in. larger than the outside diameter of the irrigation pipe, unless otherwise shown on the plans.

2.4. **Low-Voltage Wire**. Use minimum 14-gauge UL-approved wire for direct burial.

2.5. **Bentonite Slurry**. Use a viscous mixture of commercial bentonite and fresh water containing 2–8% bentonite by weight.

2.6. **Accessories**. Use valves, sprinkler heads, and controllers that meet the requirements shown on the plans. Use backflow preventers in conformance with the controlling water utility authority.

2.7. **Electrical Service**. Use materials meeting the requirements of Section 170.3.2., “Electrical Service,” for installations requiring over 100 V.

3. CONSTRUCTION

Perform irrigation system work under the supervision of a person possessing an irrigator’s license issued by TCEQ. Provide documentation of this license. Follow the codes of the utility service owner for irrigation system design, water and electrical connection, and service.

Coordinate irrigation system installation with plant installation, when plant installation is specified, to ensure that watering requirements are met. Prevent damage to vegetation, slopes, utilities, structures, and other amenities. Repair any damage within the right of way caused by the Contractor. Perform the following activities as required.

3.1. **Design**. Provide an irrigation system designed by an irrigator licensed by TCEQ. Provide a system as shown on the plans and in conformance with utility service owner and TCEQ requirements.

3.2. **Electrical Service**. Construct installations requiring more than 100V as shown on the plans and in accordance with the following.

- Item 618, “Conduit”
- Item 620, “Electrical Conductors”
- Special Specification, “Duct Cable”
- Item 624, “Ground Boxes”
- Item 628, “Electrical Services.”

3.3. **Water Service**. Construct and maintain installations shown on the plans and in conformance with the utility service owner requirements.

3.4. **Excavation and Trenching**. Excavate and trench deep enough to provide for at least 12 in. of soil cover for all lines, or as shown on the plans. Use common trenches for irrigation lines and wire runs where feasible. Protect trenches and boring pits less than 5 ft. deep using approved methods. Protect trenches and boring pits 5 ft. deep or deeper in accordance with Item 402, "Trench Excavation Protection," and Item 403, "Temporary Special Shoring."

3.5. **Boring**. Bore at the locations shown on the plans or as directed. Avoid weakening or damaging roadways or other facilities. Bore the lengths in one direction only. Maintain horizontal and vertical alignment to an accuracy of 1 in. in 10 ft. Use water or other approved fluids for boring operations only to lubricate cuttings.

Bentonite slurry may be used in unconsolidated soil formations to consolidate cuttings for the bit, seal the walls of the hole, and furnish lubrication for subsequent removal of cuttings and installation of the pipe immediately thereafter.

3.6. **Water Jetting**. Use water jetting only when shown on the plans or approved in writing. Water jet the lengths in one direction only. Cease operations and complete all necessary work by boring when jetting operations fail to produce a smooth stable hole.

3.7. **Encasement**. Provide at least 12 in. of cover over encasement pipe. Cover is measured to the top of the subgrade for roadways and paved areas and to the bottom of the structure for sidewalks, riprap, or non-load bearing slabs.

3.8. **Pipe and Valve Assembly**. Assemble pipe and fittings as recommended by the manufacturers. Clean pipe and fittings of dust, dirt, and moisture before assembly. Make connections between plastic pipe and metal valves with threaded fittings and plastic adapters. Install backflow preventers as required by ordinances of the controlling water utility authority. Install pipe, valves, and valve boxes at least 12 in. from sidewalks, buildings, walls, and other objects.

3.9. **Sprinkler Heads and Drip Tubing**. Install sprinkler heads and drip tubing in conformance with the manufacturer's recommendations.

3.10. **Controller**. Install controllers in conformance with the manufacturer's recommendations.

3.11. **Low-Voltage Wire**. Install wire in trenches below the pipe or in a minimum 1-in. PVC pipe with at least 12 in. of cover over its entire run. Install wire in continuous lengths. Splice wire, if required, in valve boxes using waterproof materials.

3.12. **Closing and Flushing of PVC Pipe**. Cap or plug pipe after installation to prevent entry of foreign materials that would obstruct the flow of water. Leave caps or plugs in place until removal is necessary for completion of the installation. Thoroughly flush all water lines.

3.13. **Hydrostatic Tests**. Notify the Engineer in writing at least 48 hr. before testing. Center-load all pipe with enough backfill to prevent arching or slipping while under pressure. After all welded joints have cured for at least 24 hr., test the main lines from the meter to the valves, with all valves closed, for at least 2 consecutive hours by applying a continuous and static minimum 80-psi water pressure. Repair leaks if necessary, and retest. Maintain the lines under static pressure for 24 hr. without leaks before final approval.

3.14. **Backfill and Compaction**. Backfill trenches and other excavations with soil free of objectionable material after the irrigation system is fully operational, all tests and inspections have been performed, and the results are approved. Backfill and compact in 8-in. layers. Smooth and shape disturbed soil to final grade.

3.15. **Performance Period**. Operate and maintain each system for 30 days after plant installation is complete. Repair and maintain in accordance with Section 193.3.6., "Irrigation System Operation and Maintenance." This period will extend until repairs are completed.

3.16. **Operation**. Begin operation of each system after plant installation has begun. Operate the system until work is completed on the project. Inspect the system for proper operation, damage, and leaks every 3 mo. Adjust the irrigation schedule during inspection to provide proper soil moisture. Shut down the system and notify the Department if the system requires repairs.

4. MEASUREMENT

This Item will be measured by the lump sum or by each complete system.

5. PAYMENT

For "lump sum" measurement, the work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Irrigation System" and "Irrigation System Design." For "each" measurement, the work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Irrigation System" of the design specified. This price is full compensation for furnishing and installing all components; flushing and testing water lines; furnishing and operating equipment; and maintenance, repairs, design, labor, tools, and incidentals.

Protection methods for excavations 5 ft. deep or deeper will be measured and paid for as required under Item 402 or Item 403.

Water service work required will not be paid for directly but will be subsidiary to pertinent Items. This includes all fees, testing, certifications, reoccurring test or certifications, permits, utility service owner inspections, connection or meter installation charges, and other costs; making arrangements with the utility service owner for all work, testing, certifications, and materials provided by the utility service owner; furnishing, installing, and connecting all components, including lines and service supports; and materials, equipment, labor, tools, and incidentals. Applications for a utility service must designate the Department as the service owner, unless otherwise shown on the plans.

Water service costs for utility-owned service line extensions and consumption charges will be paid for by the Department. The Department will reimburse the Contractor the amount billed by the utility service owner, and an additional 5% of the invoice cost will be paid for labor, equipment, administrative costs, superintendence, and profit.

Electrical work, fees, and power consumption will be measured and paid for in accordance with Item 628.

Payment for "Irrigation System" will be executed in the following manner.

5.1. **Initial Payment**. When the installation is completed, 95% of the unit price bid for each system will be paid.

5.2. **Final Payment**. When performance period of the system is completed, the remaining portion of the unit price bid for the system will be paid.

Repair or replace system parts damaged by the Contractor's operations at the Contractor's expense. Upon completion of performance period and when Item 193, "Landscape Establishment," is not included, repair or replacement of system parts not damaged by the Contractor's operations will be paid for in accordance with Article 9.7., "Payment for Extra Work and Force Account Method."

Item 193
Landscape Establishment

1. DESCRIPTION

Establish landscape plantings and maintain landscaped areas at designated locations. If used with Item 192, "Landscape Planting," begin this Item after the final payment is approved in accordance with Section 192.5.4., "Final Payment."

2. MATERIALS

Use materials in accordance with the following unless otherwise shown on the plans:

- **Fertilizer**. Use fertilizer in accordance with Article 166.2., "Materials";
- **Mulch**. Use mulch in accordance with Article 192.2., "Materials";
- **Water**. Use water in accordance with Article 168.2., "Materials";
- **Herbicide**. Use herbicide in accordance with Article 731.2., "Materials";
- replacement plants as originally installed;
- pesticides conforming to the requirements of Section 193.3.1., "Plant Maintenance;"
- plant supports of the same type as originally installed;
- irrigation system replacement parts of the same type and manufacturer as originally installed; and
- other materials associated with landscape planting that meet the requirements shown on the plans.

3. WORK METHODS

Inspect the site at least every 2 weeks and perform the required maintenance when "Plant Maintenance" or "Irrigation System Operation and Maintenance" are measured by the month. Perform the following maintenance activities and conform to requirements shown on the plans.

3.1. **Plant Maintenance**. Maintain vegetation within the site in a healthy and vigorous growing condition. Apply pesticides, when required, under the supervision of a person possessing a license in the appropriate use category issued by the Texas Department of Agriculture. Provide documentation of this license and obtain approval of the pesticides before applications. Ensure pesticide applications conform to label directions and all pertinent laws and regulations.

3.1.1. **Pruning**. Prune as shown on the plans and in accordance with Section 192.3.10., "Pruning." Remove sucker-growth on trunks of trees.

3.1.2. **Insect, Disease, and Animal Control**. Notify the Engineer in writing of problems with insects, diseases, or animals as such problems arise. Treat the plants or planted areas as directed.

3.1.3. **Fertilization**. Apply fertilizer uniformly to all plants designated to receive fertilizer.

3.1.4. **Mulching, Plant Basin, and Plant Bed Maintenance**. Physically remove or apply herbicide to weeds and grasses within plant basins and plant beds before placing additional mulch. Apply and maintain mulch at a depth of 2 in. Maintain plant basins, loose aggregate areas, and plant beds free of weeds and grasses, except those that have been treated with herbicides may remain in place until removal is directed. Reshape plant basins and plant beds as necessary to conform to plan details.

3.1.5. **Mowing, Trimming, and Edging**. Remove and dispose of litter within the designated areas before mowing. Mow and trim grassed areas at the designated height and frequency. Edge where required. Do not use nylon

cord trimmers inside plant basins or inside beds containing plant material. Trim vegetation and remove debris from curbs, sidewalks, and other hardscape features.

3.1.6. **Plant Supports**. Replace, repair, and adjust supports to meet the requirements of the plans and in accordance with Section 192.3.11., "Plant Support." Adjust staking and guying to prevent girdling of plant trunks. Remove or dispose of support material.

3.1.7. **Tree Truck Protection**. Maintain tree trunk protection guards. Replace damaged guards.

3.2. **Plant Replacement**. Remove plants selected by the Engineer and replace with plants of the original species, size, and characteristics or with approved substitutes, if required on the plans. Replace plants that have been damaged or killed due to the actions or negligence of the Contractor at no additional cost to the Department. Replace plants within the next scheduled work period following notification to begin replacement unless otherwise directed. Backfill in conformance with the plans or as directed.

3.3. **Watering**. Apply water at the designated rate and frequency to plants or planting areas not serviced by an existing irrigation system. Apply water as directed, adjusting rate and frequency to provide adequate moisture to plant material.

3.4. **Litter Removal.** Remove litter and debris within the worksite at least every 15 days or as shown on the plans. Dispose of litter from the right of way in accordance with Item 734, "Litter Removal."

3.5. **Landscape Treatments**. Perform landscape treatments using methods and materials described in the plans.

3.6. **Irrigation System Operation and Maintenance**. Repair and maintain the system under the supervision of a person possessing an irrigator's license issued by TCEQ and provide documentation of this license. Verify and adhere to all local, state, and federal regulations. Coordinate and obtain required backflow preventer testing at no cost to the Department. Operate the system using water provided by the Department unless otherwise shown on the plans. Ensure that all zones are functioning properly and providing adequate moisture to plant material using an approved watering schedule. Winterize the system, when required, to prevent freeze damage in locations where temperatures fall below 32°F. Provide plant irrigation by an approved alternate method at no cost to the Department if the system fails due to the Contractor's actions or neglect.

4. MEASUREMENT

"Landscape Establishment" will be measured by the month or by the cycle. "Plant Replacement" will be measured by each plant. "Vegetative Watering" will be measured by the 1,000 gal. (TGL) of water as applied. "Landscape Treatments" will be measured by each treatment or by the cycle. "Irrigation System Operation and Maintenance" will be measured by the month.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Landscape Establishment," "Plant Replacement" of the size specified, "Plant Replacement" of the size and type specified, "Plant Replacement" of the group specified, "Vegetative Watering," "Landscape Treatment" or "Landscape Treatment" of the type specified, and "Irrigation System Operation and Maintenance." This price is full compensation for furnishing and operating equipment and for litter removal, mowing, trimming, edging, pruning, fertilizer, herbicide, pesticides, tree trunk protection, plant supports, labor, materials, tools, and incidentals. Plant replacement needed due to Contractor negligence will be at no additional cost to the Department.

Costs for utility-owned water line consumption charges will be paid for by the Department. The Department will reimburse the Contractor the amount billed by the utility, and an additional 5% of the invoice cost will be paid for labor, equipment, administrative costs, superintendence, and profit.

Item 204
Sprinkling

1. DESCRIPTION

Apply water for dust control, earthwork, or base construction.

2. MATERIALS

Furnish water free of industrial wastes and other objectionable matter.

3. EQUIPMENT

Use sprinklers and spray bars equipped with positive and rapidly working cut-off valves.

4. CONSTRUCTION

Apply water at a uniform rate and in the required quantity, or as directed.

5. MEASUREMENT

This Item will be measured by the 1,000 gal. (TGL) of water as applied.

6. PAYMENT

Unless sprinkling is specified as a pay item, the work performed and materials furnished in accordance with this Item will not be measured or paid for directly, but will be subsidiary to pertinent Items.

When sprinkling is specified on the plans as a pay item, the work performed and water furnished will be paid for at the unit price bid for “Sprinkling (Base),” “Sprinkling (Earthwork),” or “Sprinkling (Dust Control).” This price is full compensation for furnishing and applying water; furnishing and operating sprinklers and measuring devices; and hauling, equipment, labor, fuel, materials, tools, and incidentals.

Item 216
Proof Rolling

1. DESCRIPTION

Proof-roll earthwork, base, or both to locate unstable areas.

2. EQUIPMENT

2.1. **Specified Equipment**. Furnish rollers that weigh at least 25 ton when loaded. The maximum acceptable load is 50 ton. Provide rollers that meet the requirements of Section 210.2.4., "Pneumatic Tire Rollers."

2.2. **Alternative Equipment**. The Contractor may use alternate compaction equipment that produces results equivalent to the specified equipment in the same period of time as approved. Discontinue the use of the alternative equipment and furnish the specified equipment if the desired results are not achieved.

3. CONSTRUCTION

Perform proof rolling as directed. Adjust the load and tire inflation pressures within the range of the manufacturer's charts or tabulations, as directed. Make at least two coverages with the proof roller. Offset each trip of the roller by at most one tire width. Operate rollers at a speed between 2 and 6 mph, as directed. Correct unstable or nonuniform areas, if found, in conformance with the applicable Item.

4. MEASUREMENT

Rolling will be measured by the hour operated on surfaces being tested.

5. PAYMENT

The work performed and equipment furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Proof Rolling." This price is full compensation for furnishing and operating equipment and for labor, materials, tools, and incidentals.

Item 247
Flexible Base

1. DESCRIPTION

Construct a foundation course composed of flexible base.

2. MATERIALS

Furnish uncontaminated materials of uniform quality that meet the requirements of the plans and specifications. Notify the Engineer of the proposed material sources and of changes to material sources. The Engineer may sample and test project materials at any time before compaction throughout the duration of the project to assure specification compliance.

2.1. **Aggregate**. Furnish aggregate of the type and grade shown on the plans and meeting the requirements shown in Table 1. Each source must meet Table 1 requirements for liquid limit, plasticity index, and wet ball mill for the grade specified. Do not use additives, such as but not limited to lime, cement, or fly ash to modify aggregates to meet the requirements of Table 1, unless shown on the plans.

Unless otherwise shown on the plans, the unconfined compressive strength is waived when the flexible base material meets the #200 sieve requirement. When the #200 sieve requirement does not meet the specification in Table 1, the unconfined compressive strength is required.

Table 1
Material Requirements

Property	Test Method	Grade 1–2[3]	Grade 3	Grade 4	Grade 5
Master gradation sieve size (cumulative % retained)	Tex-110-E			As shown on the plans	
2-1/2"		0	0		0
1-3/4"		0–10	0–10		0–5
7/8"		10–35	–		10–35
3/8"		30–65	–		35–65
#4		45–75	45–75		45–75
#40		65–90	50–85		70–90
#200[1, 2]		85–95	–		–
Liquid limit, % Max	Tex-104-E	40	40		35
Plasticity index, Max	Tex-106-E	10	12		10
Plasticity index, Min		As shown on the plans	As shown on the plans		As shown on the plans
Wet ball mill, % Max	Tex-116-E	40	–		40
Wet ball mill, % Max increase passing the #40 sieve		20	–		20
Min compressive strength[2], psi	Tex-117-E				
lateral pressure 0 psi		35	–		–
lateral pressure 3 psi		–	–		90
lateral pressure 15 psi		175	–		175

1. The #200 sieve test is only required to meet the waiver of the unconfined compressive strength requirement. The #200 sieve test requirement is only applicable to stockpile samples from Section 247.2.4.
2. Compressive strength and #200 sieve test requirements are waived when the flexible base is mixed with or without existing material and treated with cement, emulsion, foamed asphalt, or lime, unless otherwise shown on the plans.
3. Grade 3 may be substituted for Grade 1–2 or Grade 5 when the flexible base is mixed with or without existing material and treated with cement, emulsion, foamed asphalt, or lime, as approved. Grade 3 flexible base must meet the wet ball mill requirements of Grade 1–2 or Grade 5 as applicable.

2.1.1. **Material Tolerances**. The Engineer may accept material if no more than one of the five most recent gradation tests has an individual sieve outside the specified limits of the gradation. This allowance does not apply to the #200 sieve requirement.

The Engineer may accept material if no more than one of the five most recent liquid limit or plasticity index tests is outside the specified limit. No single failing liquid limit or plasticity index test may exceed the allowable limit by more than 2 percentage points.

2.1.2. **Material Types**. Do not use fillers or binders unless approved. Furnish the type shown on the plans in accordance with the following.

2.1.2.1. **Type A**. Crushed stone produced and graded from oversize quarried aggregate that originates from a single, naturally occurring source. Do not use gravel or multiple sources.

2.1.2.2. **Type B**. Crushed or uncrushed gravel. Blending of two or more sources is allowed.

2.1.2.3. **Type C**. Crushed gravel with a minimum of 60% of the particles retained on a No. 4 sieve with two or more crushed faces as determined in accordance with Tex-460-A, Part I. Blending of two or more sources is allowed.

2.1.2.4. **Type D**. Type A material or crushed concrete. Crushed concrete containing gravel will be considered Type D material. Crushed concrete must meet the requirements of Section 247.2.1.2.6., "Recycled Material," and be managed in a way to provide for uniform quality. The Engineer may require separate dedicated stockpiles to verify compliance.

2.1.2.5. **Type E**. Caliche, iron ore, or as otherwise shown on the plans.

2.1.2.6. **Recycled Material**. Reclaimed asphalt pavement (RAP) and other recycled materials may be used when shown on the plans. Request approval to blend two or more sources of recycled materials. When RAP is allowed, do not exceed 20% RAP by weight, unless otherwise shown on the plans. The percentage limitations for other recycled materials will be as shown on the plans.

Provide recycled materials, other than RAP, that have a maximum sulfate content of 3,000 ppm when tested in accordance with Tex-145-E. Certify compliance with DMS-11000, "Evaluating and Using Nonhazardous Recyclable Materials Guidelines." In addition, recycled materials must be free of reinforcing steel and other objectionable material and have at most 1.5% deleterious material when tested in accordance with Tex-413-A. The liquid limit, plasticity index, wet ball mill, and compressive strength for all recycled materials are waived. When using RAP, crush RAP so that 100% passes the 2-in. sieve and does not exceed a maximum percent loss from decantation of 5.0% when tested in accordance with Tex-406-A. Test RAP without removing the asphalt. The final product must meet the requirements shown in Table 1 for the grade specified except when the Department requires a specific amount of Department-furnished RAP be added to the blend, unless otherwise shown on the plans.

The Contractor is responsible for uniformly blending the recycled material with the flexible base material to build a stockpile to meet the percentages required. Any Contractor-furnished surplus of recycled materials will remain the property of the Contractor. Remove Contractor-owned recycled materials from the project and dispose of them in accordance with federal, state, and local regulations before project acceptance.

2.2. **Water**. Furnish water free of industrial wastes and other objectionable matter.

2.3. **Material Sources**. Expose the vertical faces of all strata of material proposed for use when non-commercial sources are used. Secure and process the material by successive vertical cuts extending through all exposed strata, when directed.

2.4. **Stockpile Approval**. Stockpile is approved when the Engineer's test results meet the material requirements shown in Table 1.

2.4.1. **Sampling**. The Contractor and the Engineer will sample flexible base from completed stockpiles in accordance with Tex-100-E. Personnel conducting sampling must be certified by the Department-approved soils and base certification program.

Sampling stockpiles may be located at the production site or at the project location. The Contractor will witness the Engineer's sampling and sample the stockpile for their own testing, and label as deemed necessary.

Sample the stockpile for the Engineer when shown on the plans. When the Contractor samples the stockpile for the Engineer, the Engineer must witness the sampling of material designated for the Engineer and the Materials and Tests Division (MTD). The Engineer will label their sampling containers as "Engineer" and "MTD," or as deemed necessary.

The Engineer will take immediate possession of the sample containers for the Engineer and MTD. The Engineer will maintain custody of the samples until all testing and reporting are completed.

2.4.2. **Referee Testing**. Referee testing is applicable for stockpile testing only. MTD is the referee laboratory. MTD may designate a laboratory from the Department's MPL for Commercial Laboratories Approved for Flexible Base Referee Requests as the referee laboratory as deemed necessary. The designated laboratory cannot be performing any testing under this Item for the Engineer or Contractor.

The Contractor may request referee testing when the Engineer's test results fail to meet any of the material requirements shown in Table 1 and the Contractor's sample from Section 2.4.1., "Sampling," for the same failing Department test, passes. The tests must be performed by a laboratory listed on the Department's MPL for Commercial Laboratories Approved for Flexible Base Referee Requests. Submit the request by email within 5 working days after receiving failing test results from the Engineer. Include completed test reports passing the applicable requirements shown in Table 1 in the email.

Record and submit completed test reports electronically on Department-provided templates in their original format meeting the applicable material requirements shown in Table 1. Use Department-provided templates to record and calculate all test data. The Engineer and the Contractor will provide any available test results to the other party when requested.

3. EQUIPMENT

Provide machinery, tools, and equipment necessary for proper execution of the work.

3.1. **Rollers**. Provide rollers in accordance with Item 210, "Rolling." Provide proof rollers in accordance with Item 216, "Proof Rolling," when required.

3.2. **Inertial Profiler**. When ride quality measurement is required, provide a high-speed or lightweight inertial profiler certified at the Texas A&M Transportation Institute. Provide equipment certification documentation. Display a current decal on the equipment indicating the certification expiration date.

4. CONSTRUCTION

Construct each layer uniformly, free of loose or segregated areas, and with the required density and moisture content. Provide a smooth surface that conforms to the typical sections, lines, and grades shown on the plans or as directed.

Stockpile base material temporarily at an approved location before delivery to the roadway. Build stockpiles in layers no greater than 2 ft. thick. Stockpiles must have a total height between 10 and 16 ft. unless otherwise approved. After construction and acceptance of the stockpile in accordance with Section 247.2.4., "Stockpile Approval," loading from the stockpile for delivery is allowed. Load by making successive vertical cuts through the entire depth of the stockpile.

Do not add or remove material from temporary stockpiles that require sampling and testing before delivery, unless otherwise approved. Charges for additional sampling and testing required as a result of adding or removing material will be deducted from the Contractor's estimates.

Haul approved flexible base in clean trucks. Deliver the required quantity to each 100-ft. station or designated stockpile site as shown on the plans. Prepare stockpile sites as directed. When delivery is to the 100-ft. station, manipulate in conformance with the applicable Items.

4.1. **Preparation of Subgrade or Existing Base**. Remove or scarify existing asphalt concrete pavement in accordance with Item 105, "Removing Treated and Untreated Base and Asphalt Pavement," when shown on the plans or as directed. Shape the subgrade or existing base to conform to the typical sections shown on the plans or as directed.

When new base is required to be mixed with existing base, deliver, place, and spread the new flexible base in the required amount per station. Manipulate and thoroughly mix the new base with existing material to provide a uniform mixture to the specified depth before shaping.

Proof roll the roadbed in accordance with Item 216 before pulverizing or scarifying when shown on the plans or directed. Correct soft spots as directed.

4.2. **Placing**. Spread and shape flexible base into a uniform layer using an approved spreader the same day as delivered unless otherwise approved. Construct layers to the thickness shown on the plans. Maintain the shape of the course. Control dust by sprinkling, as directed. Correct or replace segregated areas as directed at no additional expense to the Department.

Place successive base courses and finish courses using the same construction methods required for the first course.

4.3. **Compaction**. Compact using density control unless otherwise shown on the plans. Multiple lifts are permitted when shown on the plans or approved. Bring each layer to the moisture content directed. When necessary, sprinkle the material in accordance with Item 204, "Sprinkling." Maintain moisture during compaction within ±2.0% of the optimum moisture content as determined in accordance with Tex-113-E.

Begin rolling longitudinally at the sides and proceed toward the center, overlapping on successive trips by at least 1/2 the width of the roller unit. Begin rolling at the low side and progress toward the high side on superelevated curves. Offset alternating trips of the roller. Operate rollers at a speed between 2 and 6 mph as directed.

Rework, recompact, and refinish material that fails to meet or that loses required moisture, density, stability, or finish requirements before the next course is placed or the project is accepted. Continue work until specification requirements are met. Perform the work at no additional expense to the Department.

Before final acceptance, the Engineer will select the locations of tests and measure the flexible base depth in accordance with Tex-140-E. Correct areas deficient by more than 1/2 in. in thickness by scarifying, adding material as required, reshaping, recompacting, and refinishing at the Contractor's expense.

4.3.1. **Ordinary Compaction**. Roll using approved compaction equipment as directed. Correct irregularities, depressions, and weak spots immediately by scarifying the areas affected, adding or removing approved material as required, reshaping, and recompacting.

4.3.2. **Density and Moisture Control**. Compact to a minimum of 100% of the maximum dry density and within ±2.0% of the optimum moisture content as determined in accordance with Tex-113-E, unless otherwise shown on the plans. Provide the Engineer with the beginning and ending station numbers of the area completed for testing. The Engineer will determine roadway density and moisture content of completed sections in accordance with Tex-115-E, Part I. The Engineer will determine random locations for testing in accordance with Tex-115-E, Part IV. Do not achieve density by drying the material after compaction.

When the density is less than 100% of the maximum dry density, the Engineer may perform additional testing to determine the extent of the area to correct. The Engineer may accept the section if no more than one of the five most recent density tests is below the specified density and the failing test is no more than 3 pcf below the specified density.

4.3.3. **Miscellaneous and Small Areas**. Miscellaneous areas are those that typically involve handwork or discontinuous paving operations, such as temporary detours, driveways, mailbox turnouts, crossovers, gores, spot level-up areas, and other similar areas. Miscellaneous and small areas are not subject to density testing but may be tested as directed.

4.4. **Finishing.** After completing compaction, clip, skin, or tight-blade the surface using a maintainer or subgrade trimmer to a depth of approximately 1/4 in. Remove loosened material and dispose of it at an approved location. Seal the clipped surface immediately by rolling using a pneumatic tire roller until a smooth surface is attained. Add small increments of water as needed during rolling. Shape and maintain the course and surface in conformity with the typical sections, lines, and grades as shown on the plans or as directed.

Correct grade deviations greater than 1/4 in. in 16 ft. measured longitudinally. Correct grade deviations greater than 1/4 in. over the entire width of the cross-section in areas where surfacing is to be placed. Correct by loosening and adding or removing material. Reshape and recompact in accordance with Section 247.4.3., "Compaction."

4.5. **Curing**. Cure the finished section until the moisture content is at least 2 percentage points below optimum or as directed before applying the next successive course or prime coat.

4.6. **Ride Quality.** Measurement of ride quality only applies to the final travel lanes that receive a one- or two-course surface treatment for the final riding surface, unless otherwise shown on the plans. Measure the ride quality of the base course either before or after the application of the prime coat, as directed, and before placement of the surface treatment. Use a certified profiler operator listed on the Department's MPL. When requested, furnish the Engineer with documentation for the person certified to operate the profiler.

Provide all profile data to the Engineer in electronic data files within 3 days of measuring the ride quality using the format specified in Tex-1001-S. The Engineer will use Department software to evaluate longitudinal profiles to determine areas requiring corrective action. Correct 0.1-mi. sections with an average international roughness index (IRI) value greater than 100 in. per mile to an IRI value of 100 in. per mile or less, unless otherwise shown on the plans. Reprofile and correct sections that fail to maintain ride quality before the placement of the surface treatment, as directed. Unless ride deterioration is due to environmental impact, traffic, or other incidents outside the Contractor's control, perform this work at no additional expense to the Department, as approved.

5. MEASUREMENT

Flexible base will be measured as follows.

- **Flexible Base (Complete in Place)**. The ton, square yard, or any cubic yard method.
- **Flexible Base (Roadway Delivery)**. The ton or any cubic yard method.
- **Flexible Base (Stockpile Delivery)**. The ton, cubic yard in vehicle, or cubic yard in stockpile.

Measurement by the cubic yard in final position and square yard is a plans quantity measurement. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

Measurement is further defined for payment as follows.

5.1. **Cubic Yard in Vehicle**. By the cubic yard in vehicles of uniform capacity at the point of delivery.

5.2. **Cubic Yard in Stockpile**. By the cubic yard in the final stockpile position, by the method of average end areas, or as shown on the plans.

5.3. **Cubic Yard in Final Position**. By the cubic yard in the completed and accepted final position. The volume of base course is computed in place by the method of average end areas between the original subgrade or existing base surfaces and the lines, grades, and slopes of the accepted base course, or as shown on the plans.

5.4. **Square Yard**. By the square yard of surface area in the completed and accepted final position. The surface area of the base course is based on the width of flexible base, or as shown on the plans.

5.5. **Ton**. By the ton of dry weight in vehicles as delivered. The dry weight is determined by deducting the weight of the moisture in the material at the time of weighing from the gross weight of the material. The Engineer will determine the moisture content in the material in accordance with Tex-103-E from samples taken at the time of weighing.

When material is measured in trucks, the weight of the material will be determined on certified scales, or the Contractor must provide a set of standard platform truck scales at an approved location. Scales must meet the requirements of Item 520, "Weighing and Measuring Equipment."

6. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for the types of work described below. No additional payment will be made for thickness or width exceeding that shown on the typical section or provided on the plans for cubic yard in the final position or square yard measurement.

Sprinkling and rolling, except proof rolling, will not be paid for directly, but will be subsidiary to this Item unless otherwise shown on the plans. When proof rolling is shown on the plans or directed, it will be paid for in accordance with Item 216.

Where subgrade is constructed under this Contract, correction of soft spots in the subgrade will be at the Contractor's expense. Where subgrade is not constructed under this Contract, correction of soft spots in the subgrade will be paid in conformance with pertinent Items or in accordance with Article 4.4., "Changes in the Work."

6.1. **Flexible Base (Complete in Place)**. Payment will be made for the type and grade specified. For cubic yard measurement, "In Vehicle," "In Stockpile," or "In Final Position" will be specified. For square yard measurement, a depth will be specified. This price is full compensation for furnishing materials, temporary stockpiling, assistance provided in stockpile sampling and operations to level stockpiles for measurement, loading, hauling, delivery of materials, spreading, blading, mixing, shaping, placing, compacting, reworking, finishing, correcting locations where thickness is deficient, curing, furnishing scales and labor for weighing and measuring, equipment, labor, tools, and incidentals.

6.2. **Flexible Base (Roadway Delivery)**. Payment will be made for the type and grade specified. For cubic yard measurement, "In Vehicle," "In Stockpile," or "In Final Position" will be specified. The unit price bid will not include processing at the roadway. This price is full compensation for furnishing materials, temporary stockpiling, assistance provided in stockpile sampling and operations to level stockpiles for measurement, loading, hauling, delivery of materials, furnishing scales and labor for weighing and measuring, equipment, labor, tools, and incidentals.

6.3. **Flexible Base (Stockpile Delivery)**. Payment will be made for the type and grade specified. For cubic yard measurement, "In Vehicle" or "In Stockpile" will be specified. The unit price bid will not include processing at the roadway. This price is full compensation for furnishing and disposing of materials, preparing the stockpile area, temporary or permanent stockpiling, assistance provided in stockpile sampling and operations to level

stockpiles for measurement, loading, hauling, delivery of materials to the stockpile, furnishing scales and labor for weighing and measuring, equipment, labor, tools, and incidentals.

Item 300
Asphalts, Oils, and Emulsions

1. DESCRIPTION

Provide asphalt cements, cutback and emulsified asphalts, performance-graded asphalt binders, and other miscellaneous asphalt materials as shown on the plans.

2. MATERIALS

Provide asphalt materials that meet the stated requirements when tested in conformance with the referenced Department, AASHTO, and ASTM test methods. Use asphalt containing recycled materials only if the recycled components meet the requirements of Article 6.9., "Recycled Materials." Provide asphalt materials that the Department has preapproved for use in accordance with Tex-545-C.

Inform the Department of all additives or modifiers included in the asphalt binder as part of the facility quality plan, as required by Tex-545-C, and provide that information to Department personnel. The Department reserves the right to prohibit the use of any asphalt additive or modifier.

Limit the use of polyphosphoric acid to no more than 0.5% by weight of the asphalt binder.

The use of re-refined engine oil bottoms is prohibited.

Acronyms used in this Item are defined in Table 1.

Table 1
Acronyms

Acronym	Definition
Test Procedure Designations	
Tex	Department
T or R	AASHTO
D	ASTM
Polymer Modifier Designations	
P	polymer-modified
SBS	styrene-butadiene-styrene block co-polymer
TR	tire rubber modifier (obtained from ground truck and passenger vehicle post-consumer tires)
AC	asphalt cement
AE	asphalt emulsion
AE-P	asphalt emulsion prime
A-R	asphalt-rubber
ARA	emulsified asphalt recycling agent
C	cationic
CRM	crumb rubber modifier
CSS	cationic slow setting
EAP&T	emulsified asphalt prime and tack
EBL	emulsified bonding layer
FDR	full-depth reclamation
H-suffix	harder residue (lower penetration)
HA	hot-applied
HF	high float
HRSS	hard residue surface sealant
HY	high yield
MC	medium-curing

Acronym	Definition
MS	medium-setting
MSCR	multiple stress creep recovery
NT	non-tracking
PCE	prime, cure, and erosion control
PG	performance grade
RC	rapid-curing
RS	rapid-setting
S-suffix	stockpile usage
SCM	special-use cutback material
SS	slow-setting
SY	standard yield
TRAIL	tracking resistant asphalt interlayer

2.1. **Asphalt Cement**. Provide AC that is homogeneous, water-free, and non-foaming when heated to 347°F, and in accordance with Table 2.

Table 2
Asphalt Cement

Property	Test Procedure	Viscosity Grade			
		AC-0.6		AC-1.5	
		Min	Max	Min	Max
Viscosity 140°F, poise 275°F, poise	T 202	 40 0.4	 80 –	 100 0.7	 200 –
Penetration, 77°F, 100g, 5 sec.	T 49	350	–	250	–
Flash point, C.O.C., °F	T 48	425	–	425	–
Solubility, %	T 44	99.0	–	99.0	–
Spot test	Tex-509-C	Neg.		Neg.	
Tests on residue from RTFOT: Viscosity, 140°F, poise Ductility,[1] 77°F 5 cm/min., cm	T 240 T 202 T 51	 – 100	 400 –	 – 100	 1,000 –

1. If AC-0.6 or AC-1.5 ductility at 77°F is less than 100 cm, material is acceptable if ductility at 60°F is more than 100 cm.

2.2. **Polymer-Modified Asphalt Cement**. Provide polymer-modified AC that is smooth, homogeneous, and meets the requirements shown in Table 3. Supply samples of the base AC and polymer additives if requested.

Table 3
Polymer-Modified Asphalt Cement

Property	Test Procedure	Polymer-Modified Viscosity Grade											
		AC-12-5TR		NT-HA[1]		AC-15P		AC-20XP		AC-10-2TR		AC-20-5TR	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Polymer		TR		–		SBS		SBS		TR		TR	
Polymer content, % (solids basis)	Tex-533-C or Tex-553-C	5.0	–	–	–	3.0	–	–	–	2.0	–	5.0	–
Dynamic shear, G*/sin δ, 82°C, 10 rad/s, kPa	T 315	–	–	1.0	–	–	–	–	–	–	–	–	–
Dynamic shear, G*/sin δ, 64°C, 10 rad/s, kPa	T 315	–	–	–	–	–	–	1.0	–	–	–	1.0	–
Dynamic shear, G*/sin δ, 58°C, 10 rad/s, kPa	T 315	1.0	–	–	–	–	–	–	–	1.0	–	–	–
Viscosity													
140°F, poise	T 202	1,200	–	–	–	1,500	–	2,000	–	1,000	–	2,000	–
275°F, poise	T 202	–	–	–	–	–	8.0	–	–	–	8.0	–	10.0
275°F, Pa-s	T 316	–	–	–	4.0	–	–	–	–	–	–	–	–
Penetration, 77°F, 100 g, 5 sec.	T 49	110	150	–	25	100	150	75	115	95	130	75	115
Elastic recovery, 50°F, %	Tex-539-C	55	–	–	–	55	–	55	–	30	–	55	–
Polymer separation	Tex-540-C	None		–		None		None		None		None	
Flash point, C.O.C., °F	T 48	425	–	425	–	425	–	425	–	425	–	425	–
Tests on residue from RTFOT aging and pressure aging:	T 240 and R 28												
Creep stiffness	T 313												
S, -18°C, Mpa		–	300	–	–	–	300	–	300	–	300	–	300
m-value, -18°C		0.300	–	–	–	0.300	–	0.300	–	0.300	–	0.300	–

1. This is a hot-applied TRAIL product.

2.3. **Cutback Asphalt**. Provide cutback asphalt that meets the requirements shown in Tables 4, 5, and 6 for the specified type and grade. Supply samples of the base AC and polymer additives if requested.

Table 4
Rapid-Curing Cutback Asphalt

Property	Test Procedure	Type–Grade RC-250	
		Min	Max
Kinematic viscosity, 140°F, cSt	T 201	250	400
Water, %	D95	–	0.2
Flash point, T.O.C., °F	T 79	80	–
Distillation test:	T 78		
Distillate, percentage by volume of total distillate to 680°F			
to 437°F		40	75
to 500°F		65	90
to 600°F		85	–
Residue from distillation, volume %		70	–
Tests on distillation residue:			
Viscosity, 140°F, poise	T 202	600	2,400
Ductility, 5 cm/min., 77°F, cm	T 51	100	–
Solubility, %	T 44	99.0	–
Spot test	Tex-509-C	Neg.	

Table 5
Medium-Curing Cutback Asphalt

Property	Test Procedure	Type–Grade					
		MC-30		MC-800		MC-3000	
		Min	Max	Min	Max	Min	Max
Kinematic viscosity, 140°F, cSt	T 201	30	60	800	1,600	3,000	6,000
Water, %	D95	–	0.2	–	0.2	–	0.2
Flash point, T.O.C., °F	T 79	95	–	140	–	149	–
Distillation test:	T 78						
Distillate, percentage by volume of total distillate to 680°F							
to 437°F		–	35	–	–	–	–
to 500°F		30	75	–	40	–	15
to 600°F		75	95	45	85	15	75
Residue from distillation, volume %		50	–	75	–	80	–
Tests on distillation residue:							
Viscosity, 140°F, poise	T 202	300	1,200	300	1,200	300	1,200
Ductility, 5 cm/min., 77°F, cm	T 51	100	–	100	–	100	–
Solubility, %	T 44	99.0	–	99.0	–	99.0	–
Spot test	Tex-509-C	Neg.		Neg.		Neg.	

Table 6
Special-Use Cutback Asphalt

Property	Test Procedure	Type–Grade	
		SCM I	
		Min	Max
Kinematic viscosity, 140°F, cSt	T 201	500	1,000
Water, %	D95	–	0.2
Flash point, T.O.C., °F	T 79	175	–
Distillation test:	T 78		
Distillate, percentage by volume of total distillate to 680°F			
to 437°F		–	–
to 500°F		–	0.5
to 600°F		20	60
Residue from distillation, volume %		76	–
Tests on distillation residue:			
Penetration, 100 g, 5 sec., 77°F	T 49	180	–
Solubility, %	T 44	99.0	–

2.4. **Emulsified Asphalt**. Provide emulsified asphalt that is homogeneous, does not separate after thorough mixing, and meets the requirements for the specified type and grade shown in Tables 7, 8, 9, 10, and 10A–C.

Table 7
Emulsified Asphalt

Property	Test Procedure	Type–Grade							
		Rapid-Setting		Medium-Setting		Slow-Setting			
		HFRS-2		MS-2		SS-1		SS-1H	
		Min	Max	Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol	T 72								
77°F, sec.		–	–	–	–	20	100	20	100
122°F, sec.		150	400	100	300	–	–	–	–
Sieve test, %	T 59	–	0.1	–	0.1	–	0.1	–	0.1
Miscibility	T 59	–		–		Pass		Pass	
Cement mixing, %	T 59	–	–	–	–	–	2.0	–	2.0
Demulsibility, 35 mL of 0.02 N $CaCl_2$, %	T 59	50	–	–	30	–	–	–	–
Storage stability, 1 day, %	T 59	–	1	–	1	–	1	–	1
Freezing test, 3 cycles[1]	T 59	–		Pass		Pass		Pass	
Distillation test:	T 59								
Residue by distillation, % by wt.		65	–	65	–	60	–	60	–
Oil distillate, % by volume of emulsion		–	0.5	–	0.5	–	0.5	–	0.5
Tests on residue from distillation:									
Penetration, 77°F, 100 g, 5 sec.	T 49	100	140	90	160	90	160	40	100
Solubility, %	T 44	97.5	–	97.5	–	97.5	–	97.5	–
Ductility, 77°F, 5 cm/min., cm	T 51	100	–	100	–	100	–	80	–
Float test, 140°F, sec.	T 50	1,200	–	–	–	–	–	–	–

1. Applies only when the Engineer designates material for winter use.

Table 8
Cationic Emulsified Asphalt

Property	Test Procedure	Type–Grade							
		Rapid-Setting		Medium-Setting		Slow-Setting			
		CRS-2		CMS-2		CSS-1		CSS-1H	
		Min	Max	Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol	T 72								
77°F, sec.		–	–	–	–	20	100	20	100
122°F, sec.		150	400	100	350	–	–	–	–
Sieve test, %	T 59	–	0.1	–	0.1	–	0.1	–	0.1
Cement mixing, %	T 59	–	–	–	–	–	0.2	–	0.2
Coating ability and water resistance:	T 59								
Dry aggregate/after spray		–		Good/Fair		–		–	
Wet aggregate/after spray		–		Fair/Fair		–		–	
Demulsibility, 35 mL of 0.8% Sodium dioctyl sulfosuccinate, %	T 59	70	–	–	–	–	–	–	–
Storage stability, 1 day, %	T 59	–	1	–	1	–	1	–	1
Particle charge	T 59	Positive		Positive		Positive		Positive	
Distillation test:	T 59								
Residue by distillation, % by wt.		65	–	65	–	60	–	60	–
Oil distillate, % by volume of emulsion		–	0.5	–	7	–	0.5	–	0.5
Tests on residue from distillation:									
Penetration, 77°F, 100 g, 5 sec.	T 49	90	160	90	200	90	160	40	110
Solubility, %	T 44	97.5	–	97.5	–	97.5	–	97.5	–
Ductility, 77°F, 5 cm/min., cm	T 51	100	–	100	–	100	–	80	–

Table 9
Polymer-Modified Emulsified Asphalt

Property	Test Procedure	Type–Grade Rapid-Setting HFRS-2P	
		Min	Max
Viscosity, Saybolt Furol 122°F, sec.	T 72	150	400
Sieve test, %	T 59	–	0.1
Demulsibility, 35 mL of 0.02 N $CaCl_2$, %	T 59	50	–
Storage stability, 1 day, %	T 59	–	1
Distillation test:[1]	T 59		
Residue by distillation, % by wt.		65	–
Oil distillate, % by volume of emulsion		–	0.5
Tests on residue from distillation:			
Polymer content, wt. % (solids basis)	Tex-533-C	3.0	–
Penetration, 77°F, 100 g, 5 sec.	T 49	90	140
Solubility, %	T 44	97.0	–
Viscosity, 140°F, poise	T 202	1,500	–
Float test, 140°F, sec.	T 50	1,200	–
Ductility,[2] 39.2°F, 5 cm/min., cm	T 51	50	–
Elastic recovery,[2] 50°F, %	Tex-539-C	55	–

1. Exception to T 59: Bring the temperature on the lower thermometer slowly to 350 ± 10°F. Maintain at this temperature for 20 min. Complete total distillation in 60 ± 5 min. from the first application of heat.
2. HFRS-2P must meet one of either the ductility or elastic recovery requirements.

Table 10
Polymer-Modified Cationic Emulsified Asphalt

Property	Test Procedure	Type-Grade											
		Rapid-Setting						Medium-Setting				Slow-Setting	
		CRS-2P		CHFRS-2P		CRS-2TR		CMS-1P[3]		CMS-2P[3]		CSS-1P	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol	T 72												
77°F, sec.		–	–	–	–	--	--	10	100	–	–	20	100
122°F, sec.		150	400	100	400	150	500	–	–	50	400	–	–
Sieve test, %	T 59	–	0.1	–	0.1	--	0.1	–	0.1	–	0.1	–	0.1
Demulsibility, 35 ml of 0.8% sodium dioctyl sulfosuccinate, %	T 59	70	–	60	–	40	--	–	–	–	–	–	–
Storage stability, 1 day, %	T 59	–	1	–	1	--	1	–	1	–	1	–	1
Particle charge	T 59	Positive		Positive		Positive		Positive		Positive		Positive	
Distillation test[1]:	T 59												
Residue by distillation, % by weight		65	–	65	–	65	--	30	–	60	–	62	–
Oil distillate, % by volume of emulsion		–	0.5	–	0.5	--	3	–	0.5	–	0.5	–	0.5
Tests on residue from distillation:													
Polymer content, wt. % (solids basis)	Tex-533-C or Tex-553-C	3.0	–	3.0	–	5.0[4]	--	–	–	–	–	3.0	–
Penetration, 77°F, 100 g, 5 sec.	T 49	90	150	80	130	90	150	30	–	30	–	55	90
Viscosity, 140°F, poise	T 202	1,300	–	1,300	–	1,000	--	–	–	–	–	–	–
Solubility, %	T 44	97.0	–	95.0	–	98	--	–	–	–	–	97.0	–
Ductility, 77°F, 5 cm/min., cm	T 51	–	–	–	–	40	--	–	–	–	–	70	–
Float test, 140°F, sec.	T 50	–	–	1,800	–	--	--	–	–	–	–		
Ductility,[2] 39.2°F, 5 cm/min., cm	T 51	50	–	–	–	--	--	–	–	–	–	–	–
Elastic recovery,[2] 50°F, %	Tex-539-C	55	–	55	–	--	--	–	–	–	–	–	–
Tests on residue from evaporative recovery:	R 78, Procedure B												
Nonrecoverable creep compliance of residue, 3.2 kPa, 52°C, kPa^{-1}	T 350	–	–	–	–	–	–	–	2.0	–	4.0	–	–

1. Exception to T 59: Bring the temperature on the lower thermometer slowly to 350 ± 10°F. Maintain at this temperature for 20 min. Complete total distillation in 60 ± 5 min. from the first application of heat.
2. CRS-2P must meet one of either the ductility or elastic recovery requirements.
3. With all precertification samples of CMS-1P or CMS-2P, submit certified test reports showing the type and percent of rejuvenator and/or latex added. Submit samples of these raw materials if requested by the Engineer.
4. Modifier type is TR. Determined in accordance with Tex-553-C.

Table 10A
Non-Tracking Tack Coat Emulsion[1]

Property	Test Procedure	NT-HRE		NT-RRE		NT-SRE	
		Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol, 77°F, sec.	T 72	15	–	15	–	10	100
Storage stability, 1 Day, %	T 59	–	1	–	1	–	1
Settlement, 5-day, %	T 59	–	5	–	5	–	5
Sieve test, %	T 59	–	0.30	–	0.30	–	0.1
Distillation test:[2]	T 59						
Residue by distillation, % by wt.		50	–	58	–	50	–
Oil distillate, by volume of emulsion		–	1.0	–	1.0	–	1.0
Test on residue from distillation:							
Penetration, 77°F, 100 g, 5 sec.	T 49	–	20	15	45	40	90
Solubility, %	T 44	97.5	–	97.5	–	97.5	–
Dynamic shear, G*/sin(δ), 82°C, 10 rad/s, kPa	T 315	1.0	–	–	–	–	–

1. These are emulsion-based TRAILs. Due to the hardness of the residue, these emulsions should be heated to 120–140° F prior to thorough mixing as the emulsion is being prepared for testing.
2. Exception to T 59: Bring the temperature on the lower thermometer slowly to 350 ± 10°F. Maintain at this temperature for 20 min. Complete total distillation in 60 ± 5 min. from first application of heat.

Table 10B
Spray-Applied Underseal Membrane Polymer-Modified Emulsions

Property	Test Procedure	EBL	
		Min	Max
Viscosity @ 77°F, SSF	T 72	20	100
Storage Stability[1], %	T 59	–	1
Demulsibility[2] Anionic emulsions — 35 ml of 0.02 N CaCl2, % Cationic emulsions — 35 ml 0.8% sodium dioctyl sulfosuccinate, %	T 59	55	–
Sieve Test[3], %	T 59	–	0.05
Distillation Test[4] Residue by distillation, % by wt. Oil portion of distillate, % by vol.	T 59	 63 –	 – 0.5
Test on Residue from Distillation Elastic Recovery @ 50°F, 50 mm/min., % Penetration @ 77°F, 100 g, 5 sec, 0.1 mm	 Tex-539-C T 49	 60 80	 – 130

1. After standing undisturbed for 24 hr., the surface must be smooth, must not exhibit a white or milky colored substance, and must be a homogeneous color throughout.
2. Material must meet demulsibility test for emulsions.
3. May be required by the Engineer only when the emulsion cannot be easily applied in the field.
4. The temperature on the lower thermometer should be brought slowly to 350 ± 10°F and maintained at this temperature for 20 min. The total distillation should be completed in 60 ± 5 min. from the first application of heat.

Table 10C
Full-Depth Reclamation Emulsion

Property	Test Procedure	Standard Yield (FDR EM-SY)		High Yield (FDR EM-HY)[2]	
		Min	Max	Min	Max
Viscosity Saybolt Furol @ 77°F, sec.	T 72	20	100	20	100
Sieve test, %	T 59	–	0.1	–	0.1
Cement mixing, %	T 59	–	2.0	–	2.0
% Storage stability, 1 day, %	T 59	–	1	–	1
Distillation test[1]:	T 59				
Residue by distillation, % by wt.		60	–	63	–
Oil portion of distillate, % by vol.		–	0.5	–	0.5
Test on residue from distillation:					
Penetration @ 77°F, dmm	T 49	40	95	120	–

1. The temperature on the lower thermometer should be brought slowly to 350 ± 10°F and maintained at this temperature for 20 min. The total distillation should be completed in 60 ± 5 min. from the first application of heat.
2. Provide a manufacturer's certificate of analysis (COA) with the type and percent of rejuvenator added.

2.5. **Specialty Emulsions**. Provide specialty emulsion that is either asphalt-based or resin-based and meets the requirements shown in Table 11 or Table 11A.

Table 11
Specialty Emulsions

Property	Test Procedure	Type–Grade					
		Medium-Setting				Slow-Setting	
		AE–P		EAP&T		PCE[1]	
		Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol	T 72						
77°F, sec.		–	–	–	–	10	100
122°F, sec.		15	150	–	–	–	–
Sieve test, %	T 59	–	0.1	–	0.1	–	0.1
Miscibility[2]	T 59	–		Pass		Pass	
Demulsibility, 35 mL of 0.10 N $CaCl_2$, %	T 59	–	70	–	–	–	–
Storage stability, 1 day, %	T 59	–	1	–	1	–	–
Particle size,[5] % by volume < 2.5 μm	Tex-238-F[3]	–	–	90	–	90	–
Asphalt emulsion distillation to 500°F followed by Cutback asphalt distillation of residue to 680°F:	T 59 and T 78						
Residue after both distillations, % by wt.		40	–	–	–	–	–
Total oil distillate from both distillations, % by volume of emulsion		25	40	–	–	–	–
Residue by distillation, % by wt.	T 59	–	–	60	–	–	–
Residue by evaporation,[4] % by wt.	T 59	–	–	–	–	60	–
Tests on residue after all distillation(s):							
Viscosity, 140°F, poise	T 202	–	–	800	–	–	–
Kinematic viscosity,[5] 140°F, cSt	T 201	–	–	–	–	100	350
Flash point C.O.C., °F	T 48	–	–	–	–	400	–
Solubility, %	T 44	97.5	–	–	–	–	–
Float test, 122°F, sec.	T 50	50	200	–	–	–	–

1. Supply with each shipment of PCE:
   - a copy of a lab report from an approved analytical lab, signed by a lab official, indicating the PCE formulation does not meet any characteristics of a Resource Conservation Recovery Act (RCRA) hazardous waste;
   - a certification from the producer that the formulation supplied does not differ from the one tested and that no listed RCRA hazardous wastes or Polychlorinated Biphenyls have been mixed with the product; and
   - a Safety Data Sheet.
2. Exception to T 59: In dilution, use 350 mL of distilled or deionized water and a 1,000-mL beaker.
3. Use Tex-238-F, beginning at "Particle Size Analysis by Laser Diffraction," with distilled or deionized water as a medium and no dispersant, or use another approved method.
4. Exception to T 59: Leave sample in the oven until foaming ceases, then cool and weigh.
5. PCE must meet either the kinematic viscosity requirement or the particle size requirement.

Table 11A
Hard Residue Surface Sealant

Property	Test Procedure	HRSS	
		Min	Max
Viscosity, Krebs unit, 77°F, Krebs units	D 562	45	75
Softening point, °F	Tex-505-C[1]	250	–
Uniformity	D 2939	Pass[2]	
Resistance to heat	D 2939	Pass[3]	
Resistance to water	D 2939	Pass[4]	
Wet flow, mm	D 2939	–	0
Resistance to Kerosene (optional)[5]	D 2939	Pass[6]	
Ultraviolet exposure, UVA-340, 0.77 W/m^2, 50°C chamber, 8 hr. UV lamp, 5 min. spray, 3 hr. 55 min. condensation, 1,000 hr. total exposure[7]	G 154	Pass[8]	
Abrasion loss, 1.6 mm thickness, liquid only, %	ISSA TB-100	–	1.0
Residue by evaporation, % by weight	D 2939	33	–
Tests on residue from evaporation:			
Penetration, 77°F, 100 g, 5 sec.	T 49	15	30
Flash point, Cleveland open cup, °F	T 48	500	–
Tests on base asphalt before emulsification			
Solubility, %	T 44	98	–

1. Cure the emulsion in the softening point ring in a 200 ± 5°F oven for 2 hr.
2. Product must be homogenous and show no separation or coagulation that cannot be overcome by moderate stirring.
3. No sagging or slippage of film beyond the initial reference line.
4. No blistering or re-emulsification.
5. Recommended for airport applications or where fuel resistance is desired.
6. No absorption of Kerosene into the clay tile past the sealer film. Note sealer surface condition and loss of adhesion.
7. Other exposure cycles with similar levels of irradiation and conditions may be used with Department approval.
8. No cracking, chipping, surface distortion, or loss of adhesion. No color fading or lightening.

2.6. **Diluted Emulsions**. Provide emulsified asphalt that is homogeneous, does not separate after thorough mixing, and meets the requirements for the specified type and grade shown in Tables 12 and 12A, where the suffixes 50/50, 40/60, and 30/70 mean 50% emulsion diluted with 50% water; 40% emulsion diluted with 60% water, and 30% emulsion diluted with 70% water, respectively. For example, CSS-1H 40/60 means 40% CSS-1H diluted with 60% water and AE-P 30/70 means 30% AE-P diluted with 70% water.

Table 12
Cationic Diluted Emulsified Asphalt

Property	Test Procedure	Type-Grade					
		Diluted Slow-Setting					
		CSS-1H 50/50		CSS-1H 40/60		CSS-1H 30/70	
		Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol 77°F, sec.	T 72	Report only		Report only		Report only	
Distillation test							
Residue by distillation, % by wt.	T 59	30	–	24	–	18	–
Oil distillate, % by volume of emulsion		–	0.5	–	0.5	–	0.5
Tests on residue from distillation:							
Penetration, 77°F, 100 g, 5 sec.	T 49	40	110	40	110	40	110
Solubility, %	T 44	97.5	–	97.5	–	97.5	–
Ductility, 77°F, 5 cm/min., cm	T 51	80	–	80	–	80	–

Table 12A
Diluted Specialty Emulsions

Property	Test Procedure	Type-Grade					
		Diluted Slow-Setting					
		AE-P 50/50		AE-P 40/60		AE-P 30/70	
		Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol 122°F, sec.	T 72	Report only		Report only		Report only	
Asphalt emulsion distillation to 500°F followed by cutback asphalt distillation of residue to 680°F:	T 59 and T 78						
Residue after both distillations, % by wt.		20	–	16	–	12	–
Total oil distillate from both distillations, % by volume of emulsion		12.5	20	10.0	16	7.5	12
Tests on residue after all distillations:							
Solubility, %	T 44	97.5	–	97.5	–	97.5	–
Float test, 122°F, sec.	T 50	50	200	50	200	50	200

2.7. **Recycling Agent**. Recycling agent and emulsified asphalt recycling agent (ARA) must meet the requirements shown in Table 13. Additionally, recycling agent and residue from ARA, when added in the specified proportions to the recycled asphalt, must meet the properties shown on the plans.

Table 13
Recycling Agent and Emulsified Asphalt Recycling Agent

Property	Test Procedure	Recycling Agent		ARA-1		ARA-1P	
		Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol, 77°F, sec.	T 72	–	–	15	100	15	110
Sieve test, %	T 59	–	–	–	0.1	–	0.1
Miscibility[1]	T 59	–		No coagulation		–	
Residue by evaporation[2], % by wt.	T 59	–	–	60	–	–	–
Distillation test[3]:	T 59						
Residue by distillation, % by wt.		–	–	–	–	60	65
Oil distillate, % by volume of emulsion		–	–	–	–	–	2
Penetration of distillation residue at 39.2°F, 100 g, 5 sec.	T 49	–	–	–	–	110	190
Tests on recycling agent or residue from evaporation:							
Flash point, C.O.C., °F	T 48	400	–	400	–	400	–
Kinematic viscosity	T 201						
140°F, cSt		75	200	75	200	–	–
275°F, cSt		–	10.0	–	10.0	–	–

1. Exception to T 59: Use 0.02 N $CaCl_2$ solution in place of water.
2. Exception to T 59: Maintain sample at 300°F until foaming ceases, then cool and weigh.
3. Exception to T 59: Bring the temperature on the lower thermometer slowly to 350 ± 10°F. Maintain at this temperature for 20 min. Complete total distillation in 60 ± 5 min. from first application of heat.

2.8. **Crumb Rubber Modifier**. CRM consists of automobile and truck tires processed by ambient temperature grinding.

CRM must be:

- free of contaminants, including fabric, metal, and mineral and other non-rubber substances;
- free-flowing; and
- non-foaming when added to hot asphalt binder.

Ensure rubber gradation meets the requirements of the grades shown in Table 14 when tested in accordance with Tex-200-F, Part I, using a 50-g sample.

Table 14
CRM Gradations

Sieve Size (% Passing)	Grade A		Grade B		Grade C		Grade D	Grade E
	Min	Max	Min	Max	Min	Max		
#8	100	–	–	–	–	–	As shown on the plans	As approved
#10	95	100	100	–	–	–		
#16	–	–	70	100	100	–		
#30	–	–	25	60	90	100		
#40	–	–	–	–	45	100		
#50	0	10	–	–	–	–		
#200	–	–	0	5	–	–		

2.9. **Crack Sealer**. Provide polymer-modified emulsified asphalt crack sealer meeting the requirements shown in Table 15. Provide rubber-asphalt crack sealer meeting the requirements shown in Table 16.

Table 15
Polymer-Modified Emulsified Asphalt Crack Sealer

Property	Test Procedure	Min	Max
Rotational viscosity, 77°F, cP	D2196, Method A	10,000	25,000
Sieve test, %	T 59	–	0.1
Storage stability, 1 day, %	T 59	–	1
Evaporation Residue by evaporation, % by wt.	Tex-543-C	65	–
Tests on residue from evaporation: Penetration, 77°F, 100 g, 5 sec. Softening point, °F Ductility, 39.2°F, 5 cm/min., cm	 T 49 T 53 T 51	 35 140 100	 75 – –

Table 16
Asphalt-Rubber Crack Sealer

Property	Test Procedure	Class A		Class B	
		Min	Max	Min	Max
CRM content, Grade A or Grade B, % by wt.	Tex-544-C	22	26	–	–
CRM content, Grade B, % by wt.	Tex-544-C	–	–	13	17
Virgin rubber content[1], % by wt.		–	–	2	–
Flash point[2], C.O.C., °F	T 48	400	–	400	–
Penetration[3], 77°F, 150 g, 5 sec.	T 49	30	50	30	50
Penetration[3], 32°F, 200 g, 60 sec.	T 49	12	–	12	–
Softening point, °F	T 53	–	–	170	–
Bond test, non-immersed, 0.5 in specimen, 50% extension, 3 cycles, 20°F[4]	D5329	–		Pass	

1. Provide certification that the Min % virgin rubber was added.
2. Agitate the sealing compound using a 3/8–1/2-in. (9.5–12.7-mm) wide, square-end metal spatula to bring the material on the bottom of the cup to the surface (i.e., turn the material over) before passing the test flame over the cup. Start at one side of the thermometer, move around to the other, and then return to the starting point using 8–10 rapid circular strokes. Accomplish agitation in 3–4 sec. Pass the test flame over the cup immediately after stirring is completed.
3. Exception to T 49: Substitute the cone specified in D217 for the penetration needle.
4. Allow no crack in the crack-sealing materials or break in the bond between the sealer and the mortar blocks more than 1/4 in. deep for any specimen after completion of the test.

2.10. **Asphalt-Rubber Binders**. Provide A-R binders that are mixtures of asphalt binder and CRM that have been reacted at elevated temperatures. Provide A-R binders meeting D6114 and containing at least 15% CRM by weight. Provide Type I or Type II, containing CRM Grade C, for use in hot-mix aggregate mixtures. Provide Type II or Type III, containing CRM Grade B, for use in surface treatment binder. Ensure binder properties meet the requirements shown in Table 17.

Table 17
A-R Binders

Property	Test Procedure	Binder Type					
		Type I		Type II		Type III	
		Min	Max	Min	Max	Min	Max
Apparent viscosity, 347°F, cP	D2196, Method A	1,500	5,000	1,500	5,000	1,500	5,000
Penetration, 77°F, 100 g, 5 sec.	T 49	25	75	25	75	50	100
Penetration, 39.2°F, 200 g, 60 sec.	T 49	10	–	15	–	25	–
Softening point, °F	T 53	135	–	130	–	125	–
Resilience, 77°F, %	D5329	25	–	20	–	10	–
Flash point, C.O.C., °F	T 48	450	–	450	–	450	–
Tests on residue from RTFOT: Retained penetration ratio, 39.2°F, 200 g, 60 sec., % of original	T 240 T 49	75	–	75	–	75	–

2.11. **Performance-Graded Binders**. Provide PG binders that are smooth and homogeneous, show no separation when tested in accordance with Tex-540-C, and meet the requirements shown in Table 18.

Separation testing is not required if:

- a modifier is introduced separately at the mix plant by injection in either the asphalt line or mixer,
- the binder is blended onsite in continuously agitated tanks, or
- binder acceptance is based on field samples taken from an in-line sampling port at the hot-mix plant after the addition of modifiers.

Table 18
Performance-Graded Binders

Property and Test Method	Performance Grade																		
	PG 58			PG 64				PG 70				PG 76				PG 82		
	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28
Average 7-day Max pavement design temperature, °C[1]	58			64				70				76				82		
Min pavement design temperature, °C[1]	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28
Original Binder																		
Flash point, T 48, Min, °C	230																	
Viscosity, T 316[2, 3]: Max, 3.0 Pa·s, test temperature, °C	135																	
Dynamic shear, T 315[4]: G*/sin(δ), Min, 1.00 kPa, Max, 2.00 kPa[5], Test temperature @ 10 rad/sec., °C	58			64				70				76				82		
Elastic recovery, D6084, 50°F, % Min[6]	–	–	30	–	–	30	50	–	30	50	60	30	50	60	70	50	60	70
Rolling Thin Film Oven (RTFO) (T 240)																		
Mass change, T 240, Max, %	1.0																	
Dynamic shear, T 315 G*/sin(δ), Min, 2.20 kPa, Max, 5.00 kPa[5], Test temperature @ 10 rad/sec., °C	58			64				70				76				82		
MSCR, T 350, recovery, 0.1 kPa, high PG temperature, % Min[6]	–	–	20	–	–	20	30	–	20	30	40	20	30	40	50	30	40	50
Pressure Aging Vessel (PAV) Residue (R 28)																		
PAV aging temperature, °C	100																	
Dynamic shear, T 315 G*.sin (δ), Max, 5,000 kPa (Max, 6,000 kPa for δ ≥42°) Test temperature @ 10 rad/sec., °C	25	22	19	28	25	22	19	28	25	22	19	28	25	22	19	28	25	22
Creep stiffness, T 313[7, 8] S, Max, 300 Mpa, m-value, Min, 0.300 Test temperature @ 60 sec., °C	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18
Direct tension, T 314[8] Failure strain, Min, 1.0% Test temperature @ 1.0 mm/min., °C	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18

1. Pavement temperatures are estimated from air temperatures using an algorithm contained in a Department-supplied computer program, may be provided by the Department, or may be obtained by following procedures outlined in AASHTO M 323 and R 25.
2. This requirement may be waived at the Department's discretion if the supplier warrants that the asphalt binder can be adequately pumped, mixed, and compacted at temperatures that meet all applicable safety, environmental, and constructability requirements. At test temperatures where the binder is a Newtonian fluid, any suitable standard means of viscosity measurement may be used, including capillary (T 201 or T 202) or rotational viscometry (T 316).
3. Viscosity at 135°C is an indicator of mixing and compaction temperatures that can be expected in the lab and field. High values may indicate high mixing and compaction temperatures. Additionally, significant variation can occur from batch to batch. Contractors should be aware that variation could significantly impact their mixing and compaction operations. Contractors are therefore responsible for addressing any constructability issues that may arise.
4. For quality control of unmodified asphalt binder production, measurement of the viscosity of the original asphalt binder may be substituted for dynamic shear measurements of G*/sin (δ) at test temperatures where the asphalt is a Newtonian fluid. Any suitable standard means of viscosity measurement may be used, including capillary (T 201 or T 202) or rotational (T 316) viscometry.
5. Max values for unaged and RTFO-aged dynamic shear apply only to materials used as substitute binders, as described in Item 341, "Dense-Graded Hot-Mix Asphalt," and Item 344, "Superpave Mixtures."
6. Elastic recovery (D6084) is not required unless MSCR (T 350) is less than the Min % recovery. Elastic recovery will be used for the acceptance criteria in this instance.
7. Silicone beam molds, as described in AASHTO TP 1-93, are acceptable for use.
8. If creep stiffness is below 300 Mpa, direct tension test is not required. If creep stiffness is between 300 and 600 Mpa, the direct tension failure strain requirement can be used instead of the creep stiffness requirement. The m-value requirement must be satisfied in both cases.

3. EQUIPMENT

Provide all equipment necessary to transport, store, sample, heat, apply, and incorporate asphalts, oils, and emulsions.

4. CONSTRUCTION

4.1. **Typical Material Use**. Use materials shown in Table 19, unless otherwise determined by the Engineer.

Table 19
Typical Material Use

Material Application	Typically Used Materials
Hot-mixed, hot-laid asphalt mixtures	PG binders, A-R binder Types I and II
Surface treatment	PG 58-22, AC-15P, AC-20XP, AC-10-2TR, AC-20-5TR, HFRS-2, MS-2, CRS-2, CRS-2TR, CMS-2P, HFRS-2P, CRS-2P, CHFRS-2P, A-R binder Types II and III
Surface treatment (cool weather)	AC12-5TR, RC-250, MC-800, MC-3000, CMS-2P
Precoating	PG 58-22, PG 64-22, SS-1, SS-1H, CSS-1, CSS-1H
Tack coat	PG binders, SS-1H, CSS-1H, EAP&T, TRAIL, EBL
Fog seal	SS-1, SS-1H, CSS-1, CSS-1H, CSS-1H 50/50, CSS-1H 40/60, CSS-1H 30/70, CMS-1P
Hot-mixed, cold-laid asphalt mixtures	AC-0.6, AC-1.5, PG 58-22, CMS-2
Patching mix	MC-800, SCM I
Recycling	AC-0.6, AC-1.5, recycling agent, ARA-1, ARA-1P
Crack sealing	Polymer-modified AE crack sealant, asphalt-rubber crack sealers (Class A, Class B)
Microsurfacing	CSS-1P
Prime	MC-30, AE-P, AE-P 50/50, AE-P 40/60, AE-P 30/70, EAP&T, PCE
Curing membrane	SS-1, SS-1H, CSS-1, CSS-1H, PCE
Erosion control	SS-1, SS-1H, CSS-1, CSS-1H, PCE
FDR-foaming	PG 64-22, FDR EM-SY, FDR EM-HY

4.2. **Storage and Application Temperatures**. Use storage and application temperatures in accordance with Table 20. Store and apply materials at the lowest temperature yielding satisfactory results. Follow the manufacturer's instructions for any agitation requirements in storage. Manufacturer's instructions regarding recommended application and storage temperatures supersede those shown in Table 19.

Table 20
Storage and Application Temperatures

Type-Grade	Application		Storage
	Recommended Range (°F)	Maximum Allowable (°F)	Maximum (°F)
AC-0.6, AC-1.5	200–300	350	350
AC-15P, AC-20-5TR, AC12-5TR, and AC10-2TR	300–375	375	360
RC-250	125–180	200	200
MC-30, AE-P	70–150	175	175
MC-800, SCM I	175–260	275	275
MC-3000	225–275	290	290
HFRS-2, MS-2, CRS-2, HFRS-2P, CRS-2P, CMS-2, CRS-2TR	120–160	180	180
SS-1, SS-1H, CSS-1, CSS-1H, PCE, EAP&T, CSS-1P, recycling agent, emulsified recycling agent, polymer-modified AE crack sealant	50–130	140	140
PG binders	275–350	350	350
Asphalt-rubber crack sealers (Class A, Class B)	350–375	400	–
A-R binder Types I, II, and III	325–425	425	425

5. MEASUREMENT AND PAYMENT

The work performed, materials furnished, equipment, labor, tools, and incidentals will not be measured or paid for directly, but will be subsidiary to or are included in payment for other pertinent Items.

Item 310
Prime Coat

1. DESCRIPTION

Prepare and treat existing or newly constructed surface with an asphalt binder or other specialty prime coat binder material. Apply blotter material as required.

2. MATERIALS

2.1. **Binder**. Use material of the type and grade shown on the plans in accordance with Item 300, "Asphalts, Oils, and Emulsions."

2.2. **Blotter**. Use either base course sweepings obtained from cleaning the base or native sand as blotter materials unless otherwise shown on the plans or approved.

3. EQUIPMENT

Provide applicable equipment in accordance with Article 316.3., "Equipment."

4. CONSTRUCTION

4.1. **General**. Apply the mixture when the air temperature is at or above 60°F, or above 50°F and rising. Measure the air temperature in the shade away from artificial heat. The Engineer will determine when weather conditions are suitable for application.

Do not permit traffic, hauling, or placement of subsequent courses over freshly constructed prime coats. Maintain the primed surface until placement of subsequent courses or acceptance of the work.

4.2. **Surface Preparation**. Prepare the surface by sweeping or other approved methods. Lightly sprinkle the surface with water before applying bituminous material, when directed, to control dust and ensure absorption.

4.3. **Application**.

4.3.1. **Binder**. The Engineer will select the application temperature within the limits recommended in Item 300, or by the material manufacturer. Apply material within 15°F of the selected temperature, but do not exceed the maximum allowable temperature.

Distribute the material smoothly and evenly at the rate selected by the Engineer. Roll the freshly applied prime coat using a pneumatic-tire roller to ensure penetration when directed.

4.3.2. **Blotter**. Spread blotter material before allowing traffic to use a primed surface. Apply blotter material to primed surface at the specified rate when "Prime Coat and Blotter" is shown on the plans as a bid item or as directed. Apply blotter to spot locations when "Prime Coat" is shown on the plans as a bid item or as directed to accommodate traffic movement through the work area. Remove blotter material before placing the surface. Dispose of blotter material in conformance with applicable state and federal requirements.

5. MEASUREMENT

This Item will be measured by the gallon of binder placed and accepted.

6. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Prime Coat" or "Prime Coat and Blotter" of the type and grade of binder specified. This price is full compensation for cleaning and sprinkling the area to be primed; materials, including blotter material; and rolling, equipment, labor, tools, and incidentals.

Item 320
Equipment for Asphalt Concrete Pavement

1. DESCRIPTION

Provide equipment to produce, haul, place, compact, and core asphalt concrete pavement.

2. EQUIPMENT

Ensure weighing and measuring equipment complies with Item 520, "Weighing and Measuring Equipment." Synchronize equipment to produce a mixture meeting the required proportions.

2.1. **Production Equipment**. Provide:

- drum-mix type, weigh-batch, or modified weigh-batch mixing plants that ensure uniform, continuous production;
- automatic proportioning and measuring devices with interlock cutoff circuits that stop operations if the control system malfunctions;
- visible readouts indicating the weight or volume of asphalt and aggregate proportions;
- safe and accurate means to take required samples by inspection forces;
- permanent means to check the output of metering devices and to perform calibration and weight checks; and
- additive-feed systems to ensure a uniform, continuous material flow in the desired proportion.

2.1.1. **Drum-Mix Plants**. Provide a mixing plant that complies with the requirements below.

2.1.1.1. **Aggregate Feed System**. Provide:

- at least one cold aggregate bin for each stockpile of individual materials used to produce the mix;
- bins designed to prevent overflow of material;
- scalping screens or other approved methods to remove any oversized material, roots, or other objectionable materials;
- a feed system to ensure a uniform, continuous material flow in the desired proportion to the dryer;
- an integrated means for moisture compensation;
- belt scales, weigh box, or other approved devices to measure the weight of the combined aggregate; and
- cold aggregate bin flow indicators that automatically signal interrupted material flow.

2.1.1.2. **Reclaimed Asphalt Pavement (RAP) and Recycled Asphalt Shingles (RAS) Feed Systems**. Provide at least one bin for each stockpile of RAP and RAS to weigh and feed the recycled material into the hot-mix plant.

2.1.1.3. **Mineral Filler Feed System**. Provide a closed system for mineral filler that maintains a constant supply with minimal loss of material through the exhaust system. Interlock the measuring device into the automatic plant controls to automatically adjust the supply of mineral filler to plant production and provide a consistent percentage to the mixture.

2.1.1.4. **Heating, Drying, and Mixing Systems**. Provide:

- a dryer or mixing system to agitate the aggregate during heating,
- a heating system that controls the temperature during production to prevent aggregate and asphalt binder damage,

- a heating system that completely burns fuel and leaves no residue, and
- a recording thermometer that continuously measures and records the mixture discharge temperature.

2.1.1.5. **Dust Collection System**. Provide a dust collection system to collect fines generated by the drying and mixing process and reintroduce them into the mixing drum.

2.1.1.6. **Asphalt Binder Equipment**. Supply equipment to heat binder to the required temperature. Equip the heating apparatus with a continuously recording thermometer located at the highest temperature point. Produce a 24-hr. chart of the recorded temperature. Place a device with automatic temperature compensation that accurately meters the binder in the line leading to the mixer.

Furnish a sampling port and locate in accordance with Tex-500-C. Supply an additional sampling port between any additive blending device and mixer.

Supply an in-line viscosity-measuring device located between the blending unit and the mixing drum when asphalt-rubber (A-R) binder is specified. Provide a means to calibrate the meter onsite when an asphalt mass flow meter is used.

2.1.1.7. **Mixture Storage and Discharge**. Provide a surge-storage system to minimize interruptions during operations, unless otherwise approved. Furnish a gob hopper or other device to minimize segregation in the bin. Provide an automated system that weighs the mixture upon discharge and produces a ticket showing:

- date,
- project identification number,
- plant identification,
- mix identification,
- vehicle identification,
- total weight of the load,
- tare weight of the vehicle,
- weight of mixture in each load, and
- load number or sequential ticket number for the day.

2.1.1.8. **Truck Scales**. Provide standard platform scales at an approved location.

2.1.2. **Weigh-Batch Plants**. Provide a mixing plant that complies with Section 320.2.1.1., “Drum-Mix Plants,” except as required below.

2.1.2.1. **Screening and Proportioning**. Provide enough hot bins to separate the aggregate and to control proportioning of the mixture type specified. Supply bins that discard excessive and oversized material through overflow chutes. Provide safe access for Inspectors to obtain samples from the hot bins.

2.1.2.2. **Aggregate Weigh Box and Batching Scales**. Provide a weigh box and batching scales to hold and weigh a complete batch of aggregate. Provide an automatic proportioning system with low bin indicators that automatically stop when material level in any bin is not enough to complete the batch.

2.1.2.3. **Asphalt Binder Measuring System**. Provide bucket and scales with enough capacity to hold and weigh binder for one batch.

2.1.2.4. **Mixer**. Equip mixers with an adjustable automatic timer that controls the dry and wet mixing period and locks the discharge doors for the required mixing period. Furnish a pug mill with a mixing chamber large enough to prevent spillage.

2.1.3. **Modified Weigh-Batch Plants**. Provide a mixing plant that complies with Section 320.2.1.2., “Weigh-Batch Plants,” except as specifically described below.

2.1.3.1. **Aggregate Feeds**. Aggregate control is required at the cold feeds. Hot bin screens are not required.

2.1.3.2. **Surge Bins**. Provide one or more bins large enough to produce one complete batch of mixture.

2.2. **Hauling Equipment**. Provide trucks with enclosed sides to prevent asphalt mixture loss. Cover each load of mixture with waterproof tarpaulins when shown on the plans or required by the Engineer. Clean all truck beds before use to ensure the mixture is not contaminated. Coat the inside truck beds, when necessary, with an approved release agent from the Department's MPL.

2.3. **Placement and Compaction Equipment**. Provide equipment that does not damage underlying pavement. Comply with laws and regulations concerning overweight vehicles. Use other equipment that will consistently produce satisfactory results, when approved.

2.3.1. **Asphalt Paver**. Furnish a paver that will produce a finished surface that meets longitudinal and transverse profile, typical section, and placement requirements. Ensure the paver does not support the weight of any portion of hauling equipment other than the connection. Provide loading equipment that does not transmit vibrations or other motions to the paver that adversely affect the finished pavement quality. Equip the paver with an automatic, dual, longitudinal-grade control system and an automatic, transverse-grade control system.

2.3.1.1. **Tractor Unit**. Supply a tractor unit that can push or propel vehicles, dumping directly into the finishing machine to obtain the desired lines and grades to eliminate any hand finishing. Equip the unit with a hitch able to maintain contact between the hauling equipment's rear wheels and the finishing machine's pusher rollers while mixture is unloaded.

2.3.1.2. **Screed**. Provide a heated compacting screed that will produce a finished surface that meets longitudinal and transverse profile, typical section, and placement requirements. Screed extensions must provide the same compacting action and heating as the main unit unless otherwise approved.

2.3.1.3. **Grade Reference**. Provide a grade reference with enough support that the maximum deflection does not exceed 1/16 in. between supports. Ensure that the longitudinal controls can operate from any longitudinal grade reference, including a string line, ski, mobile reference, or joint matching shoes.

2.3.2. **Spray Paver**. Furnish a spray paver that will spray the membrane, apply the type and grade of mix shown on the plans, and level the surface of the pavement layer in a single pass. Configure the spray paver so that no equipment tires will drive through the membrane.

2.3.2.1. **Membrane Storage Tank and Distribution System**. Equip the spray paver with an insulated storage tank with a minimum capacity of 900 gal., unless otherwise approved. Provide a metered mechanical pressure sprayer on the spray paver to apply the membrane at the specified rate. Provide a readout device on the spray paver to monitor the membrane application rate.

Unless otherwise directed, furnish a volumetric calibration and strap stick for the tank in accordance with Tex-922-K, Part I. Calibrate the tank within the previous 5 yr. of the date first used on the project. The Engineer may verify calibration accuracy in accordance with Tex-922-K, Part II.

2.3.3. **Material Transfer Devices**. Provide the specified type of device when shown on the plans. Ensure the devices provide a continuous, uniform mixture flow to the asphalt paver. Provide windrow pickup equipment, when used, constructed to pick up substantially all roadway mixture placed in the windrow.

2.3.4. **Remixing Equipment**. Provide equipment, when required, that includes a pug mill, variable pitch augers, or variable diameter augers operating under a storage unit with a minimum capacity of 8 ton.

2.3.5. **Motor Grader**. Provide a self-propelled grader, when allowed, with a blade length of at least 12 ft. and a wheelbase of at least 16 ft.

2.3.6. **Thermal Imaging System or Hand-Held Thermal Camera**. Provide a thermal imaging system or hand-held thermal camera meeting the requirements of Tex-244-F.

2.3.7. **Rollers**. Provide rollers meeting the requirements of Item 210, “Rolling,” for each type of roller required for compaction.

2.3.8. **Straightedges and Templates**. Furnish 10-ft. straightedges and other templates as required or approved.

2.4. **Field Laboratory**. Provide and maintain a Type D structure (hot-mix asphalt laboratory) unless otherwise shown on the plans in accordance with Item 504, “Field Office and Laboratory.”

2.5. **Coring Equipment**. Provide equipment suitable to obtain a pavement specimen meeting the dimensions for testing when coring is required.

3. MEASUREMENT AND PAYMENT

The work performed, materials furnished, equipment, labor, tools, and incidentals will not be measured or paid for directly, but will be subsidiary to pertinent Items.

Item 341
Dense-Graded Hot-Mix Asphalt

1. DESCRIPTION

Construct a hot-mix asphalt (HMA) pavement layer composed of a compacted, dense-graded mixture of aggregate, asphalt binder, and additives mixed hot in a mixing plant. Payment adjustments will apply to HMA placed under this Specification unless the HMA is deemed exempt in accordance with Section 341.4.9.4., "Exempt Production."

2. MATERIALS

Furnish uncontaminated materials of uniform quality that meet the requirements of the plans and specifications.

Notify the Engineer of all material sources and before changing any material source or formulation. The Engineer will verify that the specification requirements are met and document all material source changes when the Contractor makes a source or formulation change. The Engineer may sample and test project materials anytime during the project to verify specification compliance in accordance with Item 6, "Control of Materials."

2.1. **Aggregate**. Furnish aggregates from sources that conform to the requirements shown in Table 1 and this Section. Aggregate requirements in this Section, including those shown in Table 1, may be modified or eliminated when shown on the plans. Additional aggregate requirements may be specified when shown on the plans. Provide aggregate stockpiles that meet the definitions in this Section for coarse, intermediate, or fine aggregate. Aggregate from reclaimed asphalt pavement (RAP) is not required to meet Table 1 requirements unless otherwise shown on the plans. Supply aggregates that meet the definitions in Tex-100-E for crushed gravel or crushed stone. The Engineer will designate the plant or the quarry as the sampling location. Provide samples from materials produced for the project. The Engineer will establish the Surface Aggregate Classification (SAC) and perform Los Angeles abrasion, magnesium sulfate soundness, and Micro-Deval tests. Perform all other aggregate quality tests shown in Table 1. Document all test results in the mixture design report. The Engineer may perform tests on independent or split samples to verify Contractor test results. Stockpile aggregates for each source and type separately. Determine aggregate gradations for mixture design and production testing based on the washed sieve analysis in accordance with Tex-200-F, Part II.

2.1.1. **Coarse Aggregate**. Coarse aggregate stockpiles must have no more than 20% material passing the No. 8 sieve. Aggregates from sources listed in the Department's Bituminous Rated Source Quality Catalog (BRSQC) are preapproved for use. Use only the rated values for HMA listed in the BRSQC. Rated values for surface treatment (ST) do not apply to coarse aggregate sources used in HMA.

For sources not listed in the Department's BRSQC:

- build an individual stockpile for each material;
- request the Department test the stockpile for specification compliance;
- allow 30 calendar days for the Engineer to sample, test, and report results;
- use only when tested and approved; and
- once approved, do not add additional material to the stockpile unless otherwise allowed by the Engineer.

Provide coarse aggregate with at least the minimum SAC shown on the plans. SAC requirements apply only to aggregates used on the surface of travel lanes, unless otherwise shown on the plans. The SAC for sources in the Department's *Aggregate Quality Monitoring Program* (AQMP) (Tex-499-A) is listed in the BRSQC.

2.1.1.1. **Blending Class A and Class B Aggregates**. Class B aggregate meeting all other requirements shown in Table 1 may be blended with a Class A aggregate to meet requirements for Class A materials, unless otherwise shown on the plans. When blending Class A and Class B aggregates to meet a Class A requirement, ensure that at least 50% by weight, or volume if required, of the material retained on the No. 4 sieve comes from the Class A aggregate source, unless otherwise shown on the plans. Blend by volume if the bulk specific gravities of the Class A and Class B aggregates differ by more than 0.300. Coarse aggregate from RAP and recycled asphalt shingles (RAS) will be considered as Class B aggregate for blending purposes.

The Engineer may perform tests anytime during production, when the Contractor blends Class A and Class B aggregates to meet a Class A requirement. The Engineer will use the Department's mix design template, when electing to verify conformance, to calculate the percent of Class A aggregate retained on the No. 4 sieve by inputting the bin percentages shown from readouts in the control room at the time of production and stockpile gradations measured at the time of production. The Engineer may determine the gradations based on either washed or dry sieve analysis from samples obtained from individual aggregate cold feed bins or aggregate stockpiles. The Engineer may perform spot checks to verify the percent of Class A aggregate retained on the No. 4 sieve. The Engineer will use the gradations supplied by the Contractor in the mixture design report as an input for the template. A failing spot check will require confirmation with a stockpile gradation determined by the Engineer.

2.1.1.2. **Micro-Deval Abrasion**. The Engineer will perform at least one Micro-Deval abrasion test in accordance with Tex-461-A for each coarse aggregate source used in the mixture design that has a rated source soundness magnesium (RSSM) loss value greater than 15 as listed in the BRSQC. The Engineer will perform testing before the start of production and may perform additional testing anytime during production. The Engineer may obtain the coarse aggregate samples from each coarse aggregate source or may require the Contractor to obtain the samples. The Engineer may waive all Micro-Deval testing based on a satisfactory test history of the same aggregate source.

The Engineer will estimate the magnesium sulfate soundness loss for each coarse aggregate source, when tested, using the following formula:

$$Mg_{est.} = (RSSM)(MD_{act.}/RSMD)$$

where:
$Mg_{est.}$ = magnesium sulfate soundness loss
$RSSM$ = rated source soundness magnesium
$MD_{act.}$ = actual Micro-Deval percent loss
$RSMD$ = rated source Micro-Deval

When the estimated magnesium sulfate soundness loss is greater than the maximum magnesium sulfate soundness loss specified, the coarse aggregate source will not be allowed for use unless otherwise approved. The Engineer will consult the Materials and Tests Division, and additional testing may be required before granting approval.

2.1.2. **Intermediate Aggregate**. Aggregates not meeting the definition of coarse or fine aggregate will be defined as intermediate aggregate. Supply intermediate aggregates, when used, that are free of organic impurities. Supply intermediate aggregate from coarse aggregate sources, when used, that meet the requirements shown in Table 1, unless otherwise approved.

Test the stockpile if 10% or more of the stockpile is retained on the No. 4 sieve, and verify that it meets the requirements in Table 1 for crushed face count (Tex-460-A) and flat and elongated particles (Tex-280-F).

2.1.3. **Fine Aggregate**. Fine aggregates consist of manufactured sands, screenings, and field sands. Fine aggregate stockpiles must meet the fine aggregate properties in accordance with Table 1 and the gradation requirements in accordance with Table 2. Supply fine aggregates that are free of organic impurities. The Engineer may test the fine aggregate in accordance with Tex-408-A to verify the material is free of organic impurities. Unless otherwise shown on the plans, at most 10% of the total aggregate may be field sand or other uncrushed fine aggregate. Use fine aggregate, except field sand, from coarse aggregate sources that meet the requirements shown in Table 1, unless otherwise approved.

Test the stockpile if 10% or more of the stockpile is retained on the No. 4 sieve and verify that it meets the requirements in Table 1 for crushed face count (Tex-460-A) and flat and elongated particles (Tex-280-F).

Table 1
Aggregate Quality Requirements

Property	Test Method	Requirement
Coarse Aggregate		
SAC	Tex-499-A (AQMP)	As shown on the plans
Deleterious material, %, Max	Tex-217-F, Part I	1.5
Decantation, %, Max	Tex-217-F, Part II	1.5
Micro-Deval abrasion, %	Tex-461-A	Note [1]
Los Angeles abrasion, %, Max	Tex-410-A	40
Magnesium sulfate soundness, 5 cycles, %, Max	Tex-411-A	30
Crushed face count,[2] %, Min	Tex-460-A, Part I	85
Flat and elongated particles @ 5:1, %, Max	Tex-280-F	10
Fine Aggregate		
Linear shrinkage, %, Max	Tex-107-E	3
Sand equivalent, %, Min	Tex-203-F	45[3]
Organic impurities	Tex-408-A	Note [4]

1. Used to estimate the magnesium sulfate soundness loss in accordance with Section 341.2.1.1.2., "Micro-Deval Abrasion."
2. Only applies to crushed gravel.
3. The Department may perform Tex-252-F on fine aggregates not meeting this minimum requirement. Fine aggregates with a methylene blue value of 10.0 mg/g or less may be used.
4. Optional test.

Table 2
Gradation Requirements for Fine Aggregate

Sieve Size	% Passing by Wt. Or Volume
3/8"	100
#8	70–100
#200	0–30

2.2. **Mineral Filler**. Mineral filler consists of finely divided mineral matter such as agricultural lime, crusher fines, hydrated lime, or fly ash. Mineral filler is allowed unless otherwise shown on the plans. Use no more than 2% hydrated lime or fly ash, unless otherwise shown on the plans. Use no more than 1% hydrated lime if a substitute binder is used, unless otherwise shown on the plans or allowed. Test all mineral fillers except hydrated lime and fly ash in accordance with Tex-107-E to ensure specification compliance. The plans may require or disallow specific mineral fillers. Provide mineral filler, when used, that:

- is dry enough, free-flowing, and free of clumps and foreign matter as determined by the Engineer;
- does not exceed 3% linear shrinkage when tested in accordance with Tex-107-E; and
- meets the gradation requirements shown in Table 3, unless otherwise shown on the plans.

Table 3
Gradation Requirements for Mineral Filler

Sieve Size	% Passing by Wt. or Volume
#8	100
#200	55–100

2.3. **Baghouse Fines**. Fines collected by the baghouse or other dust-collecting equipment may be reintroduced into the mixing drum.

2.4. **Asphalt Binder**. Furnish the type and grade of performance-graded (PG) asphalt binder shown on the plans that meets the requirements of Item 300, "Asphalts, Oils, and Emulsions."

2.5. **Tack Coat**. Furnish CSS-1H, SS-1H, EBL, or a PG binder with a minimum high-temperature grade of PG 58 for tack coat binder in accordance with Item 300. Specialized tack coat materials on the MPL for *Tracking Resistant Asphalt Interlayer* (TRAIL) will be allowed or required when shown on the plans. Do not dilute emulsified asphalts at the terminal, in the field, or at any other location before use, unless required in conformance with the manufacturer's recommendation for approved TRAIL products on the MPL.

2.6. **Additives**. Use the type of additive specified when shown on the plans. Use the rate of additive specified in conformance with the manufacturer's recommendation. Additives that facilitate mixing and compaction or improve the quality of the mixture are allowed when approved. Provide the Engineer with documentation such as the bill of lading showing the quantity of additives used in the project unless otherwise directed.

2.6.1. **Lime and Liquid Antistripping Agent**. Lime or liquid antistripping agent is required when shown on the plans. When lime or a liquid antistripping agent is used, add in accordance with Item 301, "Asphalt Antistripping Agents." Do not add lime directly into the mixing drum of any plant where lime is removed through the exhaust stream unless the plant has a baghouse or dust collection system that reintroduces the lime into the drum.

2.6.2. **Warm-Mix Asphalt (WMA)**. WMA is defined as HMA that is produced within a target temperature discharge range of 215°F and 275°F using approved WMA additives or processes from the MPL.

WMA is allowed for use on all projects and is required when shown on the plans. When WMA is required, the maximum placement or target discharge temperature for WMA will be set at a value at or below 275°F.

Department-approved WMA additives or processes may be used to facilitate mixing and compaction of HMA produced at target discharge temperatures above 275°F; however, such mixtures will not be defined as WMA.

2.6.3. **Compaction Aid**. Compaction aid is defined as a Department-approved chemical warm-mix additive, denoted as "chemical additive" on the MPL, that is used to facilitate mixing and compaction of HMA at a discharge temperature greater than 275°F.

Compaction aid is allowed for use on all projects. Compaction aid is required when shown on the plans or as required in Section 341.4.7.1., "Weather Conditions."

Warm-mix foaming processes, denoted as "foaming process" on the MPL, may be used to facilitate mixing and compaction of HMA at target discharge temperatures greater than 275°F; however, warm-mix foaming processes are not defined as a compaction aid.

2.7. **Recycled Materials**. Use of RAP and RAS is permitted unless otherwise shown on the plans. Use of RAS is restricted to only intermediate and base mixes unless otherwise shown on the plans. Do not exceed the maximum allowable percentages of RAP and RAS in accordance with Table 4. The allowable percentages in accordance with Table 4 may be decreased or increased when shown on the plans. Determine the asphalt binder content and gradation of the RAP and RAS stockpiles for mixture design purposes in accordance with Tex-236-F, Part I. The Engineer may verify the asphalt binder content of the stockpiles anytime during production. Perform other tests on RAP and RAS when shown on the plans. Asphalt binder from RAP and

RAS is designated as recycled asphalt binder. Calculate and ensure that the ratio of the recycled asphalt binder to total binder does not exceed the percentages in accordance with Table 5 during mixture design and HMA production when RAP or RAS is used. Use a separate cold feed bin for each stockpile of RAP and RAS during HMA production. Surface, intermediate, and base mixes referenced in Table 4 and Table 5 are defined as follows, unless otherwise shown on the plans.

- **Surface**. The final HMA lift placed at the top of the pavement structure.
- **Intermediate**. Mixtures placed below an HMA surface mix and less than or equal to 8.0 in. below the riding surface.
- **Base**. Mixtures placed greater than 8.0 in. below the riding surface. Unless otherwise shown on the plans, mixtures used for bond breaker are defined as base mixtures.

2.7.1. **RAP**. RAP is salvaged, milled, pulverized, broken, or crushed asphalt pavement. Fractionated RAP is defined as a stockpile that contains RAP material with at least 95.0% passing the 1/2-in. sieve, before burning in the ignition oven, unless otherwise approved. The Engineer may allow the Contractor to use an alternate to the 1/2-in. screen to fractionate the RAP.

Use of Contractor-owned RAP, including HMA plant waste, is permitted unless otherwise shown on the plans. Department-owned RAP stockpiles are available for the Contractor's use when the stockpile locations are shown on the plans. If Department-owned RAP is available for the Contractor's use, the Contractor may use Contractor-owned fractionated RAP and replace it with an equal quantity of Department-owned RAP. Department-owned RAP generated by required work on the Contract is available for the Contractor's use when shown on the plans. Perform any necessary tests to ensure Contractor- or Department-owned RAP is appropriate for use. The Department will not perform any tests or assume any liability for the quality of the Department-owned RAP unless otherwise shown on the plans. The Contractor will retain ownership of RAP generated on the project when shown on the plans.

Do not use Department- or Contractor-owned RAP contaminated with dirt or other objectionable materials. Do not use Department- or Contractor-owned RAP if the decantation value exceeds 5% and the plasticity index is greater than 8. Test the stockpiled RAP for decantation in accordance with Tex-406-A, Part I. Determine the plasticity index in accordance with Tex-106-E if the decantation value exceeds 5%. The decantation and plasticity index requirements do not apply to RAP samples with asphalt removed by extraction or ignition.

Do not intermingle Contractor-owned RAP stockpiles with Department-owned RAP stockpiles. Remove unused Contractor-owned RAP material from the project site upon completion of the project. Return unused Department-owned RAP to the designated stockpile location.

Table 4
Max Allowable Amounts of RAP[1]

Max Allowable Fractionated RAP (%)		
Surface	**Intermediate**	**Base**
20.0	30.0	35.0

1. Must also meet the recycled binder to total binder ratio shown in Table 5.

2.7.2. **RAS**. RAS is defined as processed asphalt shingle material from manufacturing of asphalt roofing shingles or from re-roofing residential structures. Post-manufactured RAS is processed manufacturer's shingle scrap byproduct. Post-consumer RAS is processed shingle scrap removed from residential structures. Use of post-manufactured RAS or post-consumer RAS (tear-offs) is not permitted in surface mixtures unless otherwise shown on the plans. RAS may be used in intermediate and base mixtures unless otherwise shown on the plans. Up to 3% RAS may be used separately or as a replacement for fractionated RAP in accordance with Table 4 and Table 5. RAS may be used separately or in conjunction with RAP. Comply with all regulatory requirements stipulated for RAS by TCEQ.

Process the RAS by ambient grinding or granulating such that 100% of the particles pass the 3/8-in. sieve when tested in accordance with Tex-200-F, Part I. Perform a sieve analysis on processed RAS material before extraction (or ignition) of the asphalt binder.

Add sand meeting the requirements of Table 1 and Table 2, or fine RAP, to RAS stockpiles if needed to keep the processed material workable. Any stockpile that contains RAS will be considered a RAS stockpile and be limited to no more than 3.0% of the HMA mixture in accordance with Table 4.

Certify compliance of the RAS with DMS-11000, "Evaluating and Using Nonhazardous Recyclable Materials Guidelines." Treat RAS as an established nonhazardous recyclable material if it has not come into contact with any hazardous materials. Use RAS from shingle sources on the MPL. Remove all materials that are not part of the shingle, such as wood, paper, metal, plastic, and felt paper, before use. Determine the deleterious content of RAS material for mixture design purposes in accordance with Tex-217-F, Part III. Do not use RAS if deleterious materials are more than 0.5% of the stockpiled RAS, unless otherwise approved. Submit a sample for approval before submitting the mixture design. The Department will perform the testing for deleterious material of RAS to determine specification compliance.

2.8. **Substitute Binders**. No binder substitution will be allowed when shown on the plans. The Contractor may use a substitute PG binder shown in Table 5 instead of the PG binder originally specified, if using recycled materials, and if the substitute PG binder and mixture made with the substitute PG binder meet the following.

- The substitute binder meets the specification requirements for the substitute binder grade in accordance with Section 300.2.11., "Performance-Graded Binders."
- The mixture has less than 10.0 mm of rutting on the Hamburg wheel test (Tex-242-F) after the number of passes required for the originally specified binder. Use of substitute PG binders may be allowed only at the discretion of the Engineer if the Hamburg wheel test results are between 10.0 mm and 12.5 mm.

Table 5
Allowable PG Binders and Max Recycled Binder Ratios

Originally Specified PG Binder	Allowable Substitute PG Binder for Surface Mixes	Allowable Substitute PG Binder for Intermediate and Base Mixes	Max Ratio of Recycled Binder[1] to Total Binder (%)		
			Surface	Intermediate	Base
76-22	70-22	70-22	15.0	25.0	30.0
70-22	Note [2]	64-22	15.0	25.0	30.0
64-22	Note [2]	Note [2]	15.0	25.0	30.0
76-28	70-28	70-28	15.0	25.0	30.0
70-28	Note [2]	64-28	15.0	25.0	30.0
64-28	Note [2]	Note [2]	15.0	25.0	30.0

1. Combined recycled binder from RAP and RAS. RAS is not permitted in surface mixtures unless otherwise shown on the plans.
2. No binder substitution is allowed.

3. EQUIPMENT

Provide required or necessary equipment in accordance with Item 320, "Equipment for Asphalt Concrete Pavement."

4. CONSTRUCTION

Produce, haul, place, and compact the specified paving mixture. In addition to tests required in accordance with the Specification, the Contractor may perform other QC tests as necessary. Anytime during the project, the Engineer may perform production and placement tests as necessary in accordance with Item 5, "Control of the Work." Schedule and participate in a mandatory pre-paving meeting with the Engineer on or before the first day of paving unless otherwise shown on the plans.

4.1. **Certification**. Personnel certified by the Department-approved HMA certification program must conduct all mixture designs, sampling, and testing in accordance with Table 6. Supply the Engineer with a list of certified personnel and copies of their current certificates before beginning production and when personnel changes are made. Provide a mixture design developed and signed by a Level 2-certified specialist. Provide Level 1A-certified specialists at the plant during production operations. Provide Level 1B-certified specialists to conduct placement tests. Provide Level AGG101-certified specialists for aggregate testing.

Table 6
Test Methods, Test Responsibility, and Min Certification Levels

Test Description	Test Method	Contractor	Engineer	Level[1]
Aggregate and Recycled Material Testing				
Sampling	Tex-221-F	✓	✓	1A/AGG101
Dry sieve	Tex-200-F, Part I	✓	✓	1A/AGG101
Washed sieve	Tex-200-F, Part II	✓	✓	1A/AGG101
Deleterious material	Tex-217-F, Part I and Part III	✓	✓	AGG101
Decantation	Tex-217-F, Part II	✓	✓	AGG101
Los Angeles abrasion	Tex-410-A	–	✓	Department
Magnesium sulfate soundness	Tex-411-A	–	✓	Department
Micro-Deval abrasion	Tex-461-A	–	✓	AGG101
Crushed face count	Tex-460-A	✓	✓	AGG101
Flat and elongated particles	Tex-280-F	✓	✓	AGG101
Linear shrinkage	Tex-107-E	✓	✓	AGG101
Sand equivalent	Tex-203-F	✓	✓	AGG101
Methylene blue test	Tex-252-F	–	✓	Department
Bulk-specific gravity	Tex-201-F	✓	✓	AGG101
Organic impurities	Tex-408-A	✓	✓	AGG101
Asphalt Binder and Tack Coat Sampling				
Asphalt binder sampling	Tex-500-C, Part II	✓	✓	1A/1B
Tack coat sampling	Tex-500-C, Part III	✓	✓	1A/1B
Mix Design and Verification				
Design and job-mix formula (JMF) changes	Tex-204-F	✓	✓	2
Mixing	Tex-205-F	✓	✓	2
Molding (Superpave gyratory compactor [SGC])	Tex-241-F	✓	✓	1A
Laboratory-molded density	Tex-207-F, Part I and Part VI	✓	✓	1A
Rice gravity	Tex-227-F, Part II	✓	✓	1A
Ignition oven correction factors[2]	Tex-236-F, Part II	✓	✓	1A
Indirect tensile strength	Tex-226-F	✓	✓	1A
Hamburg wheel test	Tex-242-F	✓	✓	1A
Witnessing mixing of correction factors	Tex-236-F, Part III	–	✓	1A/Department
Boil test	Tex-530-C	✓	✓	1A
Production Testing				
Selecting production random numbers	Tex-225-F, Part I	–	✓	1A
Mixture sampling	Tex-222-F	✓	✓	1A/1B
Molding (SGC)	Tex-241-F	✓	✓	1A
Laboratory-molded density	Tex-207-F, Part I and Part VI	✓	✓	1A
Rice gravity	Tex-227-F, Part II	✓	✓	1A
Gradation and asphalt binder content[2]	Tex-236-F, Part I	✓	✓	1A
Control charts	Tex-233-F	✓	✓	1A
Moisture content	Tex-212-F, Part II	✓	✓	1A/AGG101
Hamburg wheel test	Tex-242-F	✓	✓	1A
Micro-Deval abrasion	Tex-461-A	–	✓	AGG101
Boil test	Tex-530-C	✓	✓	1A
Absorption recovery	Tex-211-F	–	✓	Department

Test Description	Test Method	Contractor	Engineer	Level[1]
Placement Testing				
Selecting placement random numbers	Tex-225-F, Part II	–	✓	1B
Trimming roadway cores	Tex-251-F, Part I and Part II	✓	✓	1A/1B
In-place air voids	Tex-207-F, Part I and Part VI	✓	✓	1A
In-place density (nuclear method)	Tex-207-F, Part III	✓	–	1B
Establish rolling pattern	Tex-207-F, Part IV	✓	–	1B
Control charts	Tex-233-F	✓	✓	1A
Ride quality measurement	Tex-1001-S	✓	✓	Note[3]
Segregation (density profile)	Tex-207-F, Part V	✓	✓	1B
Longitudinal joint density	Tex-207-F, Part VII	✓	✓	1B
Thermal profile	Tex-244-F	✓	–	1B
Shear bond strength test	Tex-249-F	–	✓	Department

1. Levels 1A, 1B, AGG101, and 2 are certification levels provided by the Hot Mix Asphalt Center certification program.
2. Refer to Section 341.4.9.2.3., "Production Testing," for exceptions to using an ignition oven.
3. Profiler and operator are required to be certified at the Texas A&M Transportation Institute facility when surface test Type B is specified.

4.2. **Reporting and Responsibilities**. Use Department-provided templates to record and calculate all test data, including mixture design, production and placement QC and QA, control charts, thermal profiles, segregation density profiles, and longitudinal joint density. Obtain the current version of the templates from the Department's website or from the Engineer. The Engineer and the Contractor will provide any available test results to the other party when requested. The maximum allowable time for the Contractor and Engineer to exchange test data is as shown in Table 7, unless otherwise approved. The Engineer and the Contractor will immediately report to the other party any test result that requires suspension of production or placement, or a payment adjustment less than 1.000, or that fails to meet the specification requirements. Record and electronically submit all test results and pertinent information on Department-provided templates.

Subsequent sublots placed after test results are available to the Contractor, which require suspension of operations, may be considered unauthorized work. Unauthorized work will be accepted or rejected at the discretion of the Engineer in accordance with Article 5.3., "Conformity with Plans, Specifications, and Special Provisions."

Table 7
Reporting Schedule

Description	Reported By	Reported To	To Be Reported Within
Production Quality Control			
Gradation[1]	Contractor	Engineer	1 working day of completion of the sublot
Asphalt binder content[1]			
Laboratory-molded density[2]			
Moisture content[3]			
Boil test[4]			
Production Quality Assurance			
Gradation[3]	Engineer	Contractor	1 working day of completion of the sublot
Asphalt binder content[3]			
Laboratory-molded density[1]			
Hamburg wheel test[5]			
Boil test[4]			
Binder tests[5]			
Placement Quality Control			
In-place air voids[2]	Contractor	Engineer	1 working day of completion of the lot
Segregation[1]			
Longitudinal joint density[1]			
Thermal profile[1]			

Description	Reported By	Reported To	To Be Reported Within
Placement Quality Assurance			
In-place air voids[1]	Engineer	Contractor	1 working day after receiving the trimmed cores[6]
Segregation[3]			1 working day of completion of the lot
Longitudinal joint density[3]			
Thermal profile[3]			
Aging ratio[5]			
Shear bond strength test[5]			5 working days after receiving the cores
Payment adjustment summary	Engineer	Contractor	2 working days of performing all required tests and receiving Contractor test data

1. These tests are required on every sublot.
2. Optional test. When performed on split samples, report the results as soon as they become available.
3. To be performed at the frequency shown in Table 16 or as shown on the plans.
4. When shown on the plans.
5. To be reported as soon as the results become available.
6. Two days are allowed if cores cannot be dried to constant weight within 1 day.

The Engineer will use the Department-provided template to calculate all payment adjustment factors for the lot. Sublot samples may be discarded after the Engineer and Contractor sign off on the payment adjustment summary documentation for the lot.

Use the procedures described in Tex-233-F to plot the results of all QC and QA testing. Update the control charts as soon as test results for each sublot become available. Make the control charts readily accessible at the field laboratory. The Engineer may suspend production for failure to update control charts.

4.3. **Quality Control Plan (QCP)**. Develop and follow the QCP in detail. Obtain approval for changes to the QCP made during the project. The Engineer may suspend operations if the Contractor fails to comply with the QCP.

Submit a written QCP before the mandatory pre-paving meeting. Receive approval of the QCP before beginning production. Include the following items in the QCP.

4.3.1. **Project Personnel**. For project personnel, include:

- a list of individuals responsible for QC with authority to take corrective action,
- current contact information for each individual listed, and
- current copies of certification documents for individuals performing specified QC functions.

4.3.2. **Material Delivery and Storage**. For material delivery and storage, include:

- the sequence of material processing, delivery, and minimum quantities to assure continuous plant operations;
- aggregate stockpiling procedures to avoid contamination and segregation;
- frequency, type, and timing of aggregate stockpile testing to assure conformance with material requirements before mixture production; and
- procedure for monitoring the quality and variability of asphalt binder.

4.3.3. **Production**. For production, include:

- loader operation procedures to avoid contamination in cold bins;
- procedures for calibrating and controlling cold feeds;
- procedures to eliminate debris or oversized material;
- procedures for adding and verifying rates of each applicable mixture component (e.g., aggregate, asphalt binder, RAP, RAS, lime, liquid antistrip, compaction aid, foaming process, and WMA);

- procedures for reporting job control test results; and
- procedures to avoid segregation and drain-down in the silo.

4.3.4. **Loading and Transporting**. For loading and transporting, include:

- type and application method for release agents, and
- truck-loading procedures to avoid segregation.

4.3.5. **Placement and Compaction**. For placement and compaction, include:

- proposed agenda for mandatory pre-paving meeting, including date and location;
- proposed paving plan (e.g., production rate, paving widths, joint offsets, and lift thicknesses);
- type and application method for release agents in the paver and on rollers, shovels, lutes, and other utensils;
- procedures for the transfer of mixture into the paver while avoiding physical and thermal segregation and preventing material spillage;
- process to balance production, delivery, paving, and compaction to achieve continuous placement operations and good ride quality;
- paver operations (e.g., speed, operation of wings, and height of mixture in auger chamber) to avoid physical and thermal segregation and other surface irregularities; and
- procedures to construct quality longitudinal and transverse joints.

4.4. **Mixture Design**.

4.4.1. **Design Requirements**. Use the dense-graded design procedure provided in Tex-204-F, unless otherwise shown on the plans. Design the mixture to meet the requirements shown in Tables 1, 2, 3, 4, 5, 8, 9, and 10.

Design the mixture using an SGC, and 50 gyrations as the design number of gyrations (Ndesign). Use a target laboratory-molded density of 96.0% to design the mixture; however, adjustments can be made to the Ndesign value as shown in Table 9. The Ndesign level may be reduced to at least 35 gyrations at the Contractor's discretion.

Use a Department-approved laboratory on the MPL to perform the Hamburg wheel test and provide results with the mixture design, or provide the laboratory mixture and request that the Department perform the Hamburg wheel test. Upon receiving the sample from the Contractor, the Engineer will be allowed 10 working days to provide the Contractor with Hamburg wheel test results on the laboratory mixture design.

The Engineer will provide the mixture design when shown on the plans. The Contractor may submit a new mixture design anytime during the project. The Engineer will verify and approve all mixture designs (JMF1) before the Contractor can begin production.

Provide the Engineer with a mixture design report using the Department-provided template. Include the following items in the report:

- the combined aggregate gradation, source, specific gravity, and percent of each material used;
- the binder source and optimum design asphalt content;
- asphalt binder content and aggregate gradation of RAP and RAS stockpiles;
- the Ndesign level used on the SGC;
- results of all applicable tests;
- the mixing and molding temperatures;
- the signature of the Level 2 person or persons who performed the design;
- the date the mixture design was performed; and
- a unique identification number for the mixture design.

Table 8
Master Gradation Limits (% Passing by Wt. or Volume) and Void in Mineral Aggregate (VMA) Requirements

Sieve Size	DG-B Fine Base	DG-C Coarse Surface	DG-D Fine Surface	DG-F Fine Mixture
2"	–	–	–	–
1-1/2"	100.0[1]	–	–	–
1"	98.0–100.0	100.0[1]	–	–
3/4"	84.0–98.0	95.0–100.0	100.0[1]	–
1/2"	—	—	98.0–100.0	100.0[1]
3/8"	60.0–80.0	70.0–85.0	85.0–100.0	98.0–100.0
#4	40.0–60.0	43.0–63.0	50.0–70.0	70.0–90.0
#8	29.0–43.0	32.0–44.0	35.0–46.0	38.0–48.0
#30	13.0–28.0	14.0–28.0	15.0–29.0	12.0–27.0
#50	6.0–20.0	7.0–21.0	7.0–20.0	6.0–19.0
#200	2.0–7.0	2.0–7.0	2.0–7.0	2.0–7.0
Design (VMA), % Min				
–	13.0	14.0	15.0	16.0
Production (Plant-Produced) (VMA), % Min				
–	12.5	13.5	14.5	15.5

1. Defined as Max sieve size. No tolerance allowed.

Table 9
Laboratory Mixture Design Properties

Mixture Property	Test Method	Requirement
Target laboratory-molded density, %	Tex-207-F	96.0
Design gyrations (Ndesign)	Tex-241-F	50[1]
Indirect tensile strength (dry), psi	Tex-226-F	85–200[2]
Boil test[3]	Tex-530-C	–

1. Adjust within a range of 35–100 gyrations when shown on the plans, in accordance with the specification, or when mutually agreed between the Engineer and Contractor.
2. The Engineer may allow the indirect tensile test strength to exceed 200 psi if the corresponding Hamburg wheel rut depth is >2.5 mm and <12.5 mm.
3. When shown on the plans. Used to establish baseline for comparison to production results.

Table 10
Hamburg Wheel Test Requirements

High-Temperature Binder Grade	Test Method	Min # of Passes at 12.5-mm[1] Rut Depth, Tested at 50°C
PG 64 or lower	Tex-242-F	10,000[2]
PG 70		15,000[3]
PG 76 or higher		20,000

1. The Hamburg wheel test will have a minimum rut depth of 2.5 mm.
2. May be decreased to at least 5,000 passes when shown on the plans.
3. May be decreased to at least 10,000 passes when shown on the plans.

4.4.2. **Job-Mix Formula Approval**. The JMF is the combined aggregate gradation, Ndesign level, and target asphalt percentage used to establish target values for hot-mix production. JMF1 is the original laboratory mixture design used to produce the trial batch. When WMA is used, JMF1 may be designed and submitted to the Engineer without including the WMA additive, foaming process, or compaction aid. When WMA or a compaction aid is used, document the additive or process used and recommended rate in the JMF1 submittal. The Engineer and the Contractor will verify JMF1 based on plant-produced mixture from the trial batch, unless otherwise approved. The Engineer may accept an existing mixture design previously used on a Department project and may waive the trial batch to verify JMF1. The Department may require the Contractor to reimburse the Department for verification tests if more than two trial batches per design are required.

4.4.2.1. **Contractor's Responsibilities**.

4.4.2.1.1. **Providing Superpave Gyratory Compactor**. Provide an SGC in accordance with Item 504, "Field Office and Laboratory," and make the SGC available to the Engineer for use in molding production samples.

4.4.2.1.2. **Gyratory Compactor Correlation Factors**. Use Tex-206-F, Part II, to perform a gyratory compactor correlation when the Engineer uses a different SGC. Apply the correlation factor to all subsequent production test results.

4.4.2.1.3. **Submitting JMF1**. Furnish a mix design report (JMF1) with representative samples of all component materials and request approval to produce the trial batch. Provide approximately 25 lb. of the design mixture if opting to have the Department perform the Hamburg wheel test on the laboratory mixture, and request that the Department perform the test.

4.4.2.1.4. **Supplying Aggregates**. Provide approximately 40 lb. of each aggregate stockpile unless otherwise directed.

4.4.2.1.5. **Supplying Asphalt**. Provide at least 1 gal. of the asphalt material and enough quantities of any additives proposed for use.

4.4.2.1.6. **Ignition Oven Correction Factors**. Notify the Engineer before performing Tex-236-F, Part II. Allow the Engineer to witness the mixing of ignition oven correction factor sample. Determine the aggregate and asphalt correction factors from the ignition oven in accordance with Tex-236-F, Part II.

If the Engineer witnesses the mixing of the ignition oven correction factor samples, provide the Engineer with identically prepared samples of the mixtures before the trial batch production, including all additives (except water), and blank samples used to determine the correction factors for the ignition oven used for QA testing during production.

Correction factors established from a previously approved mixture design may be used for the current mixture design if the mixture design and ignition oven are the same as previously used, unless otherwise directed. Correction factors must be performed every 12 mo.

4.4.2.1.7. **Boil Test**. When shown on the plans, perform the test and retain the tested sample from Tex-530-C until completion of the project or as directed. Use this sample for comparison purposes during production.

4.4.2.1.8. **Trial Batch Production**. Provide a plant-produced trial batch upon receiving conditional approval of JMF1 and authorization to produce a trial batch. If applicable, include the WMA additive, foaming process, or compaction aid for verification testing of JMF1 and development of JMF2. Produce a trial batch mixture that meets the requirements shown in Tables 4, 5, and 11. The Engineer may accept test results from recent production of the same mixture instead of a new trial batch.

4.4.2.1.9. **Trial Batch Production Equipment**. Use only equipment and materials proposed for use on the project to produce the trial batch.

4.4.2.1.10. **Trial Batch Quantity**. Produce enough quantity of the trial batch to ensure that the mixture meets the specification requirements.

4.4.2.1.11. **Number of Trial Batches**. Produce trial batches as necessary to obtain a mixture that meets the specification requirements.

4.4.2.1.12. **Trial Batch Sampling**. Obtain a representative sample of the trial batch and split it into three equal portions in accordance with Tex-222-F. Label these portions as "Contractor," "Engineer," and "Referee." Deliver samples to the appropriate laboratory as directed.

4.4.2.1.13. **Trial Batch Testing**. Test the trial batch to ensure the mixture produced using the proposed JMF1 meets the mixture requirements shown in Table 11. Ensure the trial batch mixture is also in compliance with the

Hamburg wheel requirement shown in Table 10. Use a Department-approved laboratory listed on the MPL to perform the Hamburg wheel test on the trial batch mixture, or request that the Department perform the Hamburg wheel test. Provide approximately 25 lb. of the trial batch mixture if opting to have the Department perform the Hamburg wheel test, and request that the Department perform the test. Upon receiving the sample from the Contractor, the Engineer will be allowed 10 working days to provide the Contractor with Hamburg wheel test results on the trial batch. Provide the Engineer with a copy of the trial batch test results.

4.4.2.1.14. **Development of JMF2**. After the Engineer grants full approval of JMF1, evaluate the trial batch test results, determine the optimum mixture proportions, and submit as JMF2. Adjust the asphalt binder content or gradation to achieve the specified target laboratory-molded density. The asphalt binder content established for JMF2 is not required to be within any tolerance of the optimum asphalt binder content established for JMF1; however, mixture produced using JMF2 must meet the VMA requirements for production shown in Table 8. If the optimum asphalt binder content for JMF2 is more than 0.5% lower than the optimum asphalt binder content for JMF1, the Engineer may perform or require the Contractor to perform Tex-226-F on Lot 1 production to confirm the indirect tensile strength does not exceed 200 psi. Verify that JMF2 meets the mixture requirements shown in Table 4 and Table 5.

4.4.2.1.15. **Mixture Production**. Use JMF2 to produce Lot 1 in accordance with Section 341.4.9.3.1.1., "Lot 1 Placement," after receiving approval for JMF2 and a passing Hamburg wheel result on the trial batch from a laboratory listed on the MPL. Once JMF2 is approved, and without receiving the results from the Department's Hamburg wheel test on the trial batch, the Contractor may proceed to Lot 1 production at their own risk.

Notify the Engineer if electing to proceed without Hamburg wheel test results from the trial batch. Note that the Engineer may require up to the entire sublot of any mixture failing the Hamburg wheel test to be removed and replaced at the Contractor's expense.

4.4.2.1.16. **Development of JMF3**. Evaluate the test results from Lot 1, determine the optimum mixture proportions, and submit as JMF3 for use in Lot 2.

4.4.2.1.17. **JMF Adjustments**. If JMF adjustments are necessary to achieve the specified requirements, make the adjustments before beginning a new lot. The adjusted JMF must:

- be provided to the Engineer in writing before the start of a new lot,
- be numbered in sequence to the previous JMF,
- meet the mixture requirements in accordance with Table 4 and Table 5,
- meet the master gradation limits in accordance with Table 8, and
- be within the operational tolerances of JMF2 in accordance with Table 11.

4.4.2.1.18. **Requesting Referee Testing**. Use referee testing, if needed, in accordance with Section 341.4.9.1., "Referee Testing," to resolve testing differences with the Engineer.

Table 11
Operational Tolerances

Description	Test Method	Allowable Difference Between JMF2 and JMF1 Target[1]	Allowable Difference Between Current JMF and JMF2[2]	Allowable Difference Between Contractor and Engineer[3]
Individual % retained on #8 sieve and larger	Tex-200-F or Tex-236-F	Must be Within Master Gradation Limits in Table 8	±5.0[4]	±5.0
Individual % retained on sieves smaller than #8 and larger than #200			±3.0[4]	±3.0
% passing the #200 sieve			±2.0[4]	±1.6
Asphalt binder content, %	Tex-236-F	±0.5	±0.3	±0.3
Laboratory-molded density, %	Tex-207-F	±1.0	±1.0	±1.0
In-place air voids, %		–	–	±1.0
Laboratory-molded bulk specific gravity		–	–	±0.020
VMA, %, Min	Tex-204-F	Note[5]	Note[5]	–
Theoretical maximum specific (Rice) gravity	Tex-227-F	–	–	±0.020

1. JMF1 is the approved laboratory mixture design used for producing the trial batch. JMF2 is the approved mixture design developed from the trial batch used to produce Lot 1.
2. Current JMF is JMF3 or higher. JMF3 is the approved mixture design used to produce Lot 2.
3. Contractor may request referee testing when values exceed these tolerances.
4. When within these tolerances, mixture production gradations may fall outside the master gradation limits; however, the % passing the #200 will be considered out of tolerance when outside the master gradation limits.
5. Verify that Table 8 requirements are met for VMA.

4.4.2.2. **Engineer's Responsibilities**.

4.4.2.2.1. **Superpave Gyratory Compactor**. The Engineer will use a Department SGC, calibrated in accordance with Tex-241-F, to mold samples for laboratory mixture design verification. For molding trial batch and production specimens, the Engineer will use the Contractor-provided SGC at the field laboratory or provide and use a Department SGC at an alternate location.

4.4.2.2.2. **Conditional Approval of JMF1 and Authorizing Trial Batch**. The Engineer will review and verify conformance with the following information within 2 working days of receipt:

- the Contractor's mix design report (JMF1);
- the Contractor-provided Hamburg wheel test results;
- all required materials including aggregates, asphalt, additives, and recycled materials; and
- the mixture specifications.

The Engineer will grant the Contractor conditional approval of JMF1 if the information provided on the paper copy of JMF1 indicates that the Contractor's mixture design meets the specifications. When the Contractor does not provide Hamburg wheel test results with laboratory mixture design, 10 working days are allowed for conditional approval of JMF1. The Engineer will base full approval of JMF1 on the test results on mixture from the trial batch.

Unless waived, the Engineer will determine the Micro-Deval abrasion loss in accordance with Section 341.2.1.1.2., "Micro-Deval Abrasion." If the Engineer's test results are pending after 2 working days, conditional approval of JMF1 will still be granted within 2 working days of receiving JMF1. When the Engineer's test results become available, they will be used for specification compliance.

The Contractor is authorized to produce a trial batch after the Engineer grants conditional approval of JMF1.

4.4.2.2.3. **Hamburg Wheel Testing of JMF1**. If the Contractor requests the option to have the Department perform the Hamburg wheel test on the laboratory mixture, the Engineer will mold samples in accordance with Tex-242-F to verify compliance with the Hamburg wheel test requirement shown in Table 10. Upon receiving the sample from the Contractor, the Engineer will be allowed 10 working days to provide the Contractor with Hamburg wheel test results on the laboratory mixture design.

4.4.2.2.4. **Ignition Oven Correction Factors**. The Engineer will determine ignition oven correction factors by one of the following options.

- Witness the mixing of ignition oven correction factor samples by the Contractor in accordance with Tex-236-F, Part III. The Engineer will use the identically prepared samples provided by the Contractor to determine the aggregate and asphalt correction factors for the ignition oven in accordance with Tex-236-F, Part II.
- If the Engineer does not witness the mixing of ignition oven correction factor samples, the Engineer will prepare the samples to determine the aggregate and asphalt correction factors for the ignition oven in accordance with Tex-236-F, Part II. Notify the Contractor before performing Tex-236-F, Part II. Allow the Contractor to witness the Engineer performing Tex-236-F, Part II.

Correction factors must be performed every 12 mo. to be used for QA testing during production.

4.4.2.2.5. **Testing the Trial Batch**. Within 1 full working day, the Engineer will sample and test the trial batch to ensure that the mixture meets the requirements shown in Table 11. If the Contractor requests the option to have the Department perform the Hamburg wheel test on the trial batch mixture, the Engineer will mold samples in accordance with Tex-242-F to verify compliance with the Hamburg wheel test requirement shown in Table 10.

The Engineer will have the option to perform the following tests on the trial batch.

- Tex-226-F, to verify that the indirect tensile strength meets the requirement shown in Table 9.
- Tex-530-C, to retain and use for comparison purposes during production.

4.4.2.2.6. **Full Approval of JMF1**. The Engineer will grant full approval of JMF1 and authorize the Contractor to proceed with developing JMF2 if the Engineer's results for the trial batch meet the requirements shown in Tables 8, 9, and 10. The Engineer will notify the Contractor that an additional trial batch is required if the trial batch does not meet these requirements.

4.4.2.2.7. **Approval of JMF2.** The Engineer will approve JMF2 within 1 working day if the mixture meets the requirements shown in Table 5 and Table 8. The asphalt binder content established for JMF2 is not required to be within any tolerance of the optimum asphalt binder content established for JMF1; however, mixture produced using JMF2 must meet the VMA requirements shown in Table 8. If the optimum asphalt binder content for JMF2 is more than 0.5% lower than the optimum asphalt binder content for JMF1, the Engineer may perform or require the Contractor to perform Tex-226-F on Lot 1 production to confirm the indirect tensile strength does not exceed 200 psi.

4.4.2.2.8. **Approval of Lot 1 Production**. The Engineer will authorize the Contractor to proceed with JMF2 for Lot 1 production after a passing Hamburg wheel test result on the trial batch is achieved from a laboratory listed on the MPL. The Contractor may proceed at their own risk with Lot 1 production without the results from the Hamburg wheel test on the trial batch.

If the Department-approved laboratory's sample from the trial batch fails the Hamburg wheel test, the Engineer will suspend production until further Hamburg wheel tests meet the specified values. The Engineer may require up to the entire sublot of any mixture failing the Hamburg wheel test be removed and replaced at the Contractor's expense.

4.4.2.2.9. **Approval of JMF3 and Subsequent JMF Changes**. JMF3 and subsequent JMF changes are approved if they meet the mixture requirements shown in Table 4 and Table 5, and the master gradation limits shown in Table 8, and they are within the operational tolerances of JMF2 shown in Table 11. The addition of a WMA additive to facilitate mixing or as a compaction aid does not require a new laboratory mixture design or trial batch. Current JMF changes that exceed the operational tolerances of JMF2 in accordance with Table 11 may require a new laboratory mixture design, trial batch, or both.

4.5. **Production Operations**. Perform a new trial batch when the plant or plant location is changed. All source changes for asphalt will require a passing Hamburg wheel test result from a laboratory listed on the MPL. The Contractor may proceed at their own risk with Lot 1 production without the results from the Hamburg wheel test on the trial batch. All aggregate source changes will require a new laboratory mixture design and

trial batch. Take corrective action and receive approval to proceed after any production suspension for noncompliance with the specification. Submit a new mix design and perform a new trial batch when the asphalt binder content of:

- any RAP stockpile used in the mix is more than 0.5% higher than the value shown in the mixture design report, or
- RAS stockpile used in the mix is more than 2.0% higher than the value shown in the mixture design report.

4.5.1. **Storage and Heating of Materials**. Do not heat the asphalt binder above the temperatures specified in Item 300, or outside the manufacturer's recommended values. Provide the Engineer with daily records of asphalt binder and HMA discharge temperatures (in legible and discernible increments) in accordance with Item 320, unless otherwise directed. Do not store mixture for a period long enough to affect the quality of the mixture, nor in any case longer than 12 hr. unless otherwise approved.

4.5.2. **Mixing and Discharge of Materials.** Notify the Engineer of the target discharge temperature and produce the mixture within 25°F of the target. Monitor the temperature of the material in the truck before shipping to ensure that it does not exceed the maximum production temperatures shown in Table 12. The Department will not pay for or allow placement of any mixture produced above the maximum production temperatures shown in Table 12.

Table 12
Max Production Temperature

High-Temperature Binder Grade[1]	Max Production Temperature (°F)
PG 64	325[2]
PG 70	335[2]
PG 76	345[2]

1. The high-temperature binder grade refers to the high-temperature grade of the virgin asphalt binder used to produce the mixture.
2. The Max production temperature of WMA is 275°F.

Produce WMA within the target discharge temperature range of 215–275°F when WMA is required. Take corrective action anytime the discharge temperature of the WMA exceeds the target discharge range. The Engineer may suspend production operations if the Contractor's corrective action is not successful at controlling the production temperature within the target discharge range. Note that when WMA is produced, it may be necessary to adjust burners to ensure complete combustion such that no burner fuel residue remains in the mixture.

Control the mixing time and temperature so that substantially all moisture is removed from the mixture before discharging from the plant. Determine the moisture content, if requested, by oven-drying in accordance with Tex-212-F, Part II, and verify that the mixture contains no more than 0.2% of moisture by weight. Obtain the sample immediately after discharging the mixture into the truck and perform the test promptly.

4.6. **Hauling Operations**. Clean all truck beds before use to ensure that mixture is not contaminated. Use a release agent listed on the MPL to coat the inside bed of the truck when necessary. Do not use diesel or any release agent not listed on the MPL.

Use equipment for hauling as defined in Section 341.4.7.3.3., "Hauling Equipment." Use other hauling equipment only when allowed.

4.7. **Placement Operations**. Collect haul tickets from each load of mixture delivered to the project and provide the Department's copy to the Engineer approximately every hour, or as directed. Use a handheld thermal camera or infrared thermometer, when a thermal imaging system is not used, to measure and record the internal temperature of the mixture as discharged from the truck or material transfer device (MTD) before or as the mix enters the paver. Measure the mixture temperature at a minimum frequency of one per ten trucks, or as approved. Include an approximate station number or Global Positioning System coordinates of the

location where the temperature was taken on each ticket. Ensure the mixture meets the temperature requirements shown in Table 12. Calculate the daily yield and cumulative yield for the specified lift and provide to the Engineer at the end of paving operations for each day unless otherwise directed. The Engineer may suspend production if the Contractor fails to produce and provide haul tickets and yield calculations by the end of paving operations for each day.

Prepare the surface by removing raised pavement markers and objectionable material such as moisture, dirt, sand, leaves, and other loose impediments from the surface before placing mixture. Remove vegetation from pavement edges. Place the mixture to meet the typical section requirements and produce a smooth, finished surface with a uniform appearance and texture. Offset longitudinal joints of successive courses of hot mix by at least 6 in. Place mixture so that longitudinal joints on the surface course coincide within 6 in. of lane lines, are not placed in the wheel path, or will not be covered with pavement markings, or as directed. Ensure that all finished surfaces will drain properly. Place the mixture at the rate or thickness shown on the plans. The Engineer will use the guidelines shown in Table 13 to determine the compacted lift thickness of each layer when multiple lifts are required. The thickness determined is based on the rate of 110 lb. per square yard for each inch of pavement, unless otherwise shown on the plans.

Table 13
Compacted Lift Thickness and Required Core Height

Mixture Type	Compacted Lift Thickness Guidelines		Min Untrimmed Core Height Eligible for Testing (in.)
	Min (in.)	Max (in.)	
DG-B	2.50	5.00	1.75
DG-C	2.00	4.00	1.50
DG-D	1.50	3.00	1.25
DG-F	1.25	2.50	1.25

4.7.1. **Weather Conditions**.

4.7.1.1. **When Using a Thermal Imaging System**. Place mixture when the roadway surface is dry and the roadway surface temperature is at or above the temperatures shown in Table 14A, unless otherwise approved or as shown on the plans. Place mixtures only when weather conditions and moisture conditions of the roadway surface are suitable as determined by the Engineer. Provide output data from the thermal imaging system to demonstrate to the Engineer that no recurring severe thermal segregation exists in accordance with Section 341.4.7.3.1.2., “Thermal Imaging System.”

Table 14A
Min Pavement Surface Temperatures

High-Temperature Binder Grade[1]	Min Pavement Surface Temperatures (°F)	
	Subsurface Layers	Surface Layers
PG 64	35	40
PG 70	45[2]	50[2]
PG 76	45[2]	50[2]

1. The high-temperature binder grade refers to the high-temperature grade of the virgin asphalt binder used to produce the mixture.
2. The Contractor may pave at temperatures 10°F lower than these values when a chemical WMA additive is used as a compaction aid in the mixture or when using WMA.

4.7.1.2. **When Not Using a Thermal Imaging System**. When using a thermal camera instead of the thermal imaging system, place mixture when the roadway surface temperature is at or above the temperatures shown in Table 14B, unless otherwise approved or as shown on the plans. Measure the roadway surface temperature using a handheld thermal camera or infrared thermometer. The Engineer may allow mixture placement to begin before the roadway surface reaches the required temperature if conditions are such that the roadway surface will reach the required temperature within 2 hr. of beginning placement operations. Place mixtures only when weather conditions and moisture conditions of the roadway surface are suitable as determined by the Engineer.

Table 14B
Min Pavement Surface Temperatures

High-Temperature Binder Grade[1]	Min Pavement Surface Temperatures (°F)	
	Subsurface Layers	Surface Layers
PG 64	45	50
PG 70	55[2]	60[2]
PG 76	60[2]	60[2]

1. The high-temperature binder grade refers to the high-temperature grade of the virgin asphalt binder used to produce the mixture.
2. The Contractor may pave at temperatures 10°F lower than these values when a chemical WMA additive is used as a compaction aid in the mixture, when using WMA, or when using a paving process with equipment that eliminates thermal segregation. In such cases, for each sublot and in the presence of the Engineer, use a handheld thermal camera operated in accordance with Tex-244-F to demonstrate to the satisfaction of the Engineer that the uncompacted mat has no more than 10°F of thermal segregation.

4.7.2. **Tack Coat**.

4.7.2.1. **Application.** Clean the surface before placing the tack coat. The Engineer will set the rate between 0.04 and 0.10 gal. of residual asphalt per square yard of surface area. Apply a uniform tack coat at the specified rate unless otherwise directed. Apply the tack coat in a uniform manner to avoid streaks and other irregular patterns. Apply the tack coat to all surfaces that will come in contact with the subsequent HMA placement, unless otherwise directed. Apply adequate overlap of the tack coat in the longitudinal direction during placement of the mat to ensure bond of adjacent mats, unless otherwise directed. Allow adequate time for emulsion to break completely before placing any material. Prevent splattering of tack coat when placed adjacent to curb, gutter, and structures. Do not dilute emulsified asphalts at the terminal, in the field, or at any other location before use, unless required in conformance with the manufacturer's recommendation for approved TRAIL product use, or when shown on the plans.

4.7.2.2. **Sampling.** The Engineer will obtain at least one sample of the tack coat binder per project per source in accordance with Tex-500-C, Part III, and test it to verify compliance with Item 300. The Engineer will notify the Contractor when the sampling will occur and will witness the collection of the sample from the asphalt distributor immediately before use. Label the can with the corresponding lot and sublot numbers, producer, producer facility location, grade, district, date sampled, all applicable bills of lading (if available), and project information, including highway and control-section-job (CSJ) number. For emulsions, the Engineer may test as often as necessary to ensure the residual of the emulsion is greater than or equal to the specification requirement in Item 300.

4.7.3. **Lay-Down Operations**. Use the placement temperatures shown in Table 15 to establish the minimum placement temperature of the mixture delivered to the paving operation.

Table 15
Min Mixture Placement Temperature

High-Temperature Binder Grade[1]	Min Placement Temperature[2,3,4] (°F)
PG 64	260
PG 70	270
PG 76	280

1. The high-temperature binder grade refers to the high-temperature grade of the virgin asphalt binder used to produce the mixture.
2. The mixture temperature must be measured using a handheld thermal camera or infrared thermometer immediately before entering MTD or paver.
3. Min placement temperatures may be reduced 20°F if using a chemical WMA additive as a compaction aid, MTD with remixing capabilities, or paver hopper insert with remixing capabilities.
4. When using WMA, the minimum placement temperature is 215°F.

4.7.3.1. **Thermal Profile**. Use a handheld thermal camera or a thermal imaging system to obtain a continuous thermal profile in accordance with Tex-244-F. Thermal profiles are not applicable in areas described in Section 341.4.9.3.1.4., "Miscellaneous Areas."

4.7.3.1.1. **Thermal Segregation**.

4.7.3.1.1.1. **Moderate**. Any areas that have a temperature differential greater than 25°F, but not exceeding 50°F.

4.7.3.1.1.2. **Severe**. Any areas that have a temperature differential greater than 50°F.

4.7.3.1.2. **Thermal Imaging System**. Review the output results when a thermal imaging system is used, and provide the automated report described in Tex-244-F to the Engineer daily, unless otherwise directed. Modify the paving process as necessary to eliminate any recurring (moderate or severe) thermal segregation identified by the thermal imaging system.

The Engineer may suspend paving operations if the Contractor cannot successfully modify the paving process to eliminate recurring severe thermal segregation. Density profiles are not required and not applicable when using a thermal imaging system.

Provide the Engineer with electronic copies of all daily data files that can be used with the thermal imaging system software to generate temperature profile plots daily or as requested.

4.7.3.1.3. **Thermal Camera**. Provide the Engineer with the thermal profile of every sublot within 1 working day of the completion of each lot. When requested by the Engineer, provide the thermal images generated using the thermal camera. Report the results of each thermal profile in accordance with Section 341.4.2., "Reporting and Responsibilities." The Engineer will use a handheld thermal camera to obtain a thermal profile at least once per project.

Take immediate corrective action to eliminate recurring moderate thermal segregation when a handheld thermal camera is used.

Suspend operations and take immediate corrective action to eliminate severe thermal segregation unless otherwise directed. Resume operations when the Engineer determines that subsequent production will meet the requirements of this Section. No production or placement payment adjustments greater than 1.000 will be paid for any sublot that contains severe thermal segregation. Evaluate areas with severe thermal segregation by performing density profiles in accordance with Section 341.4.9.3.3.3., "Segregation (Density Profile)." Remove and replace the material in any areas that have severe thermal segregation and a failing result for segregation (density profile), unless otherwise directed. The sublot in question may receive a production and placement payment adjustment greater than 1.000, if applicable, when the defective material is successfully removed and replaced.

4.7.3.2. **Windrow Operations**. Operate windrow pickup equipment so that when hot mix is placed in windrows, substantially all the mixture deposited on the roadbed is picked up and loaded into the paver.

4.7.3.3. **Hauling Equipment**. Use belly dump, live-bottom, or end dump trucks to haul and transfer mixture. Except for paving miscellaneous areas, end dump trucks are allowed only when used in conjunction with an MTD with remixing capability or when a thermal imaging system is used, unless otherwise approved.

4.7.3.4. **Screed Heaters**. Turn off screed heaters to prevent overheating of the mat if the paver stops for more than 5 min. The Engineer may evaluate the suspect area in accordance with Section 341.4.9.3.3.5., "Recovered Asphalt Dynamic Shear Rheometer (DSR)," if the screed heater remains on for more than 5 min. while the paver is stopped.

4.8. **Compaction**. Compact the pavement uniformly to contain between 3.8% and 8.5% in-place air voids. Take immediate corrective action to bring the operation within 3.8% and 8.5% when the in-place air voids exceed the range of these tolerances. The Engineer will allow paving to resume when the proposed corrective action is likely to yield between 3.8% and 8.5% in-place air voids.

Obtain cores in areas placed under exempt production, as directed, at locations determined by the Engineer. The Engineer may test these cores and suspend operations or require removal and replacement if the in-place air voids are less than 2.7% or more than 9.9%. Areas defined in Section 341.4.9.3.1.4., "Miscellaneous Areas," are not subject to in-place air void determination.

Furnish the type, size, and number of rollers necessary to ensure desired compaction. Use additional rollers as required to remove any roller marks. Use only water or an approved release agent on rollers, tamps, and other compaction equipment unless otherwise directed.

Use the control strip method shown in Tex-207-F, Part IV, on the first day of production to establish the rolling pattern that will produce the desired in-place air voids, unless otherwise directed.

Use tamps to thoroughly compact the edges of the pavement along curbs, headers, and similar structures and in locations that will not allow thorough compaction using rollers. The Engineer may require rolling using a trench roller on widened areas, in trenches, and in other limited areas.

Complete all compaction operations using breakdown rollers before the pavement temperature drops below 180°F, unless otherwise allowed. Compaction using a pneumatic or light finish roller operated in static mode is allowed for pavement temperatures above 160°F.

Allow the compacted pavement to cool to 160°F or lower before opening to traffic, unless otherwise directed. Sprinkle the finished mat with water or limewater, when directed, to expedite opening the roadway to traffic.

4.9. **Acceptance Plan**. Payment adjustments for the material will be in accordance with Article 341.6., "Payment."

Sample and test the hot mix on a lot and sublot basis. Suspend production if the production payment factor shown in Section 341.6.1., "Production Payment Adjustment Factors," or the placement payment factor shown in Section 341.6.2., "Placement Payment Adjustment Factors," for two consecutive lots is below 1.000. Resume production once test results or other information indicates to the satisfaction of the Engineer that the next material produced or placed will result in payment factors of at least 1.000.

4.9.1. **Referee Testing**. The Materials and Tests Division is the referee laboratory. The Contractor may request referee testing if a "remove and replace" condition is determined based on the Engineer's test results, or if the differences between Contractor and Engineer test results exceed the maximum allowable difference in accordance with Table 11 and the differences cannot be resolved. The Contractor may also request referee testing if the Engineer's test results require suspension of production and the Contractor's test results are within specification limits. Make the request within 5 working days after receiving test results and cores from the Engineer. Referee tests will be performed only on the sublot in question and only for the tests in question. Allow 10 working days from the time the referee laboratory receives the samples for test results to be

reported. The Department may require the Contractor to reimburse the Department for referee tests if more than three referee tests per project are required and the Engineer's test results are closer to the referee test results than the Contractor's test results.

The Materials and Tests Division will determine the laboratory-molded density based on the molded specific gravity and the maximum theoretical specific gravity of the referee sample. The in-place air voids will be determined based on the bulk specific gravity of the cores, as determined by the referee laboratory, and the Engineer's average maximum theoretical specific gravity for the lot. Except for "remove and replace" conditions, referee test results are final and will establish payment adjustment factors for the sublot in question. The Contractor may decline referee testing and accept the Engineer's test results when the placement payment adjustment factor for any sublot results in a "remove and replace" condition. Placement sublots subject to be removed and replaced will be further evaluated in accordance with Section 341.6.2.2., "Placement Sublots Subject to Removal and Replacement."

4.9.2. **Production Acceptance**.

4.9.2.1. **Production Lot**. A production lot consists of four equal sublots. The default quantity for Lot 1 is 1,000 ton; however, when requested by the Contractor, the Engineer may increase the quantity for Lot 1 to no more than 4,000 ton. The Engineer will select subsequent lot sizes based on the anticipated daily production such that approximately three–four sublots are produced each day. The lot size will be between 1,000 ton and 4,000 ton. The Engineer may change the lot size before the Contractor begins any lot.

If the optimum asphalt binder content for JMF2 is more than 0.5% lower than the optimum asphalt binder content for JMF1, the Engineer may perform or require the Contractor to perform Tex-226-F on Lot 1 to confirm the indirect tensile strength does not exceed 200 psi. Take corrective action to bring the mixture within specification compliance if the indirect tensile strength exceeds 200 psi, unless otherwise directed.

4.9.2.1.1. **Incomplete Production Lots**. If a lot is begun but cannot be completed, such as on the last day of production or in other circumstances deemed appropriate, the Engineer may close the lot. Adjust the payment for the incomplete lot in accordance with Section 341.6.1., "Production Payment Adjustment Factors." Close all lots within 5 working days unless otherwise allowed.

4.9.2.2. **Production Sampling**.

4.9.2.2.1. **Mixture Sampling**. The Engineer will perform or witness the sampling of production sublots from trucks at the plant in accordance with Tex-222-F The sampler will split each sample into three equal portions in accordance with Tex-200-F and label these portions as "Contractor," "Engineer," and "Referee." The Engineer will perform or witness the sample splitting and take immediate possession of the samples labeled "Engineer" and "Referee." The Engineer will maintain the custody of the samples labeled "Engineer" and "Referee" until the Department's testing is completed.

4.9.2.2.1.1. **Random Sample**. At the beginning of the project, the Engineer will select random numbers for all production sublots. Determine sample locations in accordance with Tex-225-F. Take one sample for each sublot at the randomly selected location. The Engineer will perform or witness the sampling of production sublots.

4.9.2.2.1.2. **Blind Sample**. For one sublot per lot, the Engineer will sample, split, and test a "blind" production sample instead of the random sample collected by the Contractor. The location of the Engineer's "blind" sample will not be disclosed to the Contractor before sampling. The Engineer's "blind" sample may be randomly selected in accordance with Tex-225-F for any sublot or selected at the discretion of the Engineer. The Engineer may sample and test an additional blind sample when the random sampling process does not result in obtaining a sample.

For one sublot per lot, the Contractor must obtain from the Engineer a "blind" production sample collected by the Engineer. If desired, the Contractor may witness the collection of blind samples. Test either the "blind" or the random sample; however, referee testing for the sublot (if applicable) will be based on a comparison of results from the "blind" sample.

4.9.2.2.2. **Asphalt Binder Sampling**. The Engineer will witness the Contractor obtain a 1-qt. sample of the asphalt binder for each lot of mixture produced. The Contractor will notify the Engineer when the sampling will occur. Obtain the sample at approximately the same time the mixture random sample is obtained. Sample from a port located immediately upstream from the mixing drum or pug mill and upstream from the introduction of any additives in accordance with Tex-500-C, Part II. Label the can with the corresponding lot and sublot numbers, producer name, producer facility, grade, District, date sampled, all applicable bills of lading (if available), and project information, including highway and CSJ number. The Engineer will retain these samples for 1 yr. The Engineer may also obtain independent samples. If obtaining an independent asphalt binder sample and upon request of the Contractor, the Engineer will split a sample of the asphalt binder with the Contractor.

At least once per project, the Engineer will collect split samples of each binder grade and source used. The Engineer will submit one split sample to the Materials and Tests Division to verify compliance with Item 300, and will retain the other split sample for 1 yr.

4.9.2.3. **Production Testing**. The Contractor and Engineer must perform production tests shown in Table 16. The Contractor has the option to verify the Engineer's test results on split samples provided by the Engineer. Determine compliance with operational tolerances shown in Table 11 for all sublots.

Take immediate corrective action if the Engineer's laboratory-molded density on any sublot is less than 95.0% or greater than 97.0% to bring the mixture within these tolerances. The Engineer may suspend operations if the Contractor's corrective actions do not produce acceptable results. The Engineer will allow production to resume when the proposed corrective action is likely to yield acceptable results.

The Engineer may allow alternate methods for determining the asphalt binder content and aggregate gradation if the aggregate mineralogy is such that Tex-236-F, Part I does not yield reliable results. Provide evidence that results from Tex-236-F, Part I are not reliable before requesting permission to use an alternate method unless otherwise directed. Use the applicable test procedure as directed if an alternate test method is allowed.

Table 16
Production and Placement Testing Frequency

Description	Test Method	Min Contractor Testing Frequency	Min Engineer Testing Frequency
Individual % retained on #8 sieve and larger	Tex-200-F or Tex-236-F	1 per sublot	1 per 12 sublots[1]
Individual % retained on sieves smaller than #8 and larger than #200			
% passing #200 sieve			
Laboratory-molded density	Tex-207-F	–	1 per sublot[1]
Laboratory-molded bulk specific gravity			
In-place air voids			
VMA	Tex-204-F		
Segregation (density profile)	Tex-207-F, Part V	1 per sublot[2]	1 per project
Longitudinal joint density	Tex-207-F, Part VII	1 per sublot[3]	1 per project
Moisture content	Tex-212-F, Part II	When directed	1 per project
Theoretical maximum specific (Rice) gravity	Tex-227-F	–	1 per sublot[1]
Asphalt binder content	Tex-236-F, Part I	1 per sublot	1 per lot[1]
Thermal profile	Tex-244-F	1 per sublot[2]	1 per project
Hamburg wheel test	Tex-242-F	–	
Deleterious in RAS[4]	Tex-217-F, Part III	–	
Asphalt binder sampling and testing[4,5]	Tex-500-C, Part II	–	
Tack coat sampling and testing	Tex-500-C, Part III	–	
Boil test[6]	Tex-530-C	1 per lot	
Shear bond strength test[7]	Tex-249-F	–	

1. For production defined in Section 341.4.9.4., "Exempt Production," the Engineer will perform one test per day if 100 ton or more is produced. For exempt production, no testing is required when < 100 ton is produced.
2. To be performed in the presence of the Engineer when not using the thermal imaging system, unless otherwise approved.
3. To be performed in the presence of the Engineer.
4. Testing performed by the Materials and Tests Division or designated laboratory.
5. Sampling performed by the Contractor. The Engineer will witness sampling and retain the samples for 1 yr.
6. When shown on the plans.
7. Testing performed by the Materials and Tests Division or District for informational purposes on a sample obtained by the Contractor within the first four lots of the project.

4.9.2.4. **Operational Tolerances**. Control the production process within the operational tolerances shown in Table 11. When production is suspended, the Engineer will allow production to resume when test results or other information indicates the next mixture produced will be within the operational tolerances.

4.9.2.4.1. **Gradation**. Suspend operation and take corrective action if any aggregate is retained on the maximum sieve size shown in Table 8. A sublot is defined as out of tolerance if either the Engineer's or the Contractor's test results are out of operational tolerance. Suspend production when test results for gradation exceed the operational tolerances shown in Table 11 for three consecutive sublots on the same sieve or four consecutive sublots on any sieve, unless otherwise directed. The consecutive sublots may be from more than one lot.

4.9.2.4.2. **Asphalt Binder Content**. A sublot is defined as out of operational tolerance if either the Engineer's or the Contractor's test results exceed the values shown in Table 11. No production or placement payment adjustments greater than 1.000 will be paid for any sublot that is out of operational tolerance for asphalt binder content. Suspend production and shipment of the mixture if the Engineer's or the Contractor's asphalt binder content deviates from the current JMF by more than 0.5% for any sublot.

4.9.2.4.3. **VMAs**. The Engineer will determine the VMA for every sublot. For sublots when the Engineer does not determine asphalt binder content, the Engineer will use the asphalt binder content results from QC testing performed by the Contractor to determine VMA.

Take immediate corrective action if the VMA value for any sublot is less than the minimum VMA requirement for production shown in Table 8. Suspend production and shipment of the mixture if the Engineer's VMA results on two consecutive sublots are below the minimum VMA requirement for production shown in

Table 8. No production or placement payment adjustments greater than 1.000 will be paid for any sublot that does not meet the minimum VMA requirement for production shown in Table 8 based on the Engineer's VMA determination.

Suspend production and shipment of the mixture if the Engineer's VMA result is more than 0.5% below the minimum VMA requirement for production shown in Table 8. In addition to suspending production, the Engineer may require removal and replacement or may allow the sublot to be left in place without payment.

4.9.2.4.4. **Hamburg Wheel Test**. The Engineer may perform a Hamburg wheel test on plant-produced mixture anytime during production. Suspend production until further Hamburg wheel tests meet the specified values when the production samples fail the Hamburg wheel test criteria shown in Table 10. The Engineer may require up to the entire sublot of any mixture failing the Hamburg wheel test to be removed and replaced at the Contractor's expense.

If the Department-approved laboratory's Hamburg wheel test on plant-produced mixture results in a "remove and replace" condition, the Contractor may request that the Materials and Tests Division determine the final disposition of the material in question by re-testing the failing material.

4.9.2.5. **Individual Loads of Hot Mix**. The Engineer may reject individual truckloads of hot mix. When a load of hot mix is rejected for reasons other than temperature, contamination, or excessive uncoated particles, the Contractor may request that the rejected load be tested. Make this request within 4 hr. of rejection. The Engineer will sample and test the mixture. If test results are within the operational tolerances shown in Table 11, payment will be made for the load. If test results are not within operational tolerances, no payment will be made for the load.

4.9.3. **Placement Acceptance**.

4.9.3.1. **Placement Lot**. A placement lot consists of four placement sublots. A placement sublot consists of the area placed during a production sublot.

4.9.3.1.1. **Lot 1 Placement**. Placement payment adjustments greater than 1.000 for Lot 1 will be in accordance with Section 341.6.2., "Placement Payment Adjustment Factors"; however, no placement adjustment less than 1.000 will be assessed for any sublot placed in Lot 1 when the in-place air voids are greater than or equal to 2.7% and less than or equal to 9.9%. Remove and replace any sublot with in-place air voids less than 2.7% or greater than 9.9%.

4.9.3.1.2. **Incomplete Placement Lots**. An incomplete placement lot consists of the area placed as described in Section 341.4.9.2.1.1., "Incomplete Production Lots," excluding areas defined in Section 341.4.9.3.1.4., "Miscellaneous Areas." Placement sampling is required if the random sample plan for production resulted in a sample being obtained from an incomplete production sublot.

4.9.3.1.3. **Shoulders, Ramps, Etc**. Shoulders, ramps, intersections, acceleration lanes, deceleration lanes, and turn lanes are subject to in-place air void determination and payment adjustments unless shown on the plans as not eligible for in-place air void determination. Intersections may be considered miscellaneous areas when determined by the Engineer.

4.9.3.1.4. **Miscellaneous Areas**. Miscellaneous areas include areas that typically involve significant handwork or discontinuous paving operations, such as temporary detours, driveways, mailbox turnouts, crossovers, gores, spot level-up areas, pavement repair sections less than 300 ft., and other similar areas. Temporary detours are subject to in-place air void determination when shown on the plans. Miscellaneous areas also include level-ups and thin overlays when the layer thickness shown on the plans is less than the minimum untrimmed core height eligible for testing in accordance with Table 13. The specified layer thickness is based on the rate of 110 lb. per square yard for each inch of pavement unless another rate is shown on the plans. When "Level Up" is listed as part of the bid item description, a payment adjustment factor of 1.000 will be assigned for all placement sublots as described in Article 341.6., "Payment." Miscellaneous areas are not eligible for random placement sampling locations. Compact miscellaneous areas in accordance with

Section 341.4.8., "Compaction." Miscellaneous areas are not subject to in-place air void determination, thermal profiles testing, segregation (density profiles), or longitudinal joint density evaluations.

4.9.3.2. **Placement Sampling**. The Engineer will select random numbers for all placement sublots at the beginning of the project. The Engineer will provide the Contractor with the placement random numbers only immediately after the sublot is completed. Mark the roadway location at the completion of each sublot and record the station number. Determine one random sample location for each placement sublot in accordance with Tex-225-F. Adjust the random sample location by no more than necessary to achieve a 2-ft. clearance if the location is within 2 ft. of a joint or pavement edge.

Shoulders, ramps, intersections, acceleration lanes, deceleration lanes, and turn lanes are always eligible for selection as a random sample location; however, if a random sample location falls on one of these areas and the area is shown on the plans as not subject to in-place air void determination, cores will not be taken for the sublot and a 1.000 pay factor will be assigned to that sublot.

Provide the equipment and means to obtain and trim roadway cores onsite. Onsite is defined as in close proximity to where the cores are taken. Obtain the cores within 1 working day of the time the placement sublot is completed, unless otherwise approved. Obtain two 6-in. diameter cores side-by-side from within 1 ft. of the random location provided for the placement sublot. Mark the cores for identification, measure and record the untrimmed core height, and provide the information to the Engineer. The Engineer will witness the coring operation and measurement of the core thickness. Visually inspect each core and verify that the current paving layer is bonded to the underlying layer. Take corrective action if an adequate bond does not exist between the current and underlying layer to ensure that an adequate bond will be achieved during subsequent placement operations.

Trim the cores immediately after obtaining them from the roadway in accordance with Tex-251-F if the core heights meet the minimum untrimmed value in accordance with Table 13. Trim the cores onsite in the presence of the Engineer. Use a permanent marker or paint pen to record the lot and sublot numbers on each core, as well as the designation as Core A or Core B. The Engineer may require additional information to be marked on the core and may choose to sign or initial the core. The Engineer will take custody of the cores immediately after witnessing the trimming of the cores and will retain custody of the cores until the Department's testing is completed. Before turning the trimmed cores over to the Engineer, the Contractor may wrap the trimmed cores or secure them in a manner that will reduce the risk of possible damage occurring during transport by the Engineer. After testing, the Engineer will return the cores to the Contractor.

The Engineer may have the cores transported back to the Department's laboratory at the HMA plant via the Contractor's haul truck or other designated vehicle. In such cases where the cores will be out of the Engineer's possession during transport, the Engineer will use Department-provided security bags and the Protocol for Roadway Core Custody located on the Department's website to provide a secure means and process that protect the integrity of the cores during transport.

Decide whether to include the pair of cores in the air void determination for that sublot if the core height before trimming is less than the minimum untrimmed value shown in Table 13. Trim the cores in accordance with Tex-251-F before delivering to the Engineer if electing to have the cores included in the air void determination. If electing to not have the cores included in air void determination, inform the Engineer of the decision, and deliver untrimmed cores to the Engineer. The placement pay factor for the sublot will be 1.000 if cores will not be included in air void determination.

Instead of the Contractor trimming the cores onsite immediately after coring, the Engineer and the Contractor may mutually agree to have the trimming operations performed at an alternate location, such as a field laboratory or other similar location. In such cases, the Engineer will take possession of the cores immediately after they are obtained from the roadway and will retain custody of the cores until testing is completed. Either the Department or Contractor representative may perform trimming of the cores. The Engineer will witness all trimming operations in cases where the Contractor representative performs the trimming operation.

Dry the core holes and tack the sides and bottom immediately after obtaining the cores. Fill the hole with the same type of mixture and properly compact the mixture. Repair core holes using other methods when approved.

4.9.3.3. **Placement Testing**. Perform placement tests in accordance with Table 16. After the Engineer returns the cores, the Contractor may test the cores to verify the Engineer's test results for in-place air voids. The allowable differences between the Contractor's and Engineer's test results are shown in Table 11.

4.9.3.3.1. **In-Place Air Voids**. The Engineer will measure in-place air voids in accordance with Tex-207-F and Tex-227-F. Before drying to a constant weight, cores may be pre-dried using a CoreDry or similar vacuum device to remove excess moisture. The Engineer will average the values obtained for all sublots in the production lot to determine the theoretical maximum specific gravity. The Engineer will use the average air void content for in-place air voids.

The Engineer will use the vacuum method to seal the core if required in accordance with Tex-207-F. The Engineer will use the test results from the unsealed core to determine the placement payment adjustment factor if the sealed core yields a higher specific gravity than the unsealed core. After determining the in-place air void content, the Engineer will return the cores and provide test results to the Contractor.

4.9.3.3.2. **Informational Shear Bond Strength Testing**. The Engineer will select one random sublot within the first four lots of the project for shear bond strength testing. Obtain full-depth cores in accordance with Tex-249-F unless the HMA is being placed directly on concrete pavement. Label the cores with lot and sublot numbers and provide to the Engineer. Inspector must use pertinent Department form to document the CSJ number, producer of the tack coat, mix type, and shot rate. The Engineer will ship the cores to the Materials and Tests Division or District laboratory for shear bond strength testing. Results from these tests will not be used for specification compliance.

4.9.3.3.3. **Segregation (Density Profile)**. Test for segregation using density profiles in accordance with Tex-207-F, Part V. Density profiles are not required and are not applicable when using a thermal imaging system. Density profiles are not applicable in areas described in Section 341.4.9.3.1.4., "Miscellaneous Areas."

Perform at least one density profile per sublot. Perform additional density profiles when any of the following conditions occur, unless otherwise approved:

- areas that are identified by either the Contractor or the Engineer with severe thermal segregation,
- any visibly segregated areas that exist,
- the paver stops due to lack of material being delivered to the paving operations and the temperature of the uncompacted mat before the initial breakdown rolling is less than the temperatures shown in Table 17.

Table 17
Min Uncompacted Mat Temperature Requiring Segregation Profile[1]

High-Temperature Binder Grade[2]	Min Temperature of Uncompacted Mat Allowed Before Initial Breakdown Rolling[3,4,5] (°F)
PG 64	<250
PG 70	<260
PG 76	<270

1. Applicable only to paver stops that occur due to lack of material being delivered to the paving operations and when not using a thermal imaging system.
2. The high-temperature binder grade refers to the high-temperature grade of the virgin asphalt binder used to produce the mixture.
3. The surface of the uncompacted mat must be measured using a handheld thermal camera or infrared thermometer.
4. Min uncompacted mat temperature requiring a segregation profile may be reduced 20°F if using a chemical WMA additive as a compaction aid, MTD with remixing capabilities, or paver hopper insert with remixing capabilities.
5. When using WMA, the Min uncompacted mat temperature requiring a segregation profile is 215°F.

Provide the Engineer with the density profile of every sublot in the lot within 1 working day of the completion of each lot. Report the results of each density profile in accordance with Section 341.4.2., "Reporting and Responsibilities."

The density profile is considered failing if it exceeds the tolerances shown in Table 18. When a thermal imaging system is not used, the Engineer will measure the density profile at least once per project. The Engineer's density profile results will be used when available. The Engineer may require the Contractor to remove and replace the area in question if the area fails the density profile and has surface irregularities as defined in Section 341.4.9.3.3.6., "Irregularities." The sublot in question may receive a production and placement payment adjustment greater than 1.000, if applicable, when the defective material is successfully removed and replaced.

Investigate density profile failures and take corrective actions during production and placement to eliminate the segregation. Suspend production if two consecutive density profiles fail unless otherwise approved. Resume production after the Engineer approves changes to production or placement methods.

Table 18
Segregation (Density Profile) Acceptance Criteria

Mixture Type	Max Allowable Density Range (highest to lowest, pcf)	Max Allowable Density Range (average to lowest, pcf)
DG-B	8.0	5.0
DG-C, DG-D, and DG-F	6.0	3.0

4.9.3.3.4. **Longitudinal Joint Density**.

4.9.3.3.4.1. **Informational Tests**. Perform joint density evaluations while establishing the rolling pattern and verify that the joint density is no more than 3.0 pcf below the density taken at or near the center of the mat. Adjust the rolling pattern, if needed, to achieve the desired joint density. Perform additional joint density evaluations, at least once per sublot, unless otherwise directed.

4.9.3.3.4.2. **Record Tests**. Perform a joint density evaluation for each sublot at each pavement edge that is or will become a longitudinal joint. Joint density evaluations are not applicable in areas described in Section 341.4.9.3.1.4., "Miscellaneous Areas." Determine the joint density in accordance with Tex-207-F, Part VII. Record the joint density information and submit results on Department forms to the Engineer. The evaluation is considered failing if the joint density is more than 3.0 pcf below the density taken at the core random sample location and the correlated joint density is less than 90.0%. The Engineer will make independent joint density verification at least once per project and may make independent joint density

verifications at the random sample locations. The Engineer's joint density test results will be used when available.

Provide the Engineer with the joint density of every sublot in the lot within 1 working day of the completion of each lot. Report the results of each joint density in accordance with Section 341.4.2., "Reporting and Responsibilities."

Investigate joint density failures and take corrective actions during production and placement to improve the joint density. Suspend production if the evaluations on two consecutive sublots fail, unless otherwise approved. Resume production after the Engineer approves changes to production or placement methods.

4.9.3.3.5. **Recovered Asphalt Dynamic Shear Rheometer (DSR)**. The Engineer may take production samples or cores from suspect areas of the project to determine recovered asphalt properties. Asphalt binders with an aging ratio greater than 3.5 do not meet the requirements for recovered asphalt properties and may be deemed defective when tested and evaluated by the Materials and Tests Division. The aging ratio is the DSR value of the extracted binder divided by the DSR value of the original unaged binder. Obtain DSR values in accordance with AASHTO T 315 at the specified high-temperature PG of the asphalt. The Engineer may require removal and replacement of the defective material at the Contractor's expense. The asphalt binder will be recovered for testing from production samples or cores in accordance with Tex-211-F.

4.9.3.3.6. **Irregularities**. Identify and correct irregularities, including segregation, rutting, raveling, flushing, fat spots, mat slippage, irregular color, irregular texture, roller marks, tears, gouges, streaks, uncoated aggregate particles, or broken aggregate particles. The Engineer may also identify irregularities, and in such cases, the Engineer will promptly notify the Contractor. If the Engineer determines that the irregularity will adversely affect pavement performance, the Engineer may require the Contractor to remove and replace (at the Contractor's expense) areas of the pavement that contain irregularities. The Engineer may also require the Contractor to remove and replace (at the Contractor's expense) areas where the mixture does not bond to the existing pavement.

If irregularities are detected, the Engineer may require the Contractor to immediately suspend operations or may allow the Contractor to continue operations for no more than 1 day while the Contractor is taking appropriate corrective action.

4.9.4. **Exempt Production**. The mixture may be deemed as exempt production when mutually agreed upon between the Engineer and the Contractor, or when shown on the plans. Exempt production may be used for the following conditions.

- Anticipated daily production is less than 500 ton.
- Total production for the project is less than 5,000 ton.
- Pavement repair sections are equal to or greater than 300 ft. For pavement repair sections less than 300 ft., refer to Section 341.4.9.3.1.4., "Miscellaneous Areas."

Exempt production is not eligible for referee testing. For exempt production, the Contractor is relieved of all production and placement QC and QA sampling and testing requirements, except for coring operations when required by the Engineer. When mutually agreed upon between the Engineer and the Contractor, production sampling will be allowed at the point of delivery. When 100 ton or more per day is produced, the Engineer must perform acceptance tests for production and placement in accordance with Table 16. If the specification requirements listed below are met, the production and placement pay factors are 1.000:

- produce, haul, place, and compact the mixture in compliance with the specification and as directed;
- control mixture production to yield a laboratory-molded density that is within ±1.0% of the target laboratory-molded density as tested by the Engineer;
- compact the mixture in accordance with Section 341.4.8., "Compaction;"
- when a thermal imaging system is not used, the Engineer may perform segregation (density profiles) and thermal profiles in accordance with the specification; and
- all other specification requirements.

4.9.5. **Ride Quality**. Measure ride quality in accordance with Item 585, "Ride Quality for Pavement Surfaces," unless otherwise shown on the plans.

5. MEASUREMENT

5.1. **Dense-Graded HMA**. Hot mix will be measured by the ton of composite hot mix, which includes asphalt, aggregate, and additives. Measure the weight on scales in accordance with Item 520, "Weighing and Measuring Equipment."

5.2. **Tack Coat**. Tack coat will be measured at the applied temperature by strapping the tank before and after road application and determining the net volume in gallons from the calibrated distributor. The Engineer will witness all strapping operations for volume determination. All tack, including emulsions, will be measured by the gallon applied.

The Engineer may allow the use of a metering device to determine asphalt volume used and application rate if the device is accurate within 1.5% of the strapped volume.

6. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under Section 341.5.1., "Dense-Graded HMA," will be paid for at the unit price bid for "Dense-Graded Hot-Mix Asphalt" of the mixture type, SAC, and binder specified. These prices are full compensation for surface preparation, materials, placement, equipment, labor, tools, and incidentals.

The work performed and materials furnished in accordance with this Item and measured as provided under Section 341.5.2., "Tack Coat," will be paid for at the unit price bid for "Tack Coat" of the tack coat provided. These prices are full compensation for materials, placement, equipment, labor, tools, and incidentals. Payment adjustments will be applied as determined in accordance with this Item; however, a payment adjustment factor of 1.000 will be assigned for all placement sublots for level-ups only when "Level Up" is listed as part of the bid item description. A payment adjustment factor of 1.000 will be assigned to all production and placement sublots when "Exempt" is listed as part of the bid item description, and all testing requirements are met.

Payment for each sublot, including applicable payment adjustments greater than 1.000, will be paid only for sublots when the Contractor supplies the Engineer with the required documentation for production and placement QC and QA, thermal profiles, segregation density profiles, and longitudinal joint densities in accordance with Section 341.4.2., "Reporting and Responsibilities." When a thermal imaging system is used, documentation is not required for segregation density profiles on individual sublots; however, the thermal imaging system automated reports described in Tex-244-F are required.

Trial batches will not be paid for unless they are included in pavement work approved by the Department.

Payment adjustment for ride quality will be determined in accordance with Item 585.

6.1. **Production Payment Adjustment Factors**. The production payment adjustment factor is based on the laboratory-molded density using the Engineer's test results. The bulk specific gravities of the samples from each sublot will be divided by the Engineer's maximum theoretical specific gravity for the sublot. The individual sample densities for the sublot will be averaged to determine the production payment adjustment factor in accordance with Table 19 for each sublot, using the deviation from the target laboratory-molded density in accordance with Table 9. The production payment adjustment factor for completed lots will be the average of the payment adjustment factors for the four sublots sampled within that lot.

Table 19
Production Payment Adjustment Factors for Laboratory-Molded Density[1]

Absolute Deviation from Target Laboratory-Molded Density	Production Payment Adjustment Factor (Target Laboratory-Molded Density)
0.0	1.050
0.1	1.050
0.2	1.050
0.3	1.044
0.4	1.038
0.5	1.031
0.6	1.025
0.7	1.019
0.8	1.013
0.9	1.006
1.0	1.000
1.1	0.965
1.2	0.930
1.3	0.895
1.4	0.860
1.5	0.825
1.6	0.790
1.7	0.755
1.8	0.720
>1.8	Remove and replace

1. If the Engineer's laboratory-molded density on any sublot is <95.0% or >97.0%, take immediate corrective action to bring the mixture within these tolerances. The Engineer may suspend operations if the Contractor's corrective actions do not produce acceptable results. The Engineer will allow production to resume when the proposed corrective action is likely to yield acceptable results.

6.1.1. **Payment for Incomplete Production Lots**. Production payment adjustments for incomplete lots, described under Section 341.4.9.2.1.1., "Incomplete Production Lots," will be calculated using the average production payment factors from all sublots sampled.

A production payment factor of 1.000 will be assigned to any lot when the random sampling plan did not result in collection of any samples within the first sublot.

6.1.2. **Production Sublots Subject to Removal and Replacement**. If after referee testing the laboratory-molded density for any sublot results in a "remove and replace" condition as shown in Table 19, the Engineer may require removal and replacement or may allow the sublot to be left in place without payment. The Engineer may also accept the sublot in accordance with Section 5.3.1., "Acceptance of Defective or Unauthorized Work." Replacement material meeting the requirements of this Item will be paid for in accordance with this Section.

6.2. **Placement Payment Adjustment Factors**. The placement payment adjustment factor is based on in-place air voids using the Engineer's test results. The bulk specific gravities of the cores from each sublot will be divided by the Engineer's average maximum theoretical specific gravity for the lot. The individual core densities for the sublot will be averaged to determine the placement payment adjustment factor in accordance with Table 20 for each sublot that requires in-place air void measurement. A placement payment adjustment factor of 1.000 will be assigned to the entire sublot when the random sample location falls in an area shown on the plans as not subject to in-place air void determination. A placement payment adjustment factor of 1.000 will be assigned to quantities placed in areas described in Section 341.4.9.3.1.4., "Miscellaneous Areas." The placement payment adjustment factor for completed lots will be the average of the placement payment adjustment factors for up to four sublots within that lot.

Table 20
Placement Payment Adjustment Factors for In-Place Air Voids

In-Place Air Voids	Placement Pay Adjustment Factor	In-Place Air Voids	Placement Payment Adjustment Factor
<2.7	Remove and replace	6.4	1.042
2.7	0.710	6.5	1.040
2.8	0.740	6.6	1.038
2.9	0.770	6.7	1.036
3.0	0.800	6.8	1.034
3.1	0.830	6.9	1.032
3.2	0.860	7.0	1.030
3.3	0.890	7.1	1.028
3.4	0.920	7.2	1.026
3.5	0.950	7.3	1.024
3.6	0.980	7.4	1.022
3.7	0.998	7.5	1.020
3.8	1.002	7.6	1.018
3.9	1.006	7.7	1.016
4.0	1.010	7.8	1.014
4.1	1.014	7.9	1.012
4.2	1.018	8.0	1.010
4.3	1.022	8.1	1.008
4.4	1.026	8.2	1.006
4.5	1.030	8.3	1.004
4.6	1.034	8.4	1.002
4.7	1.038	8.5	1.000
4.8	1.042	8.6	0.998
4.9	1.046	8.7	0.996
5.0	1.050	8.8	0.994
5.1	1.050	8.9	0.992
5.2	1.050	9.0	0.990
5.3	1.050	9.1	0.960
5.4	1.050	9.2	0.930
5.5	1.050	9.3	0.900
5.6	1.050	9.4	0.870
5.7	1.050	9.5	0.840
5.8	1.050	9.6	0.810
5.9	1.050	9.7	0.780
6.0	1.050	9.8	0.750
6.1	1.048	9.9	0.720
6.2	1.046	>9.9	Remove and replace
6.3	1.044	–	–

6.2.1. **Payment for Incomplete Placement Lots**. Payment adjustments for incomplete placement lots described under Section 341.4.9.3.1.2., “Incomplete Placement Lots,” will be calculated using the average of the placement payment factors from all sublots sampled and sublots where the random location falls in an area shown on the plans as not eligible for in-place air void determination.

If the random sampling plan results in production samples, but not in placement samples, the random core location and placement adjustment factor for the sublot will be determined by applying the placement random number to the length of the sublot placed.

If the random sampling plan results in placement samples, but not in production samples, no placement adjustment factor will apply for that sublot placed.

A placement payment adjustment factor of 1.000 will be assigned to any lot when the random sampling plan did not result in collection of any production samples.

6.2.2. **Placement Sublots Subject to Removal and Replacement**. If after referee testing the placement payment adjustment factor for any sublot results in a “remove and replace” condition as shown in Table 20, the

Engineer will choose the location of two cores to be taken within 3 ft. of the original failing core location. The Contractor must obtain the cores in the presence of the Engineer. The Engineer will take immediate possession of the untrimmed cores and submit the untrimmed cores to the Materials and Tests Division, where they will be trimmed, if necessary, and tested for bulk specific gravity within 10 working days of receipt.

The bulk specific gravity of each core from each sublot will be divided by the Engineer's average maximum theoretical specific gravity for the lot. The individual core densities for the sublot will be averaged to determine the new payment adjustment factor of the sublot in question. If the new payment adjustment factor is 0.720 or greater, the new payment adjustment factor will apply to that sublot. If the new payment adjustment factor is less than 0.720, no payment will be made for the sublot. Remove and replace the failing sublot, or the Engineer may allow the sublot to be left in place without payment. The Engineer may also accept the sublot in accordance with Section 5.3.1., "Acceptance of Defective or Unauthorized Work." Replacement material meeting the requirements of this Item will be paid for in accordance with this Section.

6.3. **Total Adjusted Pay (TAP) Calculation**. TAP will be based on the applicable payment adjustment factors for production and placement for each lot.

TAP = (A+B)/2

where:
A = Bid price × production lot quantity × average payment adjustment factor for the production lot
B = Bid price × placement lot quantity × average payment adjustment factor for the placement lot + (bid price × quantity placed in miscellaneous areas × 1.000)

Production lot quantity = Quantity actually placed - quantity left in place without payment

Placement lot quantity = Quantity actually placed - quantity left in place without payment - quantity placed in miscellaneous areas

Item 360
Concrete Pavement

1. DESCRIPTION

Construct hydraulic cement concrete pavement with or without curbs on the concrete pavement.

2. MATERIALS

Use materials from non-listed sources only when tested and approved by the Engineer before use. Allow 30 calendar days for the Engineer to sample, test, and report results for non-listed sources.

2.1. **Hydraulic Cement Concrete**. Provide hydraulic cement concrete in accordance with Item 421, "Hydraulic Cement Concrete." Use compressive strength testing unless otherwise shown on the plans. Provide Class P concrete designed to meet a minimum average compressive strength of 3,200 psi at 7 days or a minimum average compressive strength of 4,000 psi at 28 days. Test in accordance with Tex-418-A.

Obtain written approval if the concrete mix design exceeds 520 lb. per cubic yard of cementitious material.

Use coarse aggregates for continuously reinforced concrete pavements to produce concrete with a rated coefficient of thermal expansion not more than 5.5×10^{-6} in./in./°F as listed in accordance with the *Concrete Rated Source Quality Catalog*.

Provide Class High Early Strength (HES) concrete designed to meet a minimum average compressive strength of 3,200 psi at 24 hr., for early opening of small pavement areas or leave-outs to traffic when shown on the plans or allowed. When opening of small pavement areas or leave-outs to traffic is less than 24 hr., design Class HES concrete to achieve a minimum average compressive strength of 1,800 psi at 8 hr.

2.2. **Reinforcing Steel**. Provide Grade 60 or above deformed steel for bar reinforcement in accordance with Item 440, "Reinforcement for Concrete." Provide positioning and supporting devices (baskets and chairs) capable of securing and holding the reinforcing steel in proper position before and during paving. Provide corrosion protection when shown on the plans.

2.2.1. **Dowels**. Provide dowel bars for concrete pavements in accordance with DMS-7325, "Dowel Bars for Concrete Pavements" and the MPL for "Dowel Bars for Concrete Pavements." Provide dowel caps filled with a soft compressible material with enough range of movement to allow complete closure of the expansion joint.

2.2.2. **Tie Bars**. Provide straight deformed steel tie bars. Provide either multiple-piece tie bars or single-piece tie bars as shown on the plans. Furnish multiple piece tie bar assemblies from the list of approved multiple-piece tie bars that have been prequalified in accordance with DMS-4515, "Multiple Piece Tie Bars for Concrete Pavement," when used. Multiple-piece tie bars used on individual projects must be sampled in accordance with Tex-711-I, and tested in accordance with Tex-712-I.

2.3. **Curing Materials**. Provide Type 2 membrane curing compound in accordance with DMS-4650, "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants." Provide asphaltic curing materials in accordance with Item 300, "Asphalts, Oils, and Emulsions," for concrete pavement to be overlaid with asphalt concrete, unless otherwise shown on the plans or approved. Provide materials for other methods of curing in accordance with Item 422, "Concrete Superstructures." When required, provide insulating blankets with a minimum thermal resistance (R) rating of 0.5 degree Fahrenheit square-foot per British Thermal Unit. Use insulating blankets that are free of tears and are in good condition.

2.4. **Epoxy**. Provide Type III, Class C epoxy in accordance with DMS-6100, "Epoxies and Adhesives," for installing all drilled-in reinforcing steel. Submit a work plan and request approval for the use of epoxy types other than Type III, Class C.

2.5. **Evaporation Retardant**. Provide evaporation retardant in accordance with DMS-4650.

2.6. **Joint Sealants and Fillers**. Provide Class 5 or Class 8 joint sealant materials and fillers unless otherwise shown on the plans or approved, and other sealant materials of the size, shape, and type shown on the plans in accordance with DMS-6310, "Joint Sealants and Fillers."

2.7. **Repair Materials**. Provide concrete repair materials in accordance with DMS-4655, "Concrete Repair Materials," or DMS-6170, "Polymeric Materials for Patching Spalls in Concrete Pavement."

3. EQUIPMENT

Furnish and maintain all equipment in good working condition. Use measuring, mixing, and delivery equipment in accordance with Item 421. Obtain approval for other equipment used.

3.1. **Placing, Consolidating, and Finishing Equipment**. Provide self-propelled paving equipment that uniformly distributes the concrete with minimal segregation and provides a smooth machine-finished consolidated concrete pavement conforming to plan line and grade. Provide an automatic grade control system on slip-forming equipment. Provide mechanically operated finishing floats capable of producing a uniformly smooth pavement surface. Provide equipment capable of providing a fine, light water fog mist.

When using stringless paving equipment, use in accordance with Section 5.9.3., "Method C," and establish control points at maximum intervals of 500 ft. Use these control points as reference to perform the work.

Provide mechanically operated vibratory equipment capable of adequately consolidating the concrete. Provide immersion vibrators on the paving equipment at sufficiently close intervals to provide uniform vibration and consolidation of the concrete over the entire width and depth of the pavement and in conformance with the manufacturer's recommendations. Provide immersion vibrator units that operate at a frequency in air of at least 8,000 cycles per minute. Provide enough hand-operated immersion vibrators for timely and proper consolidation of the concrete for concrete pavement (formed) placements, and along forms, at all joints, and in areas not covered by other vibratory equipment. Surface vibrators may be used to supplement equipment-mounted immersion vibrators. Provide tachometers to verify the proper operation of all vibrators.

For small or irregular areas or when approved, the paving equipment described in this Section is not required.

3.2. **Forming Equipment**.

3.2.1. **Pavement Forms**. Provide side forms of sufficient cross-section, strength, and rigidity to support the paving equipment and resist the impact and vibration of the operation without visible springing or settlement. Use forms that are free of detrimental kinks, bends, or warps that could affect ride quality or alignment. Provide bulkhead forms of sufficient cross-section, strength, and rigidity to support reinforcing steel and maintain alignment during concrete placement operations.

3.3. **Curb Forms**. Provide curb forms for separately placed curbs that are not slipformed that conform to the requirements of Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."

3.4. **Single-Piece Tie-Bar Inserting Equipment**. Provide inserting equipment that accurately inserts and positions reinforcing steel in the plastic concrete parallel to the profile grade and horizontal alignment as shown on the plans.

3.5. **Texturing Equipment**.

3.5.1. **Carpet Drag**. Provide a carpet drag mounted on a work bridge or a manual moveable support system. Provide a single piece of carpet of sufficient transverse length to span the full width of the pavement being placed and adjustable so that a sufficient longitudinal length of carpet is in contact with the concrete being placed to produce the desired texture. Obtain approval to vary the length and width of the carpet to accommodate specific applications.

3.5.2. **Tining Equipment**. Provide a self-propelled metal tine device equipped with steel tines with cross-section approximately 1/32 in. thick by 1/12 in. wide. Provide tines for longitudinal tining equipment spaced at approximately 3/4 in., center-to-center, or provide tines for transverse tining equipment spaced at approximately 1 in., center-to-center. Manual methods that produce an equivalent texture may be used when it is impractical to use self-propelled equipment, such as for small areas, narrow width sections, and emergencies due to equipment breakdown.

3.6. **Curing Equipment**. Provide a self-propelled machine for applying membrane curing compound using mechanically pressurized spraying equipment with atomizing nozzles. Provide equipment and controls that maintain the required uniform rate of application over the entire paving area. Hand-operated pressurized spraying equipment with atomizing nozzles may only be used on small or irregular areas, on narrow width sections, or in emergencies due to equipment breakdown.

3.7. **Sawing Equipment**. Provide power-driven concrete saws to saw the joints shown on the plans. Provide standby power-driven concrete saws during concrete sawing operations.

3.8. **Grinding Equipment**. Provide self-propelled powered grinding equipment that is specifically designed to smooth and texture concrete pavement using circular diamond blades when required. Provide equipment with automatic grade control capable of grinding at least a 3-ft. width longitudinally in each pass without damaging the concrete.

3.9. **Testing Equipment**. Provide testing equipment in accordance with Item 421, unless otherwise shown on the plans or specified. Maintain and calibrate all Contractor-supplied testing equipment in conformance with pertinent test methods. Provide calibration records of strength-testing equipment to the Engineer within 1 week after each calibration.

3.10. **Coring Equipment**. Provide coring equipment capable of extracting cores in accordance with Tex-424-A when required.

3.11. **Miscellaneous Equipment**. Furnish 10-ft. and 15-ft. steel or magnesium long-handled, standard straightedges. Furnish enough work bridges, long enough to span the pavement, for finishing and inspection operations.

4. CONSTRUCTION

Obtain approval for adjustments to plan grade-line to maintain thickness over minor subgrade or base high spots while maintaining clearances and drainage. Maintain subgrade or base in a smooth, clean, compacted condition in conformance with the required section and established grade until the pavement concrete is placed. Dampen subgrade or base with water before placing pavement concrete.

Adequately light the active work areas for all nighttime operations. Provide and maintain tools and materials to perform testing.

4.1. **Paving and Quality Control (QC) Plan**. Submit a paving and QC plan for approval before beginning pavement construction operations. Include details of all operations in the concrete paving process, including methods to construct transverse joints, methods to consolidate concrete at joints, longitudinal construction joint layout, sequencing, curing, lighting, early opening, leave-outs, sawing, inspection, contractor QC testing, testing for opening to traffic, construction methods, other details, and description of all equipment. List

certified personnel performing contractor QC testing and testing for opening to traffic. Submit revisions to the paving and QC plan for approval.

4.2. **Placing Reinforcing Steel for Continuously Reinforced Concrete Pavements**. Accurately place and secure in position all reinforcing steel as shown on the plans. Provide chairs in sufficient number to adequately support the reinforcing steel at the proper height as show on the plans. Secure reinforcing steel at alternate intersections with tie wires. Reinforcing steel intersections may be secured with locking support chairs instead of tie wires. Anchor pins used to prevent the reinforcing steel from shifting may remain in the final pavement. Stagger the lap locations so that no more than 1/3 of the longitudinal steel is spliced in any given 12-ft. width and 2-ft. length of the pavement. Tie all splices with tie wires.

4.3. **Joints**. Install formed joints as shown on the plans. Install transverse bulkhead forms to support extending reinforcing steel, shaped accurately to the cross-section of the pavement when placing of concrete is stopped.

4.3.1. **Placing Reinforcement at Joints**. Install reinforcing steel at transverse construction joints as shown on the plans. Use multiple-piece tie bars, drilled and epoxy-grouted tie bars, or mechanically inserted single-piece tie bars at longitudinal construction joints. Discontinue the use of mechanically inserted single-piece tie bars if this method results in steel misalignment or improper location, poor concrete consolidation, or other inadequacies. Protect the reinforcing steel immediately beyond the construction joint from damage, vibration, and impact.

For drilled and epoxy-grouted tie bars, drill holes into the existing concrete at least 10 in. deep unless otherwise directed. Use a drill bit with a diameter that is 1/8 in. greater than that of tie bars. Clean the holes using a wire brush and compressed air to remove all the dust and moisture. Only cartridge or machine applicator epoxies are allowed. Follow the epoxy manufacturer's instructions to apply the epoxy. Insert the tip of the epoxy cartridge or the tip of the machine applicator to the end of the tie bar hole, and inject Type III, Class C, epoxy to fill the hole with the amount of epoxy recommended by the manufacture for the size of bar and depth of hole. Insert tie bars.

4.3.2. **Testing of Tie Bars**. Verify that tie bars that are drilled and epoxied or mechanically inserted into concrete at longitudinal construction joints develop a pullout resistance equal to at least 3/4 of the yield strength of the reinforcing steel. Test pullout resistance of mechanically inserted tie bars when the concrete pavement is at least 7 days old. Test pullout resistance of epoxy-grouted bars after the epoxy manufacturer's recommended final cure time. Test 15 bars in accordance with ASTM E488, except that alternate approved equipment may be used. All 15 tested bars must meet the required pullout strength. Perform corrective measures to provide equivalent pullout resistance if any of the test results do not meet the required minimum pullout strength. Repair damage from testing.

4.3.3. **Testing of Epoxy-Grouted Longitudinal Bars in Continuously Reinforced Concrete Pavements**. When longitudinal reinforcing steel is drilled and epoxy-grouted in existing pavement, test each bar in accordance with ASTM E488, except that alternate approved equipment may be used. All bars must develop a pullout resistance equal to at least 3/4 of the yield strength of the steel. Test pullout resistance after the epoxy manufacturer's recommended final cure time. Perform corrective measures to provide equivalent pullout resistance if any of the test results do not meet the required minimum pullout strength. Repair damage from testing.

4.3.4. **Transverse Construction Joints for Concrete Pavement Contraction Design (CPCD)**. Install and rigidly secure a complete joint assembly and bulkhead in the planned transverse contraction joint location when the placing of concrete is intentionally stopped. Install a transverse construction joint either at a planned transverse contraction joint location or mid-slab between planned transverse contraction joints when the placing of concrete is unintentionally stopped. Install tie bars of the size and spacing used in the longitudinal joints for mid-slab construction joints.

Place dowels at mid-depth of the pavement slab, parallel to the surface. Place dowels for transverse contraction joints parallel to the pavement edge. Tolerances for location and alignment of dowels will be shown on the plans. For dowels used in a contraction joint, coat the entire length of the dowels with a thin

film of grease, wax, silicone, or other approved de-bonding material. For dowels used in an expansion joint, coat half the length with a thin film of grease, wax, silicone, or other approved de-bonding material; provide dowel caps on the coated half of each dowel bar.

4.4. **Curb Joints**. Construct curb joints in accordance with Item 529.

4.5. **Placing and Removing Forms**. Use clean and oiled forms. Secure forms on a base or firm subgrade that is accurately graded and that provides stable support without deflection and movement by formriding equipment. Pin every form at least at the middle and near each end. Tightly join and key form sections together to prevent relative displacement.

Set side forms far enough in advance of concrete placement to permit inspection. Check conformity of the grade, alignment, and stability of forms immediately before placing concrete, and make all necessary corrections. Use a straightedge or other approved method to test the top of forms to ensure that the ride quality requirements for the completed pavement will be met. Stop paving operations if forms settle or deflect more than 1/8 in. under finishing operations. Reset forms to line and grade, and refinish the concrete surface to correct grade.

Avoid damage to the edge of the pavement when removing side forms and bulkhead forms. Repair damage resulting from form removal with an approved repair material within 24 hr. after form removal unless otherwise approved. Chip excessively honeycombed areas to sound concrete, and repair with an approved repair material within 24 hr. after form removal unless otherwise approved. Clean joint face within 24 hr. after a bulkhead for a transverse construction joint has been removed unless otherwise approved. Promptly apply membrane curing compound to the edge of the concrete pavement when forms are removed before 72 hr. after concrete placement.

Forms that are not the same depth as the pavement but within 2 in. of that depth are permitted if the subbase is trenched or the full width and length of the form base are supported with a firm material to produce the required pavement thickness. Promptly repair the form trench after use. Use flexible or curved wood or metal forms for curves of 100-ft. radius or less.

4.6. **Concrete Delivery**. Clean delivery equipment as necessary to prevent accumulation of old concrete before loading fresh concrete. Use agitated delivery equipment for concrete designed to have a slump of more than 5 in. Segregated concrete is subject to rejection.

Begin the discharge of concrete delivered in agitated delivery equipment in accordance with Item 421. Place non-agitated concrete within 45 min. after batching. Reduce times as directed when hot weather or other conditions cause quick setting of the concrete.

4.7. **Concrete Placement**. Do not allow the pavement edge to deviate from the established paving line by more than 1/2 in. at any point. Place the concrete as near as possible to its final location, and minimize segregation and rehandling. Distribute concrete using shovels where hand spreading is necessary. Do not use rakes or vibrators to distribute concrete.

4.7.1. **Consolidation**. Consolidate all concrete using approved mechanical vibrators operated on the front of the paving equipment. Use immersion-type vibrators that simultaneously consolidate the full width of the placement when machine finishing. Keep vibrators from dislodging reinforcement. Use hand-operated vibrators to consolidate concrete for concrete pavement (formed) placements, and along forms, at all joints, and in areas not accessible to the machine-mounted vibrators. Do not operate machine-mounted vibrators while the paving equipment is stationary. Vibrator operations are subject to review.

4.7.2. **Curbs**. Curbs will be in accordance with Item 529.

4.7.3. **Temperature Restrictions**. Place concrete that is between 40°F and 95°F when measured in accordance with Tex-422-A at the time of discharge, except that concrete may be used if it was already in transit when the temperature was found to exceed the allowable maximum. Take immediate corrective action or cease concrete production when the concrete temperature exceeds 95°F.

Do not place concrete when the ambient temperature in the shade is below 40°F and falling, unless approved. Concrete may be placed when the ambient temperature in the shade is above 35°F and rising or above 40°F. Protect the pavement with an approved insulating material capable of protecting the concrete for the specified curing period when temperatures warrant protection against freezing. Submit for approval proposed measures to protect the concrete from anticipated freezing weather for the first 72 hr. after placement. Repair or replace all concrete damaged by freezing.

4.8. **Spreading and Finishing**. Finish all concrete pavement using approved self-propelled equipment. Use power-driven spreaders, power-driven vibrators, power-driven strike-off screed, or approved alternate equipment to strike-off the surface of the concrete to the required section and grade without surface voids. Use float equipment for final finishing. Use concrete with a consistency that allows completion of all finishing operations without addition of water to the surface. Use the minimal amount of water fog mist necessary to maintain a moist surface. Reduce fogging if float or straightedge operations result in excess slurry.

4.8.1. **Finished Surface**. Perform sufficient checks using a minimum 10-ft. long straightedge on the plastic concrete to ensure the final surface is within the tolerances specified in Surface Test A in accordance with Item 585, “Ride Quality for Pavement Surfaces.” Check with the straightedge parallel to the centerline.

4.8.2. **Maintenance of Surface Moisture**. Prevent surface drying of the pavement before application of the curing system by means that may include water fogging, the use of wind screens, or the use of evaporation retardants. Apply evaporation retardant at the manufacturer’s recommended rate. Reapply the evaporation retardant as needed to maintain the concrete surface in a moist condition until curing system is applied. Do not use evaporation retardant as a finishing aid. Failure to take acceptable precautions to prevent surface drying of the pavement will be cause for shutdown of pavement operations.

4.8.3. **Surface Texturing**. Complete final texturing before the concrete has attained its initial set. Drag the carpet longitudinally along the pavement surface with the carpet contact surface area adjusted to provide a satisfactory coarsely textured surface. Prevent grout from plugging the carpet. Do not perform carpet dragging operations while there is excessive bleed water.

A metal-tine texture finish is required unless otherwise shown on the plans. Provide longitudinal tining unless otherwise shown on the plans. Immediately following the carpet drag, apply a single coat of evaporation retardant, if needed, at the rate recommended by the manufacturer. Provide the metal-tine finish immediately after the concrete surface has set enough for consistent tining. Operate the metal-tine device to obtain grooves approximately 3/16 in. deep, with a minimum depth of 1/8 in., and approximately 1/12 in. wide. Do not overlap a previously tined area. Use manual methods to achieve similar results on ramps, small or irregular areas, and narrow width sections of pavements. Repair damage to the edge of the slab and joints immediately after texturing. Do not tine pavement that will be overlaid or that is scheduled for blanket diamond grinding or shot blasting.

Target a carpet drag texture of 0.04 in., as measured by Tex-436-A, when carpet drag is the only surface texture required on the plans. Ensure adequate and consistent macro-texture is achieved by applying enough weight to the carpet and by keeping grout from plugging the carpet. Correct any location with a texture less than 0.03 in. by diamond grinding or shot blasting. The Engineer will determine the test locations at points located transversely to the direction of traffic in the outside wheel path.

4.8.4. **Small, Irregular Area, or Narrow Width Placements**. Use hand equipment and procedures that produce a consolidated and finished pavement section to the line and grade where machine placements and finishing of concrete pavement are not practical.

4.8.5. **Emergency Procedures**. Use hand-operated equipment for applying texture, evaporation retardant, and cure in the event of equipment breakdown.

4.9. **Curing**. Keep the concrete pavement surface from drying in accordance with Section 360.4.8.2., “Maintenance of Surface Moisture,” until the curing material has been applied. Maintain and promptly repair damage to curing materials on exposed surfaces of concrete pavement continuously for at least 3 curing days. A curing day is defined as a 24-hr. period when either the temperature taken in the shade away from

artificial heat is above 50°F for at least 19 hr. or the surface temperature of the concrete is maintained above 40°F for 24 hr. Curing begins when the concrete curing system has been applied. Stop concrete paving if curing compound is not being applied promptly and maintained adequately. Other methods of curing in accordance with Item 422 may be used when specified or approved.

4.9.1. **Membrane Curing**. Spray the concrete surface uniformly with two coats of membrane curing compound at an individual application rate of no more than 180 sq. ft. per gallon. Apply the curing compound before allowing the concrete surface to dry.

Manage finishing and texturing operations to ensure placement of curing compound on a moist concrete surface, relatively free of bleed water, to prevent any plastic shrinkage from cracking. Time the application of curing compound to prevent plastic shrinkage from cracking.

Maintain curing compounds in a uniformly agitated condition, free of settlement before and during application. Do not thin or dilute the curing compound.

Apply additional compound at the same rate of coverage to correct damage where the coating shows discontinuities or other defects or if rain falls on the newly coated surface before the film has dried enough to resist damage. Ensure that the curing compound coats the sides of the tining grooves.

4.9.2. **Asphalt Curing**. Apply a uniform coating of asphalt curing at a rate of 90 sq. ft.–180 sq. ft. per gallon when an asphaltic concrete overlay is required. Apply curing immediately after texturing and once the free moisture (sheen) has disappeared. Obtain approval to add water to the emulsion to improve spray distribution. Maintain the asphalt application rate when using diluted emulsions. Maintain asphalt emulsions in a mixed condition during application.

4.9.3. **Curing Class HES Concrete**. Provide membrane curing in accordance with Section 360.4.9.1., “Membrane Curing,” or wet mat curing in accordance with Section 422.4.8., “Final Curing,” for all Class HES concrete.

4.10. **Sawing Joints**. Saw joints to the depth shown on the plans as soon as sawing can be accomplished without damage to the pavement, regardless of time of day or weather conditions. Some minor raveling of the saw-cut is acceptable. Use a chalk line, string line, sawing template, or other approved method to provide a true joint alignment. Provide enough saws to match the paving production rate to ensure sawing completion at the earliest possible time to avoid uncontrolled cracking. The Engineer will evaluate the cause of the uncontrolled cracking and direct any necessary repairs. Reduce paving production if necessary to ensure timely sawing of joints. Promptly restore membrane cure damaged within the first 72 hr. of curing.

The Engineer will check the depth of saw cuts in accordance with Tex-423-A within 24 hrs. after saw-cutting or before joints are sealed, whichever is sooner. Frequency of checks will be as follows:

- every 500 ft. or fraction thereof for all longitudinal contraction joints, and
- 10% of transverse contraction joints in CPCD for each daily placement.

Resaw contraction joints that are deficient in depth by more than 1/4 in. from plan depth within 24 hr. of depth checks.

4.11. **Cleaning and Sealing Joints**. Clean and seal joints in accordance with Item 438, “Cleaning and Sealing Joints.” Repair excessive spalling of the joint saw groove using an approved method before installing the sealant. Seal all joints before opening the pavement to all traffic. Joint sealants are not required on concrete pavement that is to be overlaid with asphaltic materials.

4.12. **Protection of Pavement**. Erect and maintain barricades and other standard and approved devices that will exclude all vehicles and equipment from the newly placed pavement for the periods specified. Protect the pavement from damage due to crossings using approved methods before opening to traffic. Where a detour is not readily available or economically feasible, an occasional crossing of the roadway with overweight equipment may be permitted for relocating equipment only, but not for hauling material. When an occasional

crossing of overweight equipment is permitted, temporary matting or other approved methods may be required.

Maintain an adequate supply of sheeting or other material to cover and protect fresh concrete surface from weather damage. Apply as needed to protect the pavement surface from weather.

4.13. **Opening to Traffic**. Testing for opening pavement to traffic is the responsibility of the Contractor unless otherwise shown on the plans or as directed. Before opening pavement to traffic:

- provide test results to the Engineer for review, if necessary,
- clean pavement,
- place stable material against pavement edges,
- seal joints, and
- perform all other traffic-safety related work.

4.13.1. **Opening Pavement to All Traffic**. Pavements can be open to all traffic:

- when the pavement is 7 days old,
- when 3-day curing is complete and the concrete has attained a compressive strength of 3,200 psi,
- after 24 hr. and the concrete has attained a compressive strength of 3,200 psi when Class HES concrete is used, or
- after the concrete has been cured for at least 8 hr. and attained a minimum compressive strength of 1,800 psi when Class HES concrete is used.

4.13.2. **Opening Pavement to Construction Equipment**. Unless otherwise shown on the plans, concrete pavement may be opened to concrete paving equipment and related delivery equipment after the concrete is at least 48 hr. old and has attained a compressive strength of 3,200 psi. Keep delivery equipment at least 2 ft. from the edge of the concrete pavement. Keep tracks of the paving equipment at least 1 ft. from the pavement edge. Protect textured surfaces from the paving equipment. Restore damaged membrane curing as soon as possible. Repair pavement damaged by paving or delivery equipment before opening to all traffic.

4.13.3. **Maturity Method**. Maturity method, in accordance with Tex-426-A, may be used to estimate concrete strength for opening pavement to traffic. Install at least two maturity sensors for each day's placement in areas where the maturity method will be used for opening. Maturity sensors, when used, will be installed near the day's final placement for areas being evaluated.

The Engineer will test specimens to verify the strength-maturity relationship in accordance with Tex-426-A. The strength-maturity relationship will be verified at least every 10 days of production after the first day. Establish a new strength-maturity relationship when the strength specimens deviate more than 10% from the maturity-estimated strengths. Suspend use of the maturity method for opening pavements to traffic when the strength-maturity relationship deviates by more than 10% until a new strength-maturity relationship is established.

The Engineer will determine the frequency of verification when the maturity method is used intermittently or for only specific areas.

4.13.4. **Emergency Opening to Traffic**. Open the pavement to traffic under emergency conditions, when the pavement is at least 72 hr. old, when directed in writing.

4.14. **Sampling and Testing of Concrete**. Unless otherwise specified, all fresh and hardened concrete is subject to testing as follows.

4.14.1. **Fresh Concrete**. Provide safe access and assistance to the Engineer during sampling. Fresh concrete will be sampled in accordance with Tex-407-A.

4.14.2. **Testing Concrete**. The Engineer will test the fresh and hardened concrete in accordance with the following methods:

- **Slump**. Tex-415-A, only for formed concrete pavement placements;
- **Air Content**. Tex-414-A or Tex-416-A, only when air-entrained concrete is shown on the plans;
- **Temperature**. Tex-422-A;
- **Making and Curing Strength Specimens**. Tex-447-A;
- **Compressive Strength**. Tex-418-A; and
- **Maturity**. Tex-426-A.

Maturity specimens will be made only when maturity method is used or shown on the plans.

Concrete with slump less than minimum required after all addition of water withheld will be rejected, unless otherwise allowed by the Engineer. Concrete with slump exceeding maximum allowed may be used at the Contractor's option. If used, Engineer will make, test, and evaluate strength specimens in accordance with Section 360.4.15., "Acceptance of Concrete Pavement." Acceptance of concrete not meeting air content or temperature requirements will be determined by Engineer. Fresh concrete exhibiting segregation and excessive bleeding will be rejected.

4.14.2.1. **Strength Specimen Handling**. After strength test specimens are molded, protect and cure in conformance with pertinent test methods. When necessary, deliver Contractor-molded specimens to curing facilities, remove specimens from their molds, and place specimens in curing tanks within 24–48 hr. after molding, in conformance with pertinent test methods. The Engineer will deliver Department-molded specimens to curing facilities, remove specimens from their molds, and place specimens in curing tanks within 24–48 hr. after molding, in conformance with pertinent test methods.

4.15. **Acceptance of Concrete Pavement**. The Engineer will determine pay adjustments for deficient pavement thickness within 14 days after concrete pavement has been cored. The Engineer will determine structural adequacy of low concrete strengths within 7 days after design strength specimens or cores, if taken, are tested.

4.15.1. **Pavement Thickness**. The Engineer will check the thickness in accordance with Tex-423-A unless other methods are shown on the plans. The Engineer will perform one thickness test consisting of one reading at approximately the center of the paving equipment every 500 ft. or fraction thereof. Core where directed, in accordance with Tex-424-A, to verify deficiencies. Do not core until pavement is at least 7 days old or has achieved design strength. Fill core holes using an approved concrete mixture and method.

4.15.1.1. **Assessing Payment Adjustments**. Limits for applying a payment adjustment for deficient pavement thickness are 500 ft. units of pavement in each lane. Lane width will be as shown on typical sections and in conformance with pavement design standards.

The limits for retaining deficient pavement without compensation or removing and replacing without additional compensation will be defined by coring or equivalent nondestructive means as determined by the Engineer. The remaining portion of the 500-ft. unit allowed for pay adjustment will be subject to the payment adjustment based on the average core thickness deficiency at each end of the 10-ft. interval investigation as determined by the Engineer.

Shoulders will be measured for thickness unless otherwise shown on the plans. Shoulders 6 ft. wide or wider will be considered as lanes. Shoulders less than 6 ft. wide will be considered part of the adjacent lane. Shoulders less than 6 ft. wide and placed separately from the adjacent lane will be considered as a lane.

Limits for applying payment adjustment for deficient pavement thickness for ramps, widenings, acceleration and deceleration lanes, and other miscellaneous areas are 500-ft. units. Areas less than 500-ft. units will be individually evaluated for payment adjustment based on the plan area.

4.15.1.2. **Verification of Thickness Deficiencies**. When any fresh depth test measured in accordance with Tex-423-A is deficient by more than 0.50 in. from the plan thickness, take one 4-in. diameter core at that location to verify the measurement.

When determining the average thickness deficiency for assessing a pay adjustment other than retaining pavement without compensation or remove and replace as shown in Table 1, take at least two additional cores from the unit, in accordance with Section 360.4.15.1.1., "Assessing Payment Adjustments," equidistantly spaced from the first core in each direction if the first core is deficient by more than 0.50 in. from the plan thickness. Measure the length of cores in accordance with Tex-424-A. Determine the average thickness by averaging the lengths of the cores. Subtract the calculated average thickness from the plan thickness to determine the average thickness deficiency. In calculations of the average thickness, measurements exceeding the plan thickness by more than 0.2 in. will be considered as the plan thickness plus 0.2 in.

When determining the limits for retaining the deficient pavement without compensation or remove and replace without additional compensation, take additional cores at 10-ft. intervals in each direction parallel to the centerline to determine the boundary of the deficient area if the first core length deficiency is more than 1.00 in. for pavements less than 11 in. thick or more than 1.50 in. for pavements 11 in. or thicker. Continue taking cores at 10-ft. intervals until the core length deficiency is less than 1.00 in. for pavements less than 11 in. thick or less than 1.50 in. for pavements 11 in. or thicker.

4.15.2. **Strength of Concrete Pavement**. The Engineer will accept concrete pavement meeting a compressive strength of 3,200 psi at 7 days or meeting a compressive strength of 4,000 psi at 28 days for Class P concrete.

Concrete strength testing may be correlated to an age other than 7 days in accordance with Tex-427-A when approved.

The Engineer will accept concrete pavement using Class HES concrete based on the required strength and time.

Investigate the strength test procedures, the quality of materials, the concrete production operations, and other possible problem areas to determine the cause when a concrete strength test value is more than 10% below the required strength or when three consecutive strength values fall below the required strength. Take necessary action to correct the problem, including redesign of the concrete mix if needed. The Engineer may suspend concrete paving if the Contractor is unable to identify, document, and correct the cause of low-strength test values in a timely manner. The Engineer will evaluate the structural adequacy of the pavements if any strength is more than 15% below the required strength. Remove and replace pavements found to be structurally inadequate at no additional cost when directed.

4.15.3. **Ride Quality**. Measure and correct ride quality in accordance with Item 585, unless otherwise shown on the plans.

5. MEASUREMENT

This Item will be measured as follows.

5.1. **Concrete Pavement**. Concrete pavement will be measured by the square yard of surface area in place. The surface area includes the portion of the pavement slab extending beneath the curb.

6. PAYMENT

These prices are full compensation for materials, equipment, labor, tools, and incidentals.

6.1. **Concrete Pavement**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Concrete Pavement" of

the type and depth specified as adjusted in accordance with Section 360.6.2., "Deficient Thickness Adjustment."

6.2. **Deficient Thickness Adjustment**. Where the average thickness of pavement is deficient in thickness, payment will be made using the adjustment factor in accordance with Table 1 applied to the bid price for the deficient area for each unit in accordance with Section 360.4.15.1.1., "Assessing Payment Adjustments." When pavement thickness investigation (coring) is conducted for three consecutive placements, remove and replace without additional compensation all pavement placed during these days if the average thickness deficiency from all cores taken from these consecutive placements is greater than 0.25 in.

Table 1
Deficient Thickness Price Adjustment Factor

Deficiency in Thickness Determined by Cores (in.)	**Proportional Part of Contract Price Allowed (Adjustment Factor) for Thickness <11 inches**
Not deficient	1.00
Over 0.00 through 0.50	1.00
Over 0.50 through 0.75	0.80
Over 0.75 through 1.00	0.60
Over 1.00 through 1.25	Retain pavement without compensation or Remove and Replace
Over 1.25	Remove and Replace
Deficiency in Thickness Determined by Cores (in.)	**Proportional Part of Contract Price Allowed (Adjustment Factor) for Thickness ≥11 inches**
Not deficient	1.00
Over 0.00 through 0.50	1.00
Over 0.50 through 0.75	0.90
Over 0.75 through 1.00	0.80
Over 1.00 through 1.50	0.60
Over 1.50 through 2.00	Retain pavement without compensation or Remove and replace
Over 2.00	Remove and replace

6.3. **Curb**. All curbs will be paid for under Item 529.

Item 361
Full-Depth Repair of Concrete Pavement

1. DESCRIPTION

Repair concrete pavement to full depth in accordance with the details shown on the plans and the requirements of this Item.

2. MATERIALS

Furnish materials in accordance with the following.

- Item 360, "Concrete Pavement"
- Item 421, "Hydraulic Cement Concrete"
- Item 440, "Reinforcement for Concrete"
- DMS-6100, "Epoxies and Adhesives"
- DMS-4655, "Concrete Repair Materials"

2.1. **Full-Depth Repair**. Obtain approval for the repair material mix design. The selection of repair material should be based on the time for opening to traffic and temperature range during the repair.

2.1.1. **Hydraulic Cement Concrete for Pavement**. Provide Class High Early Strength (HES) concrete designed to attain a minimum average flexural strength of 255 psi or a minimum average compressive strength of 1,800 psi within the designated timeframe if the timeframe designated for opening to traffic is less than 72 hr. after concrete placement. Otherwise, provide Class P concrete in accordance with Item 360.

Provide material in accordance with DMS-4655 Type A when Class HES concrete does not meet the strength requirement within the designated timeframe.

2.1.2. **Asphalt Concrete**. Furnish asphalt concrete material for overlay and asphalt shoulder repair as shown on the plans or when directed. The Engineer may waive quality control tests for this material.

3. EQUIPMENT

Provide tools and equipment necessary for proper execution of the work that meet the pertinent requirements of the following.

- Item 360
- **Concrete Demolition Equipment**. Provide hammers or hydro-demolition equipment for the bulk removal of concrete.
- **Concrete Lift-Out Equipment**. Provide steel chains, lift pins, and a crane or front-end loader capable of lifting the concrete and loading it onto a flatbed or dump truck.
- **Drill**. Use a drill with tungsten carbide bits.
- **Air Compressor**. Provide compressor equipped with filters designed to remove oil from the air and capable of delivering air to remove dust and debris.

4. CONSTRUCTION

Submit for approval all materials and methods of application at least 2 weeks before beginning any repair work. Repair locations will be as indicated on the plans or as directed. Repair areas may be adjusted after

removing distressed concrete. Compensation will be made for unexpected volumes of repair areas or changes in scope of work.

4.1. **Full-Depth Repair**. Repair areas identified by the Engineer. Make repair areas rectangular, at least 6 ft. long, and at least 1/2 a full lane in width, unless otherwise shown on the plans. Accept ownership of all removed material, and dispose of it in accordance with federal, state, and local regulations unless otherwise shown on the plans. Saw-cut and remove existing asphalt concrete overlay at least 2 ft. longer than the repair patch in each longitudinal direction when there is existing asphalt concrete overlay over the repair area.

Saw-cut the full depth through the concrete around the perimeter of the repair area before removal. Schedule work so that concrete placement follows full-depth saw-cutting by no more than 7 days unless otherwise shown on the plans or approved.

Remove the slab by lifting the slab with a minimum disturbance to the base materials and surrounding concrete. Do not spall or fracture concrete adjacent to the repair area. Saw-cut and remove additional concrete as directed, after slab removal, if distresses are found in the surrounding concrete pavement. Repair damages to concrete pavement caused by the Contractor's operation without additional compensation. Perform repairs as directed.

Remove loose or damaged base material completely, leaving no loose base material. Recompact, if necessary, existing base materials to the Engineer's satisfaction.

Use tie bars to restore the continuity of the concrete pavement as shown on the plans. Demonstrate, by simulated job conditions, that the bond strength of the epoxy-grouted tie bars meets a pullout strength of at least 3/4 of the yield strength of the tie bar when tested in accordance with ASTM E488 within the epoxy manufacturer's recommended curing time. Perform corrective measures and retest when necessary to meet testing requirements. Perform tie bar testing before starting repair work. During the preconstruction meeting, discuss the estimate of the number of epoxy cartridges per repair size that will be used to fill the tie-bar holes.

Place tie bars as shown on the plans. Drill holes into the existing concrete at least 10 in. deep unless otherwise directed. Use a drill bit with a diameter that is 1/8 in. greater than that of tie bars. Clean the holes with a wire brush and compressed air to remove all the dust and moisture. Only cartridge or machine applicator epoxies will be allowed. Follow the epoxy manufacturer's instructions to apply the epoxy. Insert the tip of the epoxy cartridge or the tip of the machine applicator into the end of the tie bar hole, and inject Type III, Class C epoxy to fill the entire hole. Insert tie bars.

Place new deformed reinforcing steel bars of the same size and spacing as those shown on the plans for continuously reinforced concrete pavement (CRCP) repairs. Lap all longitudinal reinforcing steel at least 25 in. Provide and place supports to firmly hold the new reinforcing steel in place when needed.

Place dowel bars as shown on the plans for concrete pavement contraction design (CPCD) repairs. Provide and place supports to firmly hold the dowel bars in place.

After removing all loose base material and installing all necessary reinforcing steel, place concrete directly on the remaining existing base.

Mix, place, cure, and test concrete in accordance with Item 360 and Item 421. Broom-finish the concrete surface unless otherwise shown on the plans.

Perform a timely saw-cut over the dowel bars at transverse contraction joints for CPCD in accordance with Section 360.4.10., "Sawing Joints." Clean and seal CPCD transverse contraction joints and any existing longitudinal joints in accordance with Section 360.4.11., "Cleaning and Sealing Joints."

Match the grade and alignment of existing concrete pavement. Replace any asphalt overlay and shoulder material removed with new asphalt concrete material after concrete strength requirements have been met.

Remove repair area debris from the right of way each day. Concrete pavement may be opened to traffic when specified strength is achieved.

The maturity method, Tex-426-A, may be used to estimate concrete strength for opening pavement to traffic, in accordance with Section 360.4.13.3., "Maturity Method."

5. MEASUREMENT

This Item will be measured by the cubic yard of material in place of the completed concrete area repaired. Volume will be computed based on the measured area in place and the average depth measured in place.

6. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as specified under "Measurement" will be paid for at the unit price bid for "Repair of Concrete Pavement (Full-Depth)." This price is full compensation for removal, stockpiling, and disposal of waste material and for equipment, materials, labor, tools, and incidentals. Asphalt concrete, pavement markings, and curbing will be paid for under pertinent Items.

Item 400
Excavation and Backfill for Structures

1. DESCRIPTION

Excavate for placement and construction of structures and backfill structures. Cut and restore pavement.

2. MATERIALS

Use materials that meet the requirements of the following.

- Item 401, "Flowable Backfill"
- Item 421, "Hydraulic Cement Concrete"
- DMS-4600, "Hydraulic Cement"

3. CONSTRUCTION

3.1. **Excavation**.

3.1.1. **General**. Excavate to the lines and grades shown on the plans or as directed. Provide slopes, benching, sheeting, bracing, pumping, and bailing as necessary to maintain the stability and safety of excavations up to 5 ft. deep. Excavation protection for excavations deeper than 5 ft. is governed by Item 402, "Trench Excavation Protection," and Item 403, "Temporary Special Shoring." Use satisfactory excavated material as backfill or as embankment fill in accordance with Item 132, "Embankment." Dispose of material not incorporated into the final project off the right of way in conformance with federal, state, and local regulations.

Keep any topsoil that has been removed separate, and replace it, as nearly as feasible, in its original position when excavating for installation of structures across private property or beyond the limits of the embankment. Restore the area to an acceptable condition.

Excavate drilled shafts in accordance with Item 416, "Drilled Shaft Foundations."

3.1.1.1. **Obstructions**. Remove obstructions to the proposed construction, including trees and other vegetation, debris, and structures, over the width of the excavation to a depth of 1 ft. below the bottom of excavation. Remove as required to clear the new structure and plug in an approved manner if abandoned storm drains, sewers, or other drainage systems are encountered. Restore the bottom of the excavation to grade by backfilling after removing obstructions in accordance with this Item. Dispose of surplus materials in conformance with federal, state, and local regulations.

3.1.1.2. **Excavation in Streets**. Cut pavement and base to neat lines when structures are installed in streets, highways, or other paved areas. Restore pavement structure after completion of excavation and backfilling.

Maintain and control traffic in accordance with the approved traffic control plan and the TMUTCD.

3.1.1.3. **Utilities**. Comply with the requirements of Article 7.15., "Responsibility for Damage Claims." Conduct work with minimum disturbance of existing utilities, and coordinate work in or near utilities with the utility owners. Inform utility owners before work begins, allowing them enough time to identify, locate, reroute, or make other adjustments to utility lines.

Avoid cutting or damaging underground utility lines that are to remain in place. Promptly notify the utility company if damage occurs. Provide temporary flumes across the excavation while open if an active sanitary

sewer line is damaged during excavation and restore the lines when backfilling has progressed to the original bedding lines of the cut sewer.

3.1.1.4. **De-Watering**. Construct or place structures in the presence of water only if approved. Place precast members, pipe, and concrete only on a dry, firm surface. Remove water by bailing, pumping, well point installation, deep wells, underdrains, or other approved method.

Remove standing water in a manner that does not allow water movement through or alongside concrete being placed if structures are approved for placement in the presence of water. Pump or bail only from a suitable sump separated from the concrete work while placing structural concrete or for a period of at least 36 hr. thereafter. Pump or bail during placement of seal concrete only to the extent necessary to maintain a static head of water within the cofferdam. Pump or bail to de-water inside a sealed cofferdam only after the seal has aged at least 36 hr.

Place a stabilizing material in the bottom of the excavation if the bottom cannot be de-watered to the point the subgrade is free of mud or it is difficult to keep reinforcing steel clean. Use flexible base, cement-stabilized base or backfill, lean concrete, or other approved stabilizing material. Provide concrete with at least 275 lb. of cement per cubic yard, if lean concrete is used, and place to a minimum depth of 3 in. Stabilizing material placed for the convenience of the Contractor will be at the Contractor's expense.

3.1.2. **Bridge Foundations and Retaining Walls**. Do not disturb material below the bottom of footing grade. Do not backfill to compensate for excavation that has extended below grade. Fill the area with concrete at the time the footing is placed if excavation occurs below the proposed footing grade. Additional concrete placed will be at the Contractor's expense.

Take core samples to determine the character of the supporting materials if requested. Provide an intact sample adequate to judge the character of the founding material. Take these cores when the excavation is close to completion. Cores should be approximately 5 ft. deeper than the proposed founding grade.

Remove loose material if the founding stratum is rock or other hard material, and clean and cut it to a firm surface that is level, stepped, or serrated, as directed. Clean out soft seams, and fill with concrete when the footing is placed.

Place the foundation once the Engineer has inspected the excavation and authorized changes have been made to provide a uniform bearing condition if the material at the footing grade of a retaining wall, bridge bent, or pier is a mixture of compressible and incompressible material.

3.1.3. **Cofferdams**. The term "cofferdam" designates any temporary or removable structure constructed to hold surrounding earth, water, or both out of the excavation whether the structure is formed of soil, timber, steel, concrete, or a combination of these. Use pumping wells or well points for de-watering cofferdams if required.

Submit details and design calculations for sheet pile or other types of cofferdams requiring structural members bearing the seal, signature, and date of a licensed professional engineer for review before constructing the cofferdam. The Department reserves the right to reject designs. Design structural systems to comply with the AASHTO *Standard Specifications for Highway Bridges* or AASHTO LRFD *Bridge Design Specifications*. Interior dimensions of cofferdams must provide enough clearance for the construction, inspection, and removal of required forms and, if necessary, enough room to allow pumping outside the forms. Extend sheet pile cofferdams well below the bottom of the footings and make concrete seals as well-braced and watertight as practicable.

Use Class E concrete for foundation seals unless otherwise specified. Place concrete foundation seals in accordance with Item 420, "Concrete Substructures." Seals placed for the convenience of the Contractor will be at the Contractor's expense.

Make the excavation deep enough to allow for swelling of the material at the base of the excavation during pile-driving operations when the Engineer judges it to be impractical to de-water inside a cofferdam and a concrete seal is to be placed around piling driven within the cofferdam. Remove swelling material to the

bottom of the seal grade after driving the piling. Remove the foundation material to exact footing grades where it is possible to de-water inside the cofferdam without placing a seal after driving piling. Do not backfill a foundation to compensate for excavation that has been extended below grade; fill such areas below grade with concrete at the time the seals or footings are placed.

Remove cofferdams after completing the substructure without disturbing or damaging the structure unless otherwise provided.

3.1.4. **Culverts and Storm Drains**. When the design requires special bedding conditions for culverts or storm drains, an excavation diagram will be shown on the plans. Do not exceed these limits of excavation.

Construct pipe structures in an open cut with vertical sides extending to a point 1 ft. above the pipe unless otherwise shown on the plans. When site conditions or the plans do not prohibit sloping the cut, the excavation may be stepped or laid back to a stable slope beginning 1 ft. above the pipe. Maintain the stability of the excavation throughout the construction period.

Construct the embankment for pipe to be installed in fill above natural ground to an elevation at least 1 ft. above the top of the pipe, and then excavate for the pipe.

3.1.4.1. **Unstable Material**. Remove the material to a depth of no more than 2 ft. below the grade of the structure when unstable soil is encountered at established footing grade, unless the Engineer authorizes additional depth. Replace soil removed with stable material in uniform layers no greater than 8 in. deep (loose measurement). Each layer must have enough moisture to be compacted by rolling or tamping as required to provide a stable foundation for the structure.

Use special materials such as flexible base, cement-stabilized base, cement-stabilized backfill, or other approved material when it is not feasible to construct a stable foundation as outlined above.

3.1.4.2. **Incompressible Material**. Remove the incompressible material to 6 in. below the footing grade, backfill with an approved compressible material, and compact in accordance with Section 400.3.3., “Backfill,” if rock, part rock, or other incompressible material is encountered at established footing grade while placing prefabricated elements.

3.2. **Shaping and Bedding**.

3.2.1. **General**. Place at least 2 in. of fine granular material for precast box sections on the base of the excavation before placing the box sections. Use bedding as shown in Figure 1 for pipe installations. Use Class C bedding unless otherwise shown on the plans. The Engineer may require the use of a template to secure reasonably accurate shaping of the foundation material. Undercut the excavation at least 4 in. where cement-stabilized backfill is shown on the plans and backfill with stabilized material to support the pipe or box at the required grade.

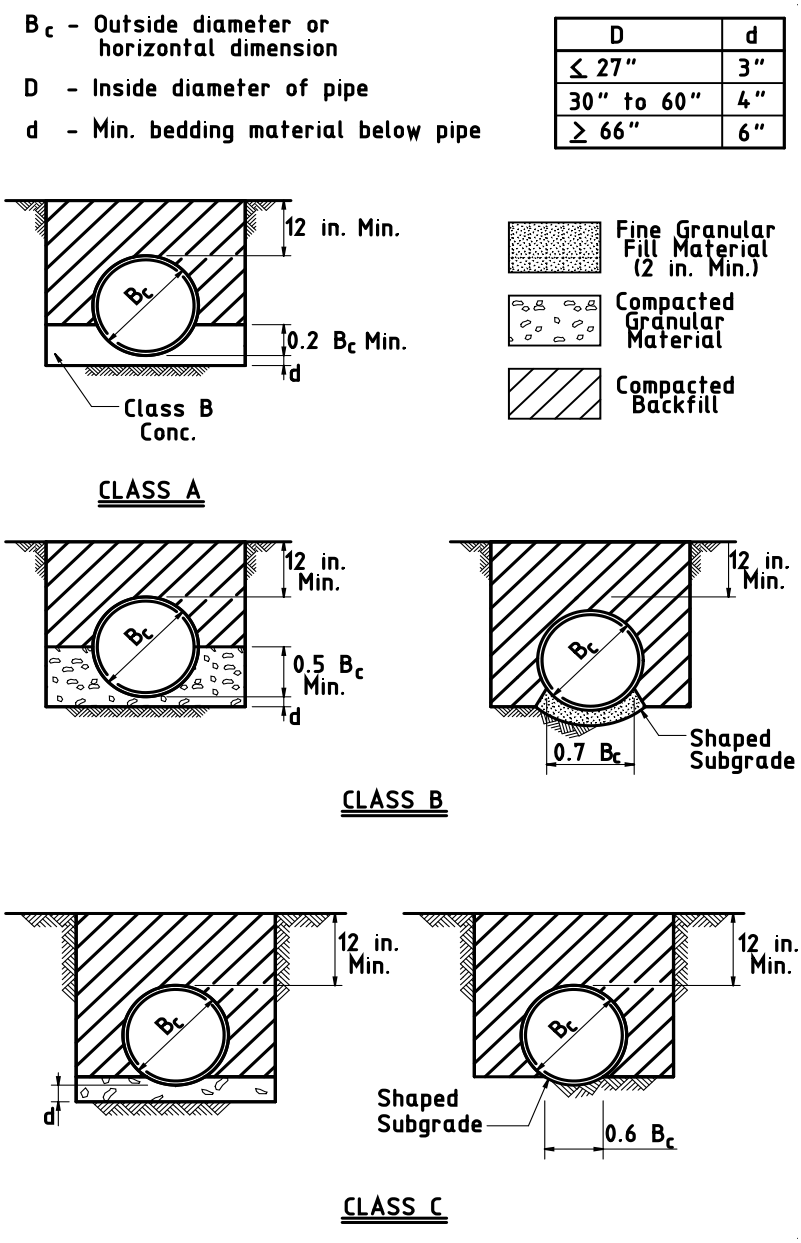

Figure 1
Bedding Diagrams

3.2.2. **Optional Shaping and Bedding for Precast Concrete Pipe.** For precast concrete pipe, the beddings in accordance with ASTM C1479 are permissible.

3.3. **Backfill**.

3.3.1. **General**. Backfill the excavation after placement of the permanent structure as soon as practical. Use backfill free of stones large enough to interfere with compaction; large or frozen lumps that will not break down readily under compaction; and wood or other extraneous material. Obtain backfill material from excavation or from other sources.

Place backfill in layers no greater than 10 in. deep (loose measurement) in areas not supporting a completed roadbed, retaining wall, or embankment. Place backfill in uniform layers no greater than 8 in. deep (loose measurement) in areas supporting a portion of a roadbed, retaining wall, or embankment. Compact each

layer to meet the density requirements of the roadbed, retaining wall, or embankment material, or as shown on the plans.

Bring each layer of backfill material to the moisture content needed to obtain the required density. Use mechanical tamps or rammers to compact the backfill. Rollers may be used to compact backfill if feasible.

Cohesionless materials may be used for backfilling. Use cohesionless materials that conform to the requirements shown in Table 1.

Table 1
Cohesionless Material Gradation Limits

Sieve Size	Percent Retained
3"	0
#10	Note 1
#200	90–100

1. No. 10 sieve requirements are 0–30% retained when used as aggregate for cement-stabilized backfill.

Compact cohesionless materials using vibratory equipment, water ponding, or a combination of both.

3.3.2. **Bridge Foundations, Retaining Walls, Manholes and Inlets, and Box Culverts**. Place backfill against the structure only after the concrete has reached the design strength required in Item 421.

Backfill retaining walls with material meeting the requirements of Item 423, “Retaining Walls.” Backfill around bridge foundations, manholes and inlets, and culverts using material with particles no more than 4 in. in greatest dimension and a gradation that permits thorough compaction. Use rock or gravel mixed with soil if the percentage of fines is enough to fill all voids and ensure a uniform and thoroughly compacted mass of proper density.

Use mechanical tamps and rammers to avoid damage to the structure where backfill material is being placed too close to the structure to permit compaction with blading and rolling equipment.

Avoid wedging action of backfill against structures. Step or serrate slopes bounding the excavation to prevent such action. Place backfill uniformly around bridge foundations. Place backfill equally and in uniform layers along both sides of manholes and inlets and culverts.

The Engineer may require backfilling of structures excavated into hard, erosion-resistant material, and subject to erosive forces, with stone or lean concrete.

Box culverts may be opened to traffic as soon as enough backfill and embankment have been placed over the top to protect culverts against damage from heavy construction equipment. Repair damage to culvert caused by construction traffic at no additional expense to the Department.

3.3.3. **Pipe**. Bring backfill material to the proper moisture condition after installing bedding and pipe as required and place it equally along both sides of the pipe in uniform layers no greater than 8 in. deep (loose measurement). Compact each lift mechanically. Thoroughly compact materials placed under the haunches of the pipe to prevent damage or displacement of the pipe. Place backfill in this manner to the top-of-pipe elevation. Place and compact backfill above the top of the pipe in accordance with Section 400.3.3.1., “General.”

The Engineer may reject backfill material containing more than 20% by weight of material retained on a 3-in. sieve with large lumps not easily broken down or that cannot be spread in loose layers. Material excavated by trenching machine must generally meet the requirements of this Section as long as large stones are not present.

Place and compact additional material where pipe extends beyond the toe of slope of the embankment and the depth of cover provided by backfill to the original ground level is less than the minimum required by the specifications for the type of pipe involved, until the minimum cover has been provided.

3.3.4. **Cement-Stabilized Backfill**. Backfill the excavation to the elevations shown with cement-stabilized backfill when shown on the plans. Use cement-stabilized backfill that contains aggregate conforming to the gradation limits shown in Table 1, water, and at least 7% hydraulic cement based on the dry weight of the aggregate, in accordance with Tex-120-E.

Place cement-stabilized backfill equally along the sides of structures to prevent strain on or displacement of the structure. Fill voids when placing cement-stabilized backfill. Use hand-operated tampers, if necessary, to fill voids. Compact the mixture using density control unless otherwise shown on the plans. Place and compact the backfill within 2 hr. of mixing.

3.3.5. **Flowable Backfill**. Backfill the excavation with flowable backfill to the elevations indicated when shown on the plans. Prevent the structure from being displaced during the placement of the flowable fill, and prevent flowable fill from entering manholes and inlets, culverts, and drainage structures.

4. MEASUREMENT

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

4.1. **Structural Excavation**. Unless shown on the plans as a pay item, structural excavation quantities shown are for information purposes only.

When structural excavation is specified as a pay item, structural excavation for pipe headwalls, inlets, manholes, culvert or storm drain extensions less than 15 ft. long, bridge abutments, retaining walls, and side road and private entrance pipe culverts will not be measured. No allowance will be made for variance from plans quantity incurred by an alternate bid.

When specified as a pay item, structural excavation will be measured by the cubic yard as computed by the average end areas method or as shown on the plans. Excavation diagrams shown on the plans take precedence over the provisions of this Article.

4.1.1. **Boundaries of Measurement**.

4.1.1.1. **Pipe**.

4.1.1.1.1. **Pipe up to 42 Inches**. For pipe up to 42 in. nominal or equivalent diameter, no material outside vertical planes 1 ft. beyond and parallel to the horizontal projection of the outside surfaces of the pipe will be included.

4.1.1.1.2. **Pipe Larger than 42 Inches**. For pipes larger than 42 in. nominal or equivalent diameter, no material outside vertical planes located 2 ft. beyond and parallel to the horizontal projection of the outside surfaces of the pipe will be included.

Quantities for excavation in fill above natural ground include 1 ft. above the top of the pipe regardless of the height of completed fill. Excavation for pipe will be measured between the extreme ends of the completed structure, including end appurtenances as shown on the plans and from centerline to centerline of structures such as inlets and manholes.

4.1.1.2. **Footings, Walls, Boxes, and Other Excavation**. No material outside vertical planes 1 ft. beyond and parallel to the edges of the footings or outside walls will be included, whether a cofferdam or shoring is used. When plans provide the option of cast-in-place or precast boxes, measurement will be based on the cast-in-place option.

Where excavation in addition to that allowed for the footings is required for other portions of the structure, measurement for the additional excavation will be limited laterally by vertical planes 1 ft. beyond the face of the member and parallel to it, and vertically to a depth of 1 ft. below the bottom of the member.

4.1.1.3. **Excavation near Roadways and Channels**. At structure sites other than culverts and pipe excavations, the measurement of structural excavation will include only material below or outside the limits of the completed road or channel excavation. Roadway and channel excavation will be paid under Item 110, "Excavation." For culverts except side road and private entrance culverts, excavation within the limits of the structure and below or outside the limits of the completed roadway excavation will be measured as structural excavation.

4.1.2. **Falsework**. No measurement will be made for excavation necessary for placing forms or falsework that exceed the limits given in Section 400.4.1.1., "Boundaries of Measurement."

4.1.3. **Swelling**. Measurement will not include materials removed below footing grades to compensate for anticipated swelling due to pile driving, nor will it include material required to be removed due to swelling beyond the specified limits during pile-driving operations.

4.1.4. **Cave-Ins**. Measurement will not include additional volume caused by slips, slides, cave-ins, silting, or fill material resulting from the action of the elements or the Contractor's operation.

4.1.5. **Undercut**. Where rock or other incompressible or unstable material is undercut to provide a suitable foundation for pipe or box sections, such material below grade directed to be removed will be measured for payment.

4.1.6. **Grade Change**. Additional measurement will be made of the volume of excavation involved in the lowering or raising of the elevation of a footing, foundation, or structure unit, when such grade change is authorized.

4.2. **Cement-Stabilized Backfill**. Cement-stabilized backfill will be measured by the cubic yard as shown on the plans.

4.3. **Cutting and Restoring Pavement**. Cutting and restoring pavement will be measured by the square yard as shown on the plans. Excavation below pavement or base will be measured as structural excavation of the pertinent type.

5. PAYMENT

5.1. **Structural Excavation**. Unless specified as a pay item, structural excavation and backfill performed, and material furnished in accordance with this Item will not be paid for directly, but will be subsidiary to pertinent Items.

When structural excavation is specified as a pay item, the excavation and backfill work performed, and materials furnished will be paid for at the unit price bid for "Structural Excavation," "Structural Excavation (Box)," "Structural Excavation (Pipe)," and "Structural Excavation (Bridge)." This price includes concrete to compensate for excavation that has extended below grade for bridge foundations and retaining walls, and backfilling and compacting areas that were removed as part of structural excavation.

Cofferdams or other measures necessary for supporting excavations less than 5 ft. deep will not be measured or paid for directly, but will be subsidiary to the Contract.

Foundation seal concrete for cofferdams, when required, will be paid for as provided in the pertinent Items. If no direct method of payment is provided in the Contract, the work will be measured and paid for in accordance with Article 9.7., "Payment for Extra Work and Force Account Method." Seal placed for the convenience of the Contractor will not be paid for.

Unless otherwise provided, stone or lean concrete backfill around structures as provided for in Section 400.3.3.2., "Bridge Foundations, Retaining Walls, Manholes and Inlets, and Box Culverts," will be

measured and paid for as extra work in accordance with Article 9.7., "Payment for Extra Work and Force Account Method."

When structural excavation is specified as a pay item, a partial payment of 50% of the bid price will be made for structural excavation completed to the satisfaction of the Engineer but not backfilled. The remaining amount will be paid upon completion of backfilling. When the Contractor elects to excavate beyond plan requirements, no measurement will be made of the additional volume.

5.2. **Removal and Replacement of Unsuitable or Incompressible Material**. Removal and replacement of material will be paid for if directed. Removal and replacement of material or placement of special material made necessary by the softening of founding material due to the Contractor's sequence of work or operation will be at the Contractor's expense. Special material used or additional excavation made for the Contractor's convenience will not be paid for.

5.2.1. **Structural Excavation as a Pay Item**. Where special materials are not required or specified, payment for the removal and replacement of unstable or incompressible material will be made at a price equal to 200% of the unit price bid per cubic yard for "Structural Excavation." When the Contractor elects to remove and replace material deeper than directed, no measurement will be made on that portion below the directed elevation. This price is full compensation for removing the unstable or incompressible material; furnishing, hauling, placing, and compacting suitable replacement material; and equipment, labor, tools, and incidentals.

When shown on the plans or when directed, for the use of special materials such as flexible base, cement-stabilized base, cement-stabilized backfill, or other special material, payment for excavation below footing grades will be made at the unit price bid for "Structural Excavation." Payment for furnishing, hauling, placing, and compacting the flexible base, cement-stabilized base, cement-stabilized backfill, or other special materials will be made at the unit price bid for these items in the Contract, or, if the required material is not a bid item, in accordance with Article 9.7., "Payment for Extra Work and Force Account Method."

5.2.2. **Structural Excavation Not a Pay Item**. Where special materials for backfill are not required or specified, payment for the authorized removal and replacement of unstable or incompressible material will be measured and paid for at $18 per cubic yard of material removed. This price is full compensation for removing the unstable or incompressible material; furnishing, hauling, placing, and compacting suitable replacement material; and equipment, labor, tools, and incidentals.

When shown on the plans or when directed, for the use of special materials such as flexible base, cement-stabilized base, cement-stabilized backfill, or other special material, excavation below the footing grades will be paid for at $12 per cubic yard. Payment for furnishing, hauling, placing, and compacting the flexible base, cement-stabilized base, cement-stabilized backfill, or other special materials will be made at the unit price bid for these items, or, if the required material is not a bid item, in accordance with Article 9.7., "Payment for Extra Work and Force Account Method."

5.3. **Lowering of a Structure Foundation**. If the Engineer requires a structure foundation to be lowered to an elevation below the grade shown on the plans, overexcavation will be paid for in accordance with Table 2.

Table 2
Payment for Required Overexcavation

Variance of Revised Footing Grade from Plan Grade	Payment Terms	Variance of Revised Footing Grade from Plan Grade
	"Structural Excavation" is a Bid Item	"Structural Excavation" is Not a Bid Item
Up to and including 5 ft.	Unit price equal to 115% of unit price bid for "Structural Excavation"	$12 per cubic yard
Over 5 ft. up to 10 ft.	Unit price equal to 125% of unit price bid for "Structural Excavation"	$15 per cubic yard
Over 10 ft.	In accordance with Article 9.7., "Payment for Extra Work and Force Account Method."	

5.4. **Cement-Stabilized Backfill**. Cement-stabilized backfill will be paid for at the unit price bid for "Cement-Stabilized Backfill."

5.5. **Cutting and Restoring Pavement**. Cutting and restoring pavement will be paid for at the unit price bid for "Cutting and Restoring Pavement" of the type specified.

Work done to repair damage to base or pavement incurred outside the limits shown on the plans, or the limits authorized, will not be measured for payment.

The unit prices bid are full compensation for excavation, including removing obstructions and plugging drainage systems; bedding and backfilling, including placing, sprinkling, and compaction of material; soundings; cleaning and filling seams; constructing and removing cofferdams; de-watering, sheeting, or bracing excavations up to and including 5 ft. deep; pumps; drills; explosives; disposition of surplus material; cutting pavement and base to neat lines; and materials, hauling, equipment, labor, tools, and incidentals.

Flowable backfill will be paid for in accordance with Item 401. Protection methods for open excavations deeper than 5 ft. will be measured and paid for as required in accordance with Item 402 or Item 403.

Item 401
Flowable Backfill

1. DESCRIPTION

Furnish and place flowable backfill for trench, hole, or other void.

2. MATERIALS

Use materials from prequalified sources listed on the Department website. Use materials from non-listed sources only when tested and approved before use. Allow 30 calendar days for the Engineer to sample, test, and report results for non-listed sources. Do not combine approved material with unapproved material.

2.1. **Cement**. Furnish cement in accordance with DMS-4600, "Hydraulic Cement."

2.2. **Fly Ash**. Furnish fly ash in accordance with DMS-4610, "Coal Ash."

2.3. **Chemical Admixtures**. Furnish chemical admixtures in accordance with DMS-4640, "Chemical Admixtures for Concrete." Use specialty type admixtures to enhance the flowability, reduce shrinkage, and reduce segregation by maintaining solids in suspension when necessary. Use and proportion all admixtures in conformance with the manufacturer's recommendations.

2.4. **Fine Aggregate**. Provide fine aggregate that will stay in suspension in the mortar to the extent required for proper flow and that meets the gradation requirements shown in Table 1.

Table 1
Aggregate Gradation Chart

Sieve Size	Percent Passing
3/4"	100
#200	0–30

Test fine aggregate gradation in accordance with Tex-401-A.

Plasticity index must not exceed six when tested in accordance with Tex-106-E.

2.5. **Mixing Water**. Use mixing water in accordance with Item 421, "Hydraulic Cement Concrete."

3. CONSTRUCTION

Submit a construction method and plan, including mix design, for approval. Provide a means of filling the entire void area and be able to demonstrate this has been accomplished. Prevent the movement of any inserted structure from its designated location. Remove and replace or correct the problem if voids are found in the fill or any of the requirements are not met as shown on the plans, without additional cost to the Department.

Furnish a mix meeting the requirements shown in Table 2, unless otherwise shown on the plans.

Table 2
Flowable Fill Mix Design Requirements

Property	Excavatable	Non-Excavatable	Test Method
28-day compressive strength[1], psi	80–200	> 200	ASTM D4832
Consistency[2], Min diameter, in.	8		ASTM D6103
Unit weight, pcf	90–125	100 to 145	ASTM D6023
Air content, %	10–30	5 to 15	ASTM D6023

1. Average of two specimens.
2. Mixture must not segregate.

Mix the flowable fill using a central-mixed concrete plant, ready-mix concrete truck, pug mill, or other approved method.

Furnish all labor, equipment, tools, containers, and molds required for sampling, making, transporting, curing, removing, and disposing of test specimens. Furnish test molds meeting the requirements of Tex-447-A. Transport, strip, and cure the test specimens as scheduled at the designated location. Cure test specimens in accordance with Tex-447-A. The Engineer will sample, make, and test all specimens. Dispose of used, broken specimens in an approved location and manner. The frequency of job-control testing will be at the direction of the Engineer.

4. MEASUREMENT

This Item will be measured by the cubic yard of material placed. Measurement will not include additional volume caused by slips, slides, or cave-ins resulting from the Contractor's operations.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Flowable Backfill." This price is full compensation for furnishing, hauling, and placing materials and for equipment, tools, labor, and incidentals.

Item 402
Trench Excavation Protection

1. DESCRIPTION

Furnish and place excavation protection for trenches 5 ft. or greater in depth for pipe, box culvert, electrical or telephone conduit, duct, or other utility installation.

2. CONSTRUCTION

Provide vertical or sloped cuts, benches, shields, support systems, or other systems providing the necessary protection in accordance with OSHA Standards and Interpretations, 29 CFR Part 1926, Subpart P, "Excavations."

3. MEASUREMENT

This Item will be measured by the foot along the long axis of the trench where the depth of trench exceeds 5 ft. This measurement includes all required trench protection, including trench ends.

4. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Trench Excavation Protection." This price is full compensation for excavation and backfill required for excavation protection; furnishing, placing, and removing shoring, sheeting, or bracing; de-watering or diversion of water; jacking and jack removal; and equipment, labor, materials, tools, and incidentals.

Item 403
Temporary Special Shoring

1. DESCRIPTION

Furnish and install temporary shoring to hold the surrounding earth, water, or both out of the work area.

2. MATERIALS

Furnish new or used materials. Furnish materials that meet the requirements of Item 410, "Soil Nail Anchors," or Item 411, "Rock Nail Anchors," when using temporary nailed walls (rock or soil).

3. CONSTRUCTION

The Contractor is responsible for the temporary special shoring design unless complete details are shown on the plans. Submit details and design calculations bearing the seal and signature of a licensed professional engineer before constructing the shoring. The Department reserves the right to reject designs. Design the shoring to comply with OSHA Standards and Interpretations, 29 CFR Part 1926, Subpart P, "Excavations." Design structural systems to comply with AASHTO *Standard Specifications for Highway Bridges* or AASHTO LRFD *Bridge Design Specifications*. Design shoring subject to railroad loading to comply with the AREMA *Manual for Railway Engineering* and any additional requirements of the railway being supported.

Provide vertical or sloped cuts, benches, shields, support systems, or other systems to provide the necessary protection in accordance with the approved design. Construct temporary nailed walls (rock or soil), when used, in accordance with Item 410 or Item 411.

4. MEASUREMENT

This Item will be measured by the square foot of surface area of a vertical plane at the face of the shoring between the top of the ground being supported and the minimum protection grade line shown on the plans. If no minimum protection grade is shown on the plans, the lowest required excavated elevation will be used. Shoring projecting above the level of the ground being supported will not be measured. When excavation techniques (e.g., sloped cuts or benching) are used to provide the necessary protection, the surface area for payment will be calculated based on the area described by a vertical plane adjacent to the structure.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Temporary Special Shoring." This price is full compensation for excavation and backfill; furnishing, placing, and removing shoring, sheeting, or bracing; de-watering or diversion of water; jacking and jack removal; and equipment, labor, materials, tools, and incidentals.

No payment will be made for special shoring made necessary by the selection of an optional design or sequence of work that creates the need for shoring.

Item 416
Drilled Shaft Foundations

1. DESCRIPTION

Construct foundations consisting of reinforced or non-reinforced concrete drilled shafts.

2. MATERIALS

Use materials that meet the requirements of the following Items.

- Item 421, “Hydraulic Cement Concrete”
- Item 440, “Reinforcement for Concrete”
- Item 448, “Structural Field Welding”

Use concrete for drilled shafts that meets the requirements shown in Table 1 unless otherwise shown on the plans.

Table 1
Concrete for Drilled Shafts

Drilled Shaft Type	Concrete
Non-reinforced	Class A
Reinforced	Class C
Slurry and underwater concrete placement	Class SS

Use coarse aggregate Grade 4, 5, or 6 for drilled shaft concrete in reinforced drilled shafts. Grade 2 or Grade 3 may be used if the shaft is dry and reinforcing steel has a 5 in. minimum clear spacing.

Use a water-reducing, retarding admixture in accordance with DMS-4640, “Chemical Admixtures for Concrete,” in all concrete when using casing that will be pulled or when placing shafts under water or under slurry.

Use concrete with slump that meets the requirements shown in Table 2 as determined in accordance with Tex-415-A.

Table 2
Slump Requirements

Placement Type	Min Acceptable Placement Slump (in.)	Recommended Design and Placement Slump (in.)	Max Acceptable Placement Slump (in.)
Dry	5-1/2	6-1/2	7-1/2
Underwater and under slurry	7	8	9

Perform a slump loss test in accordance with Tex-430-A before beginning work when casing is to be pulled or concrete is to be placed underwater or under slurry. Provide concrete that will maintain a slump of at least 4 in. throughout the entire anticipated time of concrete placement. Time of concrete placement is in accordance with Section 416.3.6., “Concrete,” and Section 416.3.7., “Additional Requirements for Slurry Displacement or Underwater Concrete Placement Methods.” Note the temperature of the concrete mix at the beginning of the slump loss test. Place the concrete if its temperature at the time of placement into the drilled shaft is no more than 10°F higher than the slump loss test temperature. Use ice or other concrete-cooling ingredients to lower concrete temperature or run additional slump loss tests at the higher temperatures. Slump loss testing will be waived if anticipated time of concrete placement is less than 90 min.

Use mineral drilling slurry that meets the requirements shown in Table 3, as determined in accordance with Tex-130-E. Determine pH of slurry in accordance with Tex-128-E or using pH paper strips.

Table 3
Mineral Slurry Requirements

Before Introduction into Excavation			Sampled from Bottom of Excavation Before Concreting		
Specific Gravity	Sand Content	pH	Specific Gravity	Viscosity (sec.)	Sand Content
≤1.10	≤1%	8–11	≤1.15	≤45	≤4%

Use mineral slurry consisting of processed bentonite or attapulgite clays mixed with clean fresh water. Do not use partially hydrolyzed polyacrylamide (PHPA) polymeric slurry or any other fluid composed primarily of a polymer solution.

If approved, water may be used as the drilling fluid. In this case, all the provisions shown in Table 3 must be met, except that the maximum specific gravity is not to exceed 1.12.

Sample slurry from the bottom of the hole, before placing concrete, and test it in accordance with Tex-130-E. Use a pump or air lift to remove slurry that does not meet the requirements shown in Table 3 while adding fresh clean slurry to the top of the hole to maintain the slurry level. Continue this operation until the slurry sampled from the bottom of the hole meets the requirements.

3. CONSTRUCTION

Submit drilled shaft installation plan for review no later than 1 mo. before drilled shaft construction. Include the following in the plan:

- name and experience record of the drilled shaft superintendent who will be in charge of drilled shaft operations for the project;
- list of proposed equipment to be used, including cranes, drills, augers, bailing buckets, final cleaning equipment, de-sanding equipment, slurry pumps, core-sampling equipment, tremies or concrete pumps, and casing;
- details of overall construction operation sequence and the sequence of shaft construction in bents or groups;
- details of shaft excavation methods;
- when the use of slurry is anticipated, details of the slurry mix design and its suitability for the subsurface conditions at the construction site, mixing and storage methods, maintenance methods, and disposal procedures;
- details of methods to clean the shaft excavation;
- details of reinforcement placement, including support and centralization methods;
- details of concrete placement, including proposed operational procedures for free-fall, tremie, or pumping methods; and
- details of casing installation and removal methods.

The installation plan will be reviewed for conformance with the plans, specifications, and special provisions. The Contractor will be notified within 14 days of receipt of the installation plan of any additional information required or changes necessary to meet the Contract requirements. All procedural approvals will be subject to trial in the field and will not relieve the Contractor of the responsibility to satisfactorily complete the work as shown on the plans and in conformance with specifications.

Place the shaft to within the following tolerances.

- Vertical plumbness: 1 in. per 10 ft. of depth
- Center of shaft located under column: 1 in. of horizontal plan position
- Center of shaft located under footing: 3 in. of horizontal plan position

Complete the embankment at bridge ends before installing drilled shafts that pass through the fill. Refer to Item 423, "Retaining Walls," for provisions for drilled shafts passing through the structural volume of retaining walls.

3.1. **Excavation**. The plans indicate the expected depths and elevations for encountering satisfactory bearing material. Excavate as required for the shafts through all materials encountered to the dimensions and elevations shown on the plans or required by the site conditions. Removal of man-made obstructions not shown on the plans will be paid for in accordance with Article 9.7., "Payment for Extra Work and Force Account Method." Adjust the bottom of the shaft or alter the foundation if satisfactory founding material is not encountered at plan elevation, as approved, to satisfactorily comply with design requirements. Blasting is not allowed for excavations.

Stop drilling if caving conditions are encountered and adopt a construction method that stabilizes the shaft walls.

Do not excavate a shaft within two shaft diameters (clear) of an open shaft excavation, or one in which concrete has been placed in the preceding 24 hr.

Dispose of material excavated from shafts and not incorporated into the finished project as shown on the plans and in conformance with federal, state, and local laws.

Provide suitable access, lighting, and equipment for proper inspection of the completed excavation and checking of the dimensions and alignment of shaft excavation.

3.2. **Core Holes**. Take cores to determine the character of the supporting materials if directed. Use a method that will result in recovery of an intact sample adequate for judging the character of the founding material. Such cores should be at least 5 ft. deeper than the proposed founding grade or a depth equal to the diameter of the shaft, whichever is greater. Take these cores when the excavation is complete.

3.3. **Casing**. Use casing when necessary to prevent caving of the material, excluding groundwater, when slurry is used for hole stabilization, or when required in conformance with the Contractor's safety plan. Provide casing with an outside diameter not less than the specified diameter of the shaft. The portion of shaft below the casing may be as much as 2 in. smaller than the specified shaft diameter. No extra compensation will be made for concrete required to fill an oversized casing or oversized excavation. Use casing strong enough to withstand handling stresses and pressures of concrete and of the surrounding earth or water, and that is watertight, smooth, clean, and free of accumulations of hardened concrete.

Use construction methods that result in a minimal amount of disturbed soil trapped outside the casing. This does not apply to temporary undersized casings used to protect workers inside shafts or to drilled shafts designed for point bearing only.

Leave casing in place only if authorized or shown on the plans. Extract casing only after placing the concrete to an appropriate level. Always maintain enough concrete in the casing to counteract soil and water pressure. Rotate or move the casing up or down a few inches if necessary before and during concrete placement to facilitate extraction of the casing.

3.4. **Requirements for Slurry Displacement Method**. When soil conditions warrant, use the slurry displacement method to construct drilled shafts, unless otherwise shown on the plans. Use this method to support the sides of the excavation with processed mineral slurry that is then displaced by concrete to form a continuous concrete shaft.

Install surface casing to at least 10 ft. below existing ground before introducing slurry. Do not use casing other than surface casing. Do not use surface casing longer than 20 ft. without approval. Do not extract the surface casing until after placing the concrete.

Pre-mix slurry in a reservoir with enough capacity to fill the excavation and for recovery of the slurry during concrete placement. Do not mix slurry in the shaft excavation or other hole. Allow adequate time for hydration of the slurry before introduction into the excavation.

Maintain a head of slurry in the shaft excavation at or near ground level or higher, as necessary, to counteract groundwater pressure during and after drilling.

Use an air lift or proper size cleanout bucket, just before placing reinforcing steel, to remove any material that may have fallen from the sides of the excavation or accumulated on the bottom after the completion of drilling. Use a cleanout bucket if material is too large to be picked up using an air lift.

Re-process the hole using the auger as directed if concrete placement is not started within 4 hr. of the completion of the shaft excavation. Then clean the bottom using an air lift or cleanout bucket and check the slurry at the bottom of the hole for compliance with slurry requirements in accordance with Article 416.2., "Materials."

Agitate the congealed slurry to liquefaction if the slurry forms a gel before concrete placement, and whenever directed.

Recover and dispose of all slurry as approved, and in conformance with all federal, state, and local laws. Do not discharge slurry into or in close proximity to streams or other bodies of water.

3.5. **Reinforcing Steel**. Completely assemble the cage of reinforcing steel and place it as a unit immediately before concrete placement. The cage consists of longitudinal bars and lateral reinforcement (spiral reinforcement, lateral ties, or horizontal bands). Connect individual segments with couplers or by lapping steel as approved if overhead obstacles prevent placement of the cage as a single unit.

Extend the reinforcing steel cage as follows if the shaft is lengthened beyond plan length, unless directed otherwise.

- Extend the cage to the bottom for shafts supporting structures other than bridges.
- Extend the cage to 25 ft. or to the bottom, whichever is shorter, for bridge shafts with plan lengths less than 25 ft.
- Do not extend the cage for bridge shafts with plan lengths at least 25 ft. that are lengthened less than 33% of plan length.
- Extend the cage as directed for bridge shafts with plan lengths at least 25 ft. that are lengthened more than 33% of plan length.

If the cage does not reach the bottom of the shaft, it may be suspended, or a portion of the longitudinal steel may be extended to support the cage on the bottom of the shaft. Bars used to extend or support the cage may be lap spliced or welded by a qualified welder. Place the extension at the bottom of the shaft.

Tie spiral reinforcement to the longitudinal bars at a spacing no more than 24 in., or as required for a stable cage. Ensure lateral reinforcement is not welded to longitudinal bars unless otherwise shown on the plans.

Center the reinforcing steel cage in the excavation using approved "roller"-type centering devices unless otherwise approved. Use concrete or plastic chairs to keep the reinforcing cage off the bottom of the hole. Use centering devices starting at 1.5 ft. off from the bottom of the cage and spaced vertically at intervals not exceeding 10 ft. Use at least three centering devices per level at a spacing not to exceed 30 in. Flat or crescent-shaped centralizers ("sleds") are not allowed.

Support or hold down the cage to control vertical displacement during concrete placement or extraction of the casing. Use support that is concentric with the cage to prevent racking and distortion of the steel.

Check the elevation of the top of the steel cage before and after concrete placement or after casing extraction when casing is used. Downward movement of the steel up to 6 in. per 20 ft. of shaft length and upward movement of the steel up to 6 in. total are acceptable.

Maintain the minimum length of steel required for lap with column steel. Use dowel bars if the proper lap length is provided both into the shaft and into the column. Locate and tie all dowel bars into the cage before placing concrete.

Locate and tie anchor bolts when required before placement of concrete. Use templates or other devices to assure accurate placement of anchor bolts.

3.6. **Concrete**. Perform all work in accordance with Item 420, "Concrete Substructures." Provide concrete with maximum placement temperatures as shown in Table 4. Provide thermal analysis to show, and temperature-recording devices to verify, maximum concrete core temperature requirements are met in accordance with Section 420.4.7.14, "Mass Placements," for shafts with diameter exceeding 7 ft. Instrument the first shaft for each size shaft exceeding 7 ft. diameter, and as directed if results do not meet specifications and when the concrete mix design changes.

Table 4
Max Concrete Placing Temperature

Shaft Size	Mix Design Options 1–5	Mix Design Options 6–8
Diameter <5 ft.	95°F	95°F
5 ft. ≤ diameter ≤ 7 ft.	95°F	85°F
7 ft. < diameter	85°F	75°F

Form portions of drilled shaft that project above natural ground.

Remove loose material and accumulated seep water from the bottom of the excavation before placing concrete. No more than 3 in. of water should be present within the base of the excavation at the time of concrete placement. The rate of inflow should be confirmed by observation to be less than 12 in. per hour. Place concrete using underwater placement methods if seepage exceeds the tolerable levels cited above.

Place concrete as soon as possible after all excavation is complete and reinforcing steel is placed. Provide workable concrete that does not require vibrating or rodding. Vibrate formed portions of drilled shafts.

Place concrete continuously for the entire length of the shaft. Limit free fall of concrete to 25 ft. for dry shafts of 24-in. or smaller diameter. Use a suitable tube or tremie to prevent segregation of materials. Use a tube or tremie in sections to provide proper discharge and permit raising as the placement progresses. For dry shafts more than 24-in. diameter, concrete may be allowed to free fall an unlimited distance if it does not strike the reinforcing cage or sides of the hole during placement. Provide a hopper with a minimum 3-ft. long drop-tube at the top of the shaft to direct concrete vertically down the center of the shaft when free fall is used. Do not use a shovel or other means to simply deflect the concrete discharge from the truck.

Always maintain enough head of concrete for cased shafts above the bottom of the casing to overcome hydrostatic pressure. Extract casing at a slow, uniform rate with the pull in line with the axis of the shaft. Monitor the concrete level in the casing during extraction. Stop the extraction and add concrete to the casing as required to ensure a completely full hole upon casing removal. The elapsed time from the mixing of the first concrete placed into the cased portion of the shaft until the completion of extraction of the casing must not exceed the time for which the concrete maintains a slump of more than 4 in. in accordance with Article 416.2., "Materials." Modify the concrete mix, the construction procedures, or both for subsequent shafts if the elapsed time is exceeded.

Cure the top surface and treat any construction joint area in accordance with Item 420.

3.7. **Additional Requirements for Slurry Displacement or Underwater Concrete Placement Methods**. Place concrete on the same day the shaft is excavated and as soon as possible after all excavation is complete and reinforcing steel is placed. Rework the hole by overdrilling a minimum 1/2 in. on all sides on the same day that concrete is placed when drilling of a hole is performed on multiple days if approved. Use an air lift or cleanout bucket of the proper size to clean the bottom of the excavation before placing the reinforcing steel cage and concrete. Place concrete through a closed tremie or pump it to the bottom of the excavation. The minimum tremie diameter will be at least six times the maximum size of aggregate used in the concrete mix,

but not less than 10 in. Initially seal the tremie or pump line to positively separate the concrete from the slurry or water. Place concrete continuously from the beginning of placement until the shaft is completed. Always keep the tremie full of concrete and well submerged in the previously placed concrete if using a tremie. Raise the tremie as necessary to maintain the free flow of concrete and the stability of any casing used. Always keep the discharge tube submerged in the previously placed concrete if using a pump. Place additional concrete to ensure the removal of any contaminated concrete at the top of the shaft. Allow the top portion of concrete to flush completely from the hole at the completion of the pour until there is no evidence of slurry or water contamination. Do not attempt to remove this concrete using shovels, pumps, or other means. Level the top of shaft with hand tools as necessary.

Use a sump or other approved method to channel displaced fluid and concrete away from the shaft excavation. Recover slurry and dispose of it as approved. Do not discharge displaced fluids into or near streams or other bodies of water. Provide a collar or other means of capturing slurry and the top portion of concrete flushed from the shaft for pours over water.

Remove the tube, reseal it at the bottom, penetrate with the tube into the concrete already placed by at least 5 ft., and recharge it before continuing if concrete placement is interrupted due to withdrawal of the submerged end of the tremie or pump discharge tube before completion. If this condition exists, notify the Engineer and note the elevation and circumstances related to the loss of seal on the drilled shaft log.

The elapsed time from the mixing of the first concrete placed until the completion of concrete placement, including extraction of the casing, must not exceed the time for which the concrete maintains a slump of more than 4 in. in accordance with Article 416.2., "Materials." Modify the concrete mix, the construction procedures, or both for subsequent shafts if the elapsed time is exceeded.

3.8. **Test Load**. Load test shafts, if required, in accordance with Item 405, "Foundation Load Test."

3.9. **Trial Shaft**. When required on the plans, construct trial shafts to the depth and diameter shown on the plans. Trial shafts include drilling the hole, placement of the rebar cage (unless otherwise stated), and placement of the concrete. When trial shafts are required, delay start of production shafts until successful completion of trial shafts.

4. MEASUREMENT

4.1. **Drilled Shaft**. Drilled shaft foundations will be measured by the foot to the bottom of the shaft.

4.1.1. **Interior Bents and Piers**. Shafts will be measured from a point approximately 6 in. below the finished earthwork elevation at the center of each shaft, unless specific elevations or dimensions are shown on the plans or unless otherwise directed to meet unusual conditions. The bent height shown on the plans is for estimating purposes only and does not control the top-of-shaft measurement.

4.1.2. **Abutment Bents and Retaining Walls**. Shafts will be measured from the bottom of footing or cap elevation.

4.1.3. **Other Non-Bridge Structures**. Shafts, including trial shafts, will be measured from the top of the shaft.

4.2. **Core Hole**. Core holes will be measured by each core hole drilled.

5. PAYMENT

The unit prices bid for the various classifications of drilled shafts are full compensation for excavation; furnishing, placing, and removing casing; furnishing, processing, and recovering slurry; furnishing and placing reinforcing steel; pumping; furnishing and placing concrete, including additional concrete required to fill an oversize casing or oversize excavation; conducting slump loss tests; backfilling; disposing of cuttings and slurry; and materials, tools, equipment, labor, and incidentals.

When the bottom of a drilled shaft is placed at an elevation below plan grade, no direct payment will be made for extra reinforcement placed to support the cage. The extra reinforcement will be subsidiary to the unit price bid per foot of shaft. No extra payment will be made for casings left in place, unless specified on the plans.

No payment will be made for "Drilled Shaft" until the concrete has been placed.

5.1. **Drilled Shaft**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Drilled Shaft," "Drilled Shaft (Non-Reinforced)," "Drilled Shaft (Sign Mounts)," "Drilled Shaft (High Mast Pole)," "Drilled Shaft (Roadway Illumination Pole)," or "Drilled Shaft (Traffic Signal Pole)" of the specified diameter, subject to the limitations for overruns authorized by the Engineer in accordance with Section 416.5.1.1., "Overrun."

5.1.1. **Overrun**. Payment for individual completed shaft lengths up to and including 5 ft. more than the maximum plan length shaft, in accordance with Section 416.5.1.2., "Maximum Plan Length Shaft," will be made at the unit price bid per foot of the specified diameter.

Payment for the portion of individual completed shaft length more than 5 ft. and up to and including 15 ft. more than the maximum plan length shaft, in accordance with this Item, will be made at a unit price equal to 115% of the unit price bid per foot of the specified diameter.

Payment for the portion of individual completed shaft length greater than 15 ft. more than the maximum plan length shaft, in accordance with Section 416.5.1.2., "Maximum Plan Length Shaft," will be made at a unit price equal to 125% of the unit price bid per foot of the specified diameter.

5.1.2. **Maximum Plan Length Shaft**. Payment described in the previous Sections is subject to the following provisions for extra depth drilling.

- For bridge structures, the maximum plan length shaft is the maximum length shaft, regardless of diameter, for any drilled shaft on that specific bridge.
- For retaining walls, the maximum plan length shaft is the maximum length shaft, regardless of diameter, for any drilled shaft on that specific retaining wall.
- For overhead sign structures, the maximum plan length shaft is the maximum length shaft, regardless of diameter, for any overhead sign structures included in the Contract.
- For high mast illumination poles, the maximum plan length shaft is the maximum length shaft, regardless of diameter, for any high mast illumination pole included in the Contract.
- For roadway illumination poles, the maximum plan length shaft is the maximum length shaft, regardless of diameter, for any roadway illumination pole included in the Contract.
- For traffic signal poles, the maximum plan length shaft is the maximum length shaft, regardless of diameter, for any traffic signal pole included in the Contract.

5.2. **Core Hole**. Core holes will be paid at $200 each.

Item 420
Concrete Substructures

1. DESCRIPTION

Construct concrete substructures including footings, columns, caps, abutments, piers, culverts, other bridge substructure elements, and other concrete structures as indicated.

2. MATERIALS

2.1. **Concrete**. Provide concrete in accordance with Item 421, "Hydraulic Cement Concrete." Provide the class of concrete for each type of structure or unit as shown on the plans or in conformance with pertinent governing specifications.

2.2. **Grout or Mortar**. Provide grout for dowelling anchors or precast connections in accordance with DMS-4675, "Cementitious Grouts and Mortars for Miscellaneous Applications."

2.3. **Latex Curing Materials**. Provide an acrylic-polymer latex admixture (acrylic resin emulsion in accordance with DMS-4640, "Chemical Admixtures for Concrete") suitable for producing polymer-modified concrete or mortar. Do not allow latex to freeze.

2.4. **Reinforcing Steel**. Provide reinforcing steel in accordance with Item 440, "Reinforcement for Concrete."

2.5. **Expansion Joint Material**. Provide materials in accordance with DMS-6310, "Joint Sealants and Fillers."

- Provide preformed fiber expansion joint material that conforms to the dimensions shown on the plans.
- Provide preformed bituminous fiber material unless otherwise specified.
- Provide asphalt board that conforms to dimensions shown on the plans.
- Provide re-bonded neoprene filler that conforms to the dimensions shown on the plans.

2.6. **Waterstop**. Provide rubber or polyvinyl chloride (PVC) waterstops in accordance with DMS-6160, "Water Stops, Nylon-Reinforced Neoprene Sheet, and Elastomeric Pads," unless otherwise shown on the plans.

2.7. **Curing Materials**. Provide membrane curing compounds in accordance with DMS-4650, "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants."

Provide cotton mats that consist of a filling material of cotton "bat" or "bats" (at least 12 oz. per square yard) completely covered with unsized cloth (at least 6 oz. per square yard) stitched longitudinally with continuous parallel rows of stitching spaced at less than 4 in., or tuft both longitudinally and transversely at intervals less than 3 in. Provide cotton mats that are free of tears and in good general condition. Provide a flap at least 6 in. wide consisting of two thicknesses of the covering and extending along one side of the mat.

Provide polyethylene sheeting that is at least 4 mils thick and free of visible defects. Provide only clear or opaque white sheeting when the ambient temperature during curing exceeds 90°F or when applicable to control temperature during mass pours.

Provide burlap-polyethylene mats made of burlap impregnated on one side with a film of opaque white pigmented polyethylene, free of visible defects. Provide laminated mats that have at least one layer of an impervious material such as polyethylene, vinyl plastic, or other acceptable material (either as a solid sheet or impregnated into another fabric) and are free of visible defects.

Provide burlap material that complies with AASHTO M 182, Class 3 (10 oz. per square yard) with the following additions.

- Manila hemp may also be used to make burlap.
- Do not use burlap fabricated from bags.
- Do not use burlap containing any water-soluble ingredient that will retard the setting time of concrete.

Provide used burlap that complies with the requirements stated above and that has only been used previously for curing concrete. "Like new" cleanliness is not expected, but contamination with any substance foreign to the concrete curing process, such as grease or oil, will be cause for rejection.

2.8. **Epoxy**. Provide epoxy materials in accordance with DMS-6100, "Epoxies and Adhesives," unless otherwise specified.

3. EQUIPMENT

3.1. **Transporting and Placing Equipment**. Use appropriate transporting and placing equipment such as buckets, chutes, buggies, belt conveyors, pumps, or other equipment as necessary. Ensure concrete is not transported or conveyed by equipment made of aluminum.

Use tremies to control the fall of concrete or for underwater placement. Use tremies that are watertight and of large enough diameter to allow the placement of the concrete but less than 14 in. in diameter. Construct the tremie so the bottom can be sealed and opened once the tremie has been fully charged with concrete for underwater placements.

Use pumps with lines at least 5 in. inside diameter (ID) where Grade 2 or smaller coarse aggregate is used, and at least 8 in. ID for Grade 1 coarse aggregate.

3.2. **Vibrators**. Use immersion-type vibrators for consolidation of concrete. Provide at least one standby vibrator for emergency use. Furnish vibrator head covered by a rubberized or elastomeric cover when used near epoxy coated reinforcing steel.

3.3. **Temperature Recording Equipment**. Use strip chart temperature-recording devices, recording maturity meters in accordance with Tex-426-A, or other approved devices that are accurate to within ±2°F within the range of 32–212°F for mass concrete operations, for cold weather placements, and as otherwise specified.

3.4. **Artificial Heating Equipment**. Use artificial heating equipment as necessary for maintaining the concrete temperatures in accordance with Section 420.4.7.11., "Placing Concrete in Cold Weather."

3.5. **Spraying Equipment**. Use mechanically powered pressure sprayers, either air or airless, with appropriate atomizing nozzles for the application of membrane curing. Use hand-pressurized spray equipment with two or three fan-spray nozzles if approved. Ensure the spray from each nozzle overlaps the spray from adjacent nozzles by approximately 50%.

3.6. **Concrete Testing Equipment**. Provide testing equipment for use by the Engineer in accordance with Section 421.3.3., "Testing Equipment."

4. CONSTRUCTION

Obtain approval for proposed construction methods before starting work. Approval of construction methods and equipment does not relieve the Contractor's responsibility for safety or correctness of methods, adequacy of equipment, or completion of work in full accordance with the Contract.

Unless otherwise shown on the plans, it is the Contractor's option to perform testing on structural concrete (structural classes of concrete are identified as shown in Table 8 of Section 421.4.1., "Classification of Concrete Mix Designs") to determine the in-situ strength to address the schedule restrictions in accordance

with Section 420.4.1., "Schedule Restrictions." The Engineer may require the Contractor to perform this testing for concrete placed in cold weather. Make enough test specimens for Contractor-performed testing to ensure strength requirements are met for the operations listed in Section 420.4.1., "Schedule Restrictions." Make at least one set of test specimens for each element cast each day. Cure these specimens under the same conditions as the portion of the structure involved for all stages of construction. Ensure safe handling, curing, and storage of all test specimens. Provide testing personnel, and sample and test the hardened concrete in accordance with Section 421.4.8., "Sampling and Testing of Concrete." The maturity method, Tex-426-A, may be used for in-situ strength determination for schedule restrictions if approved. Coring will not be allowed for in-situ strength determination for schedule restrictions. Provide the Engineer the opportunity to witness all testing operations. Report all test results to the Engineer.

If the Contractor does not wish to perform schedule restriction testing, the Engineer's 7-day lab-cured tests, performed in accordance with Article 421.5., "Acceptance of Concrete," will be used for schedule restriction determinations. The Engineer may require additional time for strength gain to account for field curing conditions such as cold weather.

4.1. **Schedule Restrictions**. Construct and open completed structures to traffic with the following limitations unless otherwise shown on the plans.

4.1.1. **Setting Forms**. Attain at least 2,500 psi compressive strength before erecting forms on concrete footings supported by piling or drilled shafts, or on individual drilled shafts. Erect forms on spread footings and culvert footings after the footing concrete has aged at least 2 curing days in accordance with Section 420.4.10., "Curing Concrete." Place concrete only after the forms and reinforcing steel have been inspected by the Engineer.

Support tie beam or cap forms by falsework on previously placed tie beams only if the tie beam concrete has attained a compressive strength of 2,500 psi and the member is properly supported to eliminate stresses not provided for in the design. Maintain curing as required until completion of the curing period.

Place superstructure forms or falsework on the substructure only if the substructure concrete has attained a compressive strength of 3,000 psi.

4.1.2. **Removal of Forms and Falsework**. Keep in place weight-supporting forms and falsework for bridge components and culvert slabs until the concrete has attained a compressive strength of 2,500 psi in accordance with Section 420.4.11., "Removal of Forms and Falsework." Keep all forms for mass placements in place for 4 days following concrete placement unless otherwise approved based on the outcome of the heat control plan in accordance with Section 420.4.7.14., "Mass Placements."

4.1.3. **Placement of Superstructure Members**. Erect or place superstructure members or precast substructure members only after the substructure concrete has attained a compressive strength of 3,000 psi.

4.1.4. **Opening to Traffic**. Direct traffic culverts may be opened to construction traffic when the design strength specified in Section 421.4.1., "Classification of Concrete Mix Designs," has been attained if curing is maintained. Obtain approval before opening direct traffic culverts to the traveling public. Open other noncritical structural and nonstructural concrete for service upon the completion of curing unless otherwise specified or directed.

4.1.5. **Post-Tensioned Construction**. Ensure strength requirements shown on the plans for structural elements designed to be post-tensioned are met for stressing and staged loading of structural elements.

4.1.6. **Backfilling**. Backfill in accordance with Section 400.3.3., "Backfill."

4.2. **Plans for Falsework and Forms**. Submit plans for falsework and forms for the following items: vertical forms for piers and single column bents; load supporting forms for caps and tie-beams; form attachments for bridges to be widened; and other items as indicated or directed. Provide design calculations when requested. Show all essential details of proposed forms, falsework, and bracing. Have a licensed professional engineer design, seal, and sign these plans. Department approval is not required, except as shown in Table 1 of

Item 5, "Control of the Work," when forms or falsework are located such that public safety can be affected, but the Department reserves the right to request modifications to the plans. The Contractor is responsible for the adequacy of these plans. Design job-fabricated formwork assuming a weight of 150 pcf for concrete, and include a live-load allowance of 50 psf of horizontal surface of the form. Do not exceed 125% of the allowable stresses used by the Department for the design of structures.

4.3. **Falsework**. Design and construct falsework to safely carry the maximum anticipated loads, including wind loads, and to provide the necessary rigidity. Consult AASHTO's *Guide Design Specifications for Bridge Temporary Works* and *Construction Handbook for Bridge Temporary Works* for falsework and shoring information not indicated below. Submit details in accordance with Section 420.4.2., "Plans for Falsework and Forms."

Design job-fabricated falsework assuming a weight of 150 pcf for concrete, and include a minimum live-load allowance of 50 psf of horizontal surface of the form. Do not exceed 125% of the allowable stresses used by the Department for the design of structures.

Do not exceed the manufacturer's maximum allowable working loads for moment and shear or end reaction for commercially produced structural units used in falsework. Include a minimum live-load allowance of 35 psf of horizontal form surface in determining the maximum allowable working load for commercially produced structural units.

Provide timber that is sound, in good condition, and free of defects that would impair its strength. Provide timber that meets or exceeds the species, size, and grade requirements shown on the submitted falsework plans.

Provide wedges made of hardwood or metal in pairs to adjust falsework to desired elevations to ensure even bearing. Do not use wedges to compensate for incorrectly cut bearing surfaces.

Use sills or grillages large enough to support the superimposed load without settlement. Take precautions to prevent settling of the supporting material unless the sills or grillages are founded on solid rock, shale, or other hard materials.

Place falsework that cannot be founded on a satisfactory spread footing on piling or drilled shafts with enough bearing capacity to support the superimposed load without settlement. Drive falsework piling to the required resistance determined by the applicable formula in Item 404, "Driving Piling." Design drilled shafts for falsework to carry the superimposed load using both skin friction and point bearing.

Weld in accordance with Item 448, "Structural Field Welding." Securely brace each falsework bent to provide the stiffness required, and securely fasten the bracing to each pile or column it crosses.

Remove falsework when it is no longer required or as shown on the submitted falsework plan. Pull or cut off foundations for falsework at least 2 ft. below finished ground level. Completely remove falsework, piling, or drilled shafts in a stream, lake, or bay to the approved limits to prevent obstruction to the waterway.

4.4. **Forms**. Submit formwork plans in accordance with Section 420.4.2., "Plans for Falsework and Forms."

4.4.1. **General**. Provide forms of either timber or metal except where otherwise specified or permitted.

Design forms for the pressure exerted by a liquid weighing 150 pcf. Take the rate of concrete placement into consideration in determining the depth of the equivalent liquid. Include a minimum live-load allowance of 50 psf of horizontal surface for job-fabricated forms. Do not exceed 125% of the Department's allowable stresses for the design of structures.

Do not exceed the manufacturer's maximum allowable working loads for moment and shear or end reaction for commercially produced structural units used for forms. Include a minimum live-load allowance of 35 psf of

horizontal form surface in determining the maximum allowable working load for commercially produced structural units.

Provide steel forms for round columns unless otherwise approved. Refer to Item 427, "Surface Finishes for Concrete," for additional requirements for off-the-form finishes.

Provide commercial form liners for imprinting a pattern or texture on the concrete surface as shown on the plans and in accordance with Section 427.4.3.5., "Form Liner Finish."

Provide forming systems that are practically mortar-tight, rigidly braced, and strong enough to prevent bulging between supports, and maintain them to the proper line and grade during concrete placement. Maintain forms in a manner that prevents warping and shrinkage. Do not allow offsets at form joints to exceed 1/16 in.

Use only material that is inert, non-biodegradable, and nonabsorptive for forms to be left in place.

Construct all forms to permit their removal without marring or damaging the concrete. Clean all forms and footing areas of any extraneous matter before placing concrete. Provide openings in forms if needed for the removal of laitance or foreign matter.

Treat the facing of all forms with bond-breaking coating of composition that will not discolor or injuriously affect the concrete surface. Take care to prevent coating of the reinforcing steel.

Complete all preparatory work before requesting permission to place concrete.

Cease placement if the forms show signs of bulging or sagging at any stage of the placement, and remove the portion of the concrete causing this condition immediately as directed. Reset the forms and securely brace them against further movement before continuing the placement.

4.4.2. **Timber Forms**. Provide properly seasoned, good-quality lumber that is free of imperfections that would affect its strength or impair the finished surface of the concrete. Provide timber or lumber that meets or exceeds the requirements for species and grade shown on the submitted formwork plans.

Maintain forms or form lumber that will be reused so it stays clean and in good condition. Do not use any lumber that is split, warped, bulged, or marred, or that has defects in any way that will produce inferior work. Promptly remove such lumber from the work.

Provide form lining for all formed surfaces except:

- the inside of culvert barrels, inlets, manholes, and box girders;
- surfaces that are subsequently covered by backfill material or are completely enclosed; and
- any surface formed by a single finished board or by plywood.

Provide form lining of an approved type such as masonite or plywood. Do not provide thin membrane sheeting such as polyethylene sheets for form lining.

Use plywood at least 3/4 in. thick. Place the grain of the face plies on plywood forms parallel to the span between the supporting studs or joists unless otherwise shown on the submitted form drawings.

Use plywood for forming surfaces that remain exposed that meets the requirements for B-B Plyform Class I or Class II Exterior of the U.S. Department of Commerce Voluntary Product Standard PS 1.

Space studs and joists so the facing form material remains in true alignment under the imposed loads.

Space wales closely enough to hold forms securely to the designated lines, scabbed at least 4 ft. on each side of joints to provide continuity. Place a row of wales near the bottom of each placement.

Place facing material with parallel and square joints, securely fastened to supporting studs.

Place forms with the form panels symmetrical (long dimensions set in the same direction) for surfaces exposed to view and receiving only an ordinary surface finish in accordance with Section 420.4.13., "Ordinary Surface Finish." Make horizontal joints continuous.

Make molding for chamfer strips or other uses of materials of a grade that will not split when nailed and can be maintained to a true line without warping. Dress wood molding on all faces. Fill forms at all sharp corners and edges with triangular chamfer strips measuring 3/4 in. on the sides unless otherwise shown on the plans.

Use metal form ties of an approved type or a satisfactory substitute of a type that permits ease of removal of the metal to hold forms in place. Cut back wire ties at least 1/2 in. from the face of the concrete.

Use devices to hold metal ties in place that can develop the strength of the tie and adjust to allow for proper alignment.

Entirely remove metal and wooden spreaders that separate the forms as the concrete is being placed.

Provide adequate cleanout openings for narrow walls and other locations where access to the bottom of the forms is not readily attainable.

4.4.3. **Metal Forms**. Requirements for timber forms regarding design, mortar tightness, filleted corners, beveled projections, bracing, alignment, removal, reuse, and wetting also apply to metal forms, except metal forms do not require lining unless as specifically shown on the plans.

Use form metal thick enough to maintain the true shape without warping or bulging. Countersink all bolt and rivet heads on the facing sides. Design clamps, pins, or other connecting devices to hold the forms rigidly together and to allow removal without damage to the concrete. Use metal forms that present a smooth surface and line up properly. Keep metal free of rust, grease, and other foreign materials.

4.5. **Drains**. Install and construct weep holes and roadway drains as shown on the plans.

4.6. **Placing Reinforcement and Post-Tensioning**. Place reinforcement in accordance with Item 440. Do not weld reinforcing steel supports to other reinforcing steel except where shown on the plans.

Place post-tensioning ducts, anchorages, and other hardware in conformance with the approved prestressing details and in accordance with Item 426, "Post-Tensioning." Keep ducts free of obstructions until all post-tensioning operations are complete.

4.7. **Placing Concrete**. Give the Engineer sufficient advance notice before placing concrete in any unit of the structure to permit the inspection of forms, reinforcing steel placement, and other preparations.

Do not place concrete when impending weather conditions would impair the quality of the finished work. Place concrete in early morning or at night or adjust the placement schedule for more favorable weather when conditions of wind, humidity, and temperature are such that concrete cannot be placed without the potential for weather-related distress.

Adequately illuminate the entire placement site as approved when mixing, placing, and finishing concrete in non-daylight hours.

Furnish adequate shelter to protect the concrete against damage from rainfall or freezing temperatures in accordance with this Item if changes in weather conditions require protective measures after work starts. Continue operations during rainfall only if approved. Use protective coverings for the material stockpiles. Cover aggregate stockpiles only to the extent necessary to control the moisture conditions in the aggregates.

Allow at least 1 curing day after the concrete has achieved initial set before placing strain on projecting reinforcement to prevent damage to the concrete.

4.7.1. **Placing Temperature**. Place concrete in accordance with the following temperature limits for the classes of concrete defined in Section 421.4.1., "Classification of Concrete Mix Designs."

- Place Class C, F, H, K, or SS concrete only when its temperature at time of placement is between 50°F and 95°F. Increase the minimum placement temperature to 60°F if slag cement is used in the concrete.
- Place Class S concrete, used in this Item only as indicated for culvert top slabs, only when its temperature is between 50°F and 85°F. Increase the minimum placement temperature to 60°F if slag cement is used in the concrete.
- Place Class A, B, and D concrete only when its temperature at the time of placement is greater than 50°F.
- Place mass concrete in accordance with Section 420.4.7.14., "Mass Placements," only when its temperature at the time of placement is between 50°F and 75°F.

4.7.2. **Transporting Time**. Begin the discharge of concrete delivered in truck mixers within the times shown in Table 14 of Item 421.

4.7.3. **Workability of Concrete**. Place concrete with a slump as specified in Section 421.4.2.5., "Slump." Water may be added to the concrete before discharging any concrete from the truck to adjust for low slump, provided that the maximum mix design water-cement ratio is not exceeded. Mix concrete in accordance with Section 421.4.6., "Mixing and Delivering Concrete," after introduction of any additional water or chemical admixtures. Do not add water or chemical admixtures after any concrete has been discharged.

4.7.4. **Transporting Concrete**. Transport concrete by buckets, chutes, buggies, belt conveyors, pumps, or other methods.

Protect concrete transported by conveyors from sun and wind to prevent loss of slump and workability. Shade or wrap with wet burlap pipes through which concrete is pumped as necessary to prevent loss of slump and workability.

Arrange and use chutes, troughs, conveyors, or pipes so the concrete ingredients will not be separated. Terminate such equipment in vertical downspouts when necessary to prevent segregation. Extend open troughs and chutes, if necessary, down inside the forms or through holes left in the forms.

Keep all transporting equipment clean and free of hardened concrete coatings. Discharge water used for cleaning clear of the concrete.

4.7.5. **Preparation of Surfaces**. Thoroughly wet all forms and hardened concrete on which concrete is to be placed before placing concrete on them. Remove any remaining puddles of excess water before placing concrete. Provide surfaces that are in a moist, saturated surface-dry (SSD) condition when concrete is placed on them.

Ensure the subgrade or foundation is moist before placing concrete on grade. Lightly sprinkle the subgrade if dry.

4.7.6. **Expansion Joints**. Construct joints and devices to provide for expansion and contraction as shown on the plans.

Use light wire or nails to anchor any preformed fiber joint material to the concrete on one side of the joint.

Ensure finished joints conform to the plans with the concrete sections completely separated by the specified opening or joint material.

Remove all concrete within the joint opening soon after form removal and again where necessary after surface finishing to ensure full effectiveness of the joint.

4.7.7. **Construction Joints**. A construction joint is the joint formed by placing plastic concrete in direct contact with concrete that has attained its initial set. Monolithic placement means the manner and sequence of concrete placing do not create a construction joint.

Make construction joints of the type and at the locations shown on the plans. Additional joints in other members are not permitted without approval. Place authorized additional joints using details equivalent to those shown on the plans for joints in similar locations.

Make construction joints square and normal to the forms unless otherwise required. Use bulkheads in the forms for all vertical joints.

Thoroughly roughen the top surface of a concrete placement terminating at a horizontal construction joint as soon as practical after initial set is attained.

Thoroughly clean the hardened concrete surface of all loose material, laitance, dirt, and foreign matter, and saturate it with water. Remove all free water and moisten the surface before concrete or bonding grout is placed against it. Ensure the surface of the existing concrete is in an SSD condition just before placing subsequent concrete. Wet the existing concrete by ponding water on the surface for 24 hr. before placing subsequent concrete. Use high-pressure water blasting if ponding is not possible to achieve SSD conditions 15–30 min. before placing the concrete. An SSD condition is achieved when the surface remains damp when exposed to sunlight for 15 min.

Draw forms tight against the existing concrete to avoid mortar loss and offsets at joints.

Bonding agents are not required unless indicated otherwise. Coat the joint surface with bonding mortar, grout, epoxy, or other material if a bonding agent is required as shown on the plans. Provide Type V epoxy in accordance with DMS-6100 for bonding fresh concrete to hardened concrete. Place the bonding epoxy on a clean, dry surface, and place the fresh concrete while the epoxy is still tacky. Place bonding mortar or grout on a surface that is SSD and place the concrete before the bonding mortar or grout dries. Place other bonding agents in conformance with the manufacturer's recommendations.

4.7.8. **Handling and Placing**. Minimize segregation of the concrete and displacement of the reinforcement when handling and placing concrete. Produce a uniform, dense compact mass.

Ensure concrete free falls no more than 5 ft. except in the case of drilled shafts, thin walls such as in culverts, or as allowed in conformance with other Items. Remove any hardened concrete splatter ahead of the plastic concrete.

Fill each part of the forms by depositing concrete as near to its final position as possible. Do not deposit large quantities of concrete at one point and run or move the concrete along to fill the forms.

Deposit concrete in the forms in layers of suitable depth but no more than 36 in. deep unless otherwise permitted.

Avoid cold joints in a monolithic placement. Sequence successive layers or adjacent portions of concrete so they can be vibrated into a homogeneous mass with the previously placed concrete before it sets. Allow no more than 1 hr. to elapse between adjacent or successive placements of concrete when re-vibration of the concrete is shown on the plans, except as otherwise allowed by an approved placing procedure. This time limit may be extended by 1/2 hr. if the concrete contains at least the minimum recommended dosage of a Type B or Type D admixture.

4.7.9. **Consolidation**. Carefully consolidate concrete and flush mortar to the form surfaces using immersion-type vibrators. Do not use vibrators that operate by attachment to forms or reinforcement except where approved on steel forms.

Vibrate the concrete immediately after deposit. Systematically space points of vibration to ensure complete consolidation and thorough working of the concrete around the reinforcement and embedded fixtures, and into the corners and angles of the forms. Insert the vibrators vertically where possible. Vibrate the entire depth of each lift, allowing the vibrator to penetrate several inches into the preceding lift. Do not use the vibrator to move the concrete to other locations in the forms. Do not drag the vibrator through the concrete. Thoroughly consolidate concrete along construction joints by operating the vibrator along and close to but not against the joint surface. Continue the vibration until the concrete surrounding reinforcements and fixtures is completely consolidated. Hand-spade or rod the concrete if necessary to ensure flushing of mortar to the surface of all forms.

4.7.10. **Installation of Dowels and Anchor Bolts**. When shown on the plans, provide an Adhesive Anchor Installer certified by ACI. Install dowels and anchor bolts by casting them in place or by grouting with grout, epoxy, or epoxy mortar unless specified otherwise. Form or drill holes for grouting. Follow the manufacturer's recommended installation procedures for pre-packaged grout or epoxy anchor systems. Test anchors if required on the plans or in conformance with other Items.

Drill holes for anchor bolts to accommodate the bolt embedment required by the plans. Make holes for dowels at least 12 in. deep unless otherwise shown on the plans. Make the hole diameter at least twice the dowel or bolt diameter, but not exceeding the dowel or bolt diameter plus 1-1/2 in. when using cementitious grout or epoxy mortar. Make the hole diameter 1/16–1/4 in. greater than the dowel or bolt diameter when using neat epoxy unless specified otherwise by the epoxy manufacturer.

Thoroughly clean holes of all loose material, oil, grease, or other bond-breaking substance, and blow them clean with filtered compressed air. Use a wire brush followed by oil-free compressed air to remove all loose material from the holes, repeating as necessary until no more material is removed. Ensure holes are in a surface-dry condition when epoxy-type materials are used and in a surface-moist condition when cementitious grout is used. Develop and demonstrate for approval a procedure for cleaning and preparing the holes for installation of the dowels and anchor bolts. Completely fill the void between the hole and dowel or bolt with grouting material. Follow exactly the requirements for cleaning in conformance with the product specifications for pre-packaged systems.

Provide hydraulic cement grout for cast-in-place or grouted systems in accordance with DMS-4675. Provide a Type III epoxy in accordance with DMS-6100 when neat epoxy is used for anchor bolts or dowels. Provide Type VIII epoxy in accordance with DMS-6100 when an epoxy grout is used. Provide grout, epoxy, or epoxy mortar as the binding agent unless otherwise shown on the plans.

Provide other anchor systems as required on the plans.

4.7.11. **Placing Concrete in Cold Weather**. Protect concrete placed under weather conditions where weather may adversely affect results. Permission given by the Engineer for placing during cold weather does not relieve the Contractor of responsibility for producing concrete equal in quality to that placed under normal conditions. Remove and replace concrete as directed at the Contractor's expense if it is determined unsatisfactory due to poor conditions.

Do not place concrete in contact with any material coated with frost or with a temperature of 32°F or lower. Do not place concrete when the ambient temperature in the shade is below 40°F and falling unless approved. Place concrete when the ambient temperature in the shade is at least 35°F and rising or above 40°F.

Provide and install recording thermometers, maturity meters, or other suitable temperature-measuring devices to verify all concrete is effectively protected as follows.

- Maintain the temperature at all surfaces of concrete in bents, piers, culvert walls, retaining walls, parapets, wingwalls, top slabs of non-direct traffic culverts, and other similar formed concrete at or above 40°F for 72 hr. from the time of placement.
- Maintain the temperature of all other concrete, including the bottom slabs (footings) of culverts, placed on or in the ground above 32°F for 72 hr. from the time of placement.

Use additional covering, insulated forms, or other means and, if necessary, supplement the covering with artificial heating. Avoid applying heat directly to concrete surfaces. Cure in accordance with Section 420.4.10., "Curing Concrete," during this period until all requirements for curing have been satisfied.

Have all necessary heating and covering material ready for use before permission is granted to begin placement when impending weather conditions indicate the possible need for temperature protection.

4.7.12. **Placing Concrete in Hot Weather**. Keep the concrete at or below the maximum temperature at time of placement in accordance with Section 420.4.7.1., "Placing Temperature." Sprinkle and shade aggregate stockpiles or use ice, liquid nitrogen systems, or other approved methods as necessary to control the concrete temperature.

4.7.13. **Placing Concrete in Water**. Deposit concrete in water only when shown on the plans or with approval. Make forms or cofferdams tight enough to prevent any water current passing through the space in which the concrete is being deposited. Do not pump water during the concrete placing or until the concrete has set for at least 36 hr.

Place the concrete using a tremie or pump, or use another approved method, and do not allow it to fall freely through the water or disturb it after it is placed. Keep the concrete surface level during placement.

Support the tremie or operate the pump so it can be easily moved horizontally to cover all the work area and vertically to control the concrete flow. Keep the lower end of the tremie or pump hose submerged in the concrete. Use continuous placing operations until the work is complete.

Design the concrete mix in accordance with Item 421 with a minimum cement content of 650 lb. per cubic yard for concrete to be placed under water. Include an anti-washout admixture in the mix design as necessary to produce a satisfactory finished product.

4.7.14. **Mass Placements**. Develop and obtain approval for a heat control plan for monolithic placements designated on the plans as mass concrete to ensure the following during the heat dissipation period:

- the temperature differential between the central core of the placement and the exposed concrete surface does not exceed 35°F and
- the temperature at the central core of the placement does not exceed 160°F.

Use the ConcreteWorks© software available from the Department, or another approved method in accordance with ACI 207, "Mass Concrete," to develop the heat control plan. The Department will make available technical assistance on the use of ConcreteWorks©. Develop the heat control plan using historical temperature ranges for the anticipated time of the mass placement. Re-create the plan if the work schedule shifts by more than one month.

The heat control plan may include a combination of the following elements:

- selection of concrete ingredients including aggregates, gradation, and cement types, to minimize heat of hydration;
- use of ice or other concrete cooling ingredients;
- use of liquid nitrogen dosing systems;
- controlling rate or time of concrete placement;
- use of insulation or supplemental external heat to control heat loss;
- use of supplementary cementing materials;

- use of a cooling system to control the core temperature; or
- vary the duration for which formwork remains in place.

Furnish and install two pairs of temperature-recording devices, maturity meters, or other approved equivalent devices. Install devices to measure the surface temperature no more than 3 in. from the surface. Install devices to measure the core temperature half the least dimension from the nearest surface near the point of maximum predicted heat. Use these devices to simultaneously measure the temperature of the concrete at the core and the surface. Maintain temperature control methods for 4 days unless otherwise approved in conformance with the submitted heat control plan. Do not use maturity meters to predict strength of mass concrete. Revise the heat control plan as necessary to maintain the temperature limitations shown above.

If the core temperature exceeds 160°F, the mass concrete element will be subject to review and acceptance by the Engineer using forensic analyses to determine its potential reduction in service life or performance. Proceed with subsequent construction on the affected element only when notified regarding acceptance. Repair any resulting cracking if the temperature differential between the central core of the placement and the nearest concrete surface exceeds 35°F at no expense to the Department and revise the heat control plan as necessary to prevent further occurrences.

4.7.15. **Placing Concrete in Foundation and Substructure**. Do not place concrete in footings until the depth and character of the foundation have been inspected and permission has been given to proceed.

Place concrete footings upon seal concrete after the cofferdams are free of water and the seal concrete is cleaned. Perform any necessary pumping or bailing during the concreting from a suitable sump located outside the forms.

Construct or adjust all temporary wales or braces inside cofferdams as the work proceeds to prevent unauthorized construction joints.

Omit forms when footings can be placed in a dry excavation without the use of cofferdams, if approved, and fill the entire excavation with concrete to the elevation of the top of footing.

Place concrete in columns monolithically between construction joints unless otherwise directed. Columns and caps or tie beams supported on them may be placed in the same operation or separately. Allow for settlement and shrinkage of the column concrete, if placed in the same operation, by placing it to the lower level of the cap or tie beam, and delay placement between 1 hr. and 2 hr. before proceeding with the cap or tie beam placement.

4.7.16. **Placing Concrete in Box Culverts**. Allow between 1 hr. and 2 hr. to elapse where the top slab and walls are placed monolithically in culverts more than 4 ft. in clear height before placing the top slab to allow for settlement and shrinkage in the wall concrete.

Accurately finish the footing slab at the proper time to provide a smooth, uniform surface. Finish top slabs that carry direct traffic in accordance with Item 422, “Concrete Superstructures.” Give top slabs of fill-type culverts a float finish.

4.8. **Extending Existing Substructures**. Verify pertinent dimensions and elevations of the existing structure before ordering any required materials.

4.8.1. **Removal**. Remove portions of the existing structure to the lines and dimensions shown on the plans or as directed. Dispose of these materials as shown on the plans or as directed. Repair any portion of the remaining structure damaged by the construction.

Do not use explosives to remove portions of the existing structure unless approved in writing. Do not use a demolition ball, other swinging weight, or impact equipment unless shown on the plans. Use pneumatic or hydraulic tools for final removal of concrete at the “break” line. Use removal equipment, as approved, that will not damage the remaining concrete.

4.8.2. **Reuse of Removed Portions of Structure**. Detach and remove all portions of the old structure that are to be incorporated into the extended structure to the lines and details as shown on the plans or as directed. Move the unit to be reused to the new location specified using approved methods. Place the reinforcement and extension concrete as shown on the plans.

4.8.3. **Splicing Reinforcing Steel**. Splice new reinforcing bars to exposed bars in the existing structure using lap splices in accordance with Item 440, unless otherwise shown on the plans. The new reinforcing steel does not need to be tied to the existing steel where spacing or elevation does not match that of the existing steel, provided the lap length is attained. Weld in accordance with Item 448 when welded splices are permitted. Install any required dowels in accordance with Section 420.4.7.10., "Installation of Dowels and Anchor Bolts."

4.8.4. **Concrete Preparation**. Roughen and clean concrete surfaces that are in contact with new construction before placing forms. Prepare these construction joint surfaces in accordance with Section 420.4.7.7., "Construction Joints."

4.9. **Treatment and Finishing of Horizontal Surfaces**. Strike off to grade and finish all unformed upper surfaces. Do not use mortar topping for surfaces constructed under this Section.

Float the surface with a suitable float after the concrete has been struck off.

Slope the tops of caps and piers between bearing areas from the center slightly toward the edge, and slope the tops of abutment and transition bent caps from the backwall to the edge, as directed, so water drains from the surface. Give the concrete a smooth trowel finish. Construct bearing areas for steel units in accordance with Section 441.3.11.6., "Bearing and Anchorage Devices." Give the bearing area under the expansion ends of concrete slabs and slab and girder spans a steel-trowel finish to the exact grades required. Give bearing areas under elastomeric bearing pads or nonreinforced bearing seat buildups a textured, wood float finish. Do not allow the bearing area to vary from a level plane more than 1/16 in. in all directions.

Cast bearing seat buildups or pedestals for concrete units integrally with the cap or a construction joint. Provide a latex-based mortar, an epoxy mortar, or an approved proprietary bearing mortar for bearing seat buildups cast with a construction joint. Mix mortars in conformance with the manufacturer's recommendations. Construct pedestals of Class C concrete, reinforced as shown on the plans or as indicated in Figure 1 and Figure 2. The Engineer of Record will design pedestals higher than 12 in.

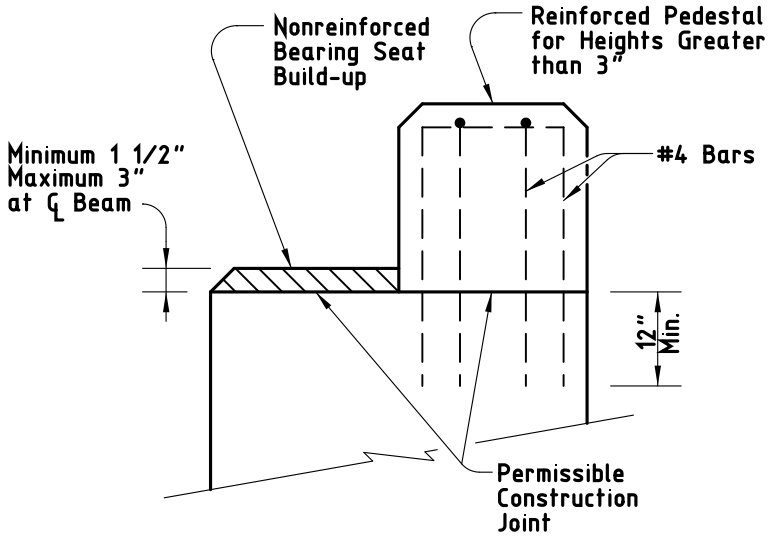

Figure 1
Section Through Bearing Seat Buildups

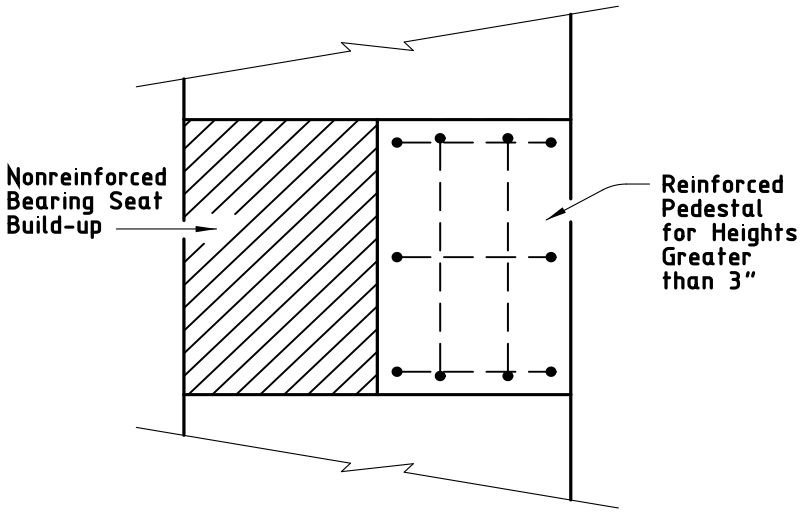

Figure 2
Plan View of Bearing Seat Buildups

4.10. **Curing Concrete**. Obtain approval of the proposed curing methods, equipment, and materials before placing concrete. The Engineer may require the same curing methods for like portions of a single structure. Inadequate curing or facilities may delay all concrete placements on the project until remedial action is taken.

A curing day is a calendar day when the temperature, taken in the shade away from artificial heat, is above 50°F for at least 19 hr. or, on colder days if the temperature of all surfaces of the concrete is maintained above 40°F, for the entire 24 hr. The required curing period begins when all concrete has attained its initial set unless specified otherwise. Tex-440-A may be used to determine when the concrete has attained its initial set.

Cure all concrete for 4 consecutive days except as allowed for the curing options listed below. Use form or membrane curing for vertical surfaces unless otherwise approved. Use only water curing for horizontal surfaces of high-performance concrete (HPC) or mass concrete. Use water or membrane curing for horizontal or unformed surfaces for all other concrete.

Use one of the following curing options for vertical surfaces, unless specified otherwise.

- Form cure for 48 hr. after placement.
- Form cure for 12 hr. after placement followed by membrane curing.
- For HPC, form cure for 48 hr. after placement followed by membrane curing.
- For mass concrete, form cure in conformance with the heat control plan followed by membrane curing if forms are removed before 4 days.

Apply membrane curing, if used, within 2 hr. of form removal.

Use only water curing in accordance with this Section for the top surface of any concrete unit upon which concrete is to be placed and bonded at a later interval (e.g., stub walls, caps with backwalls, and risers).

Cure all other concrete in conformance with the pertinent Items. Use the following methods for curing concrete in accordance with this Item.

4.10.1. **Form Curing**. When forms are left in intimate contact with the concrete, other curing methods are not required except for exposed surfaces and for cold weather protection. Use another approved curing method if forms are removed before the 4-day required curing period.

4.10.2. **Water Curing**. Keep all exposed surfaces of the concrete wet continuously for the required curing time. Use water curing in accordance with concrete mixing water in Section 421.2.5., "Water." Do not use seawater or water that stains or leaves an unsightly residue.

4.10.2.1. **Blankets**. Keep the concrete continuously wet by maintaining wet cotton or burlap mats in direct contact with the concrete for the required curing time. Weight the mats adequately to provide continuous contact with all concrete. Cover surfaces that cannot be cured by direct contact with mats, forming an enclosure well anchored to the forms or ground so outside air cannot enter the enclosure. Provide sufficient moisture inside the enclosure to keep all surfaces of the concrete wet.

4.10.2.2. **Water Spray**. Overlap sprays or sprinklers to keep all unformed surfaces continuously wet.

4.10.2.3. **Ponding**. Cover the surfaces with at least 2 in. of clean granular material, always kept wet, or at least 1 in. of deep water. Use a dam to retain the water or saturated granular material.

4.10.3. **Membrane Curing**. Choose either Type 1-D or Type 2 membrane-curing compound unless otherwise shown on the plans. Use the same type of curing compound on an individual member.

Apply membrane curing just after free moisture has disappeared at a rate of approximately 180 sq. ft. per gallon. Do not spray curing compound on projecting reinforcing steel or concrete that will later form a construction joint. Do not apply membrane curing to dry surfaces. Dampen formed surfaces and surfaces that have been given a first rub, so they are moist at the time of application of the membrane.

Leave the film unbroken for the minimum curing period specified when membrane is used for complete curing. Correct damaged membrane immediately by reapplication of membrane. Polyethylene sheeting, burlap-polyethylene mats, or laminated mats in close contact with the concrete surfaces are equivalent to membrane curing.

4.11. **Removal of Forms and Falsework**. Remove forms for vertical surfaces after the concrete has aged at least 12 hr. after initial set, provided the removal can be done without damage to the concrete, unless otherwise directed. Keep forms for mass placements in place for 4 days following concrete placement unless otherwise approved based on the outcome of the heat control plan in accordance with Section 420.4.7.14., "Mass Placements."

Leave in place weight-supporting forms and falsework spanning more than 1 ft. for all bridge components and culvert slabs except as directed otherwise until the concrete has attained a compressive strength of 2,500 psi. Remove forms for other structural components as necessary.

Remove inside forms (walls and top slabs) for box culverts and sewers after concrete has attained a compressive strength of 1,800 psi if an approved overhead support system is used to transfer the weight of the top slab to the walls of the box culvert or sewer before removal of the support provided by the forms.

Forms or parts of forms may be removed only if constructed to permit removal without disturbing forms or falsework required to be left in place for a longer period on other portions of the structure.

Remove all metal appliances used inside forms for alignment to a depth of at least 1/2 in. from the concrete surface. Make the appliances so metal may be removed without undue chipping or spalling of the concrete, and so it leaves a smooth opening in the concrete surface when removed. Do not burn off rods, bolts, or ties.

Remove all forms and falsework unless otherwise directed.

4.12. **Defective Work**. Repair defective work as soon as possible. Remove and replace at the expense of the Contractor any defect that cannot be repaired to the satisfaction of the Engineer.

4.13. **Ordinary Surface Finish**. Apply an ordinary surface finish to all concrete surfaces. Provide surfaces with uniform appearance. Address defects and surface irregularities not consistent with the intent of the expected finish by the following:

- Chip away all loose or broken material to sound concrete where porous, spalled, or honeycombed areas are visible after form removal.
- Repair spalls in accordance with the *Concrete Repair Manual* available on the Department's website.
- Clean and fill holes or spalls caused by the removal of metal appliances used inside forms, with latex grout, cement grout, or epoxy grout as approved. Do not blend the patch with the surrounding concrete.
- Remove all fins, rust staining, runs, drips, or mortar from surfaces that will be exposed. Smooth all form marks and chamfer edges by grinding or dry-rubbing.
- Ensure all repairs are dense, well-bonded, and properly cured. Finish exposed large repairs to blend with the surrounding concrete where a higher class of finish is not specified.

Apply an ordinary surface finish as the final finish to the following exposed surfaces unless specified otherwise:

- inside and top of inlets,
- inside and top of manholes,
- inside of sewer appurtenances, and
- inside of culvert barrels.

Form marks and chamfer edges do not need to be smoothed for the inside of culvert barrels.

5. MEASUREMENT

This Item will be measured by the cubic yard, square yard, foot, square foot, or each structure.

5.1. **General**. Concrete quantities will be based on the dimensions shown on the plans or those established in writing by the Engineer.

In determining quantities, no deductions will be made for chamfers less than 2 in. or for embedded portions of steel or prestressed concrete beams, piling, anchor bolts, reinforcing steel, drains, weep holes, junction boxes, electrical or telephone conduit, ducts and voids for prestressed tendons, or embedded portions of light fixtures.

Variation in concrete headwall quantity incurred when an alternate bid for pipe is permitted will not be cause for payment adjustment.

Quantities revised by a change in design, measured as specified, will be increased or decreased and included for payment.

5.2. **Plans Quantity**. Structure elements shown in Table 1 and measured by the cubic yard are plans quantity measurement items. The quantity to be paid for plans quantity items is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

No adjustment will be made for footings or other in-ground elements where the Contractor has been allowed to place concrete in an excavation without forms.

Table 1
Plans Quantity Payment
(Cubic Yard Measurement Only)

Culverts and culvert wing walls	Abutments
Headwalls for pipe	Footings
Retaining walls	Pile bent caps
Inlets and manholes	Post-tensioned elements

Note—Other elements, including pier and bent concrete, may be paid for as "plans quantity" when shown on the plans.

5.3. **Measured in Place**. Items not paid for as "plans quantity" will be measured in place.

6. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for the class of concrete and element identified and by the special designation when appropriate. This price is full compensation for furnishing, hauling, and mixing concrete materials; furnishing, bending, fabricating, splicing, welding, and placing the required reinforcement; clips, blocks, metal spacers, ties, wire, or other materials used for fastening reinforcement in place; placing, finishing, and curing concrete; mass placement controls; applying ordinary surface finish; installing bridge identification numbers; furnishing and placing drains, metal flashing strips, and expansion joint material; excavation; subgrade preparation; and forms and falsework, and for equipment, labor, tools, and incidentals.

Price will be adjusted in accordance with Article 421.6., "Measurement and Payment," when required to address non-compliance of project acceptance testing.

Design and installation of foundations for falsework are at the Contractor's expense.

In addition to the work described above, for extending structures the unit prices bid for the various classifications of concrete shown are full compensation for removing and disposing of, if necessary, the designated portion of the existing structure; removing, stockpiling if necessary, and replacing headwall units for reuse; cleaning, bending, and cutting of exposed reinforcing steel; splicing of new reinforcing steel to existing reinforcing steel; installation of dowels; and cleaning and preparing existing concrete surfaces.

Item 421
Hydraulic Cement Concrete

1. DESCRIPTION

Furnish hydraulic cement concrete for concrete pavements, concrete structures, and other concrete construction.

2. MATERIALS

Use materials from prequalified sources listed on the Department website. Provide aggregates from sources listed in the Department's Concrete Rated Source Quality Catalog (CRSQC). Use materials from non-listed sources only when tested and approved before use. Allow 30 calendar days for the Engineer to sample, test, and report results for non-listed sources. Do not combine approved material with unapproved material.

2.1. **Cement**. Furnish cement in accordance with DMS-4600, "Hydraulic Cement."

2.2. **Supplementary Cementitious Materials (SCMs)**.

- **Coal Ash**. Furnish sources of fly ash, modified fly ash (MFA), harvested coal ash (HCA), and ground bottom ash (GBA) in accordance with DMS-4610, "Coal Ash."
- **Slag Cement**. Furnish slag cement in accordance with DMS-4620, "Slag Cement."
- **Silica Fume**. Furnish silica fume in accordance with DMS-4630, "Silica Fume."
- **Natural Pozzolans**. Furnish natural pozzolans in accordance with DMS-4635, "Natural Pozzolans."

2.3. **Cementitious Material.** Cementitious materials are the cement and SCMs used in concrete.

2.4. **Chemical Admixtures**. Furnish admixtures in accordance with DMS-4640, "Chemical Admixtures for Concrete."

2.5. **Water**. Furnish mixing and curing water that is free of oils, acids, organic matter, or other deleterious substances. Water from municipal supplies approved by the Texas Department of Health will not require testing. Provide test reports showing compliance with Table 1 before use when using water from other sources.

Water that is a blend of concrete wash water and other acceptable water sources, certified by the concrete producer as complying with the requirements shown in Table 1 and Table 2, may be used as mix water. Test the blended water weekly for 4 weeks for compliance with Table 1 and Table 2 or provide previous test results. Then test every month for compliance. Provide water test results upon request.

Do not use mix water that has an adverse effect on the air-entraining agent, on any other chemical admixture, or on strength or time of set of the concrete. Use mixing and curing water free of iron and other impurities that may cause staining or discoloration when using white hydraulic cement.

Table 1
Chemical Limits for Mix Water

Contaminant	Test Method	Max Concentration (ppm or mg\L)
Chloride (Cl)	ASTM C114[1]	
Prestressed concrete		500
Bridge decks & superstructure		500
All other concrete		1,000
Sulfate (SO4)	ASTM C114[1]	2,000
Alkalis (Na2O + 0.658K2O)	ASTM C114[1]	600
Total solids	ASTM C1603	50,000

1. ASTM C114 includes reference and alternative test methods to measure the concentration of chlorides, sulfates, and alkalis in solutions prepared from dissolving cementitious materials. Use the applicable Test Methods in C114 to measure these constituents. The laboratory performing these tests is not required to conform to the method qualification requirements of Test Methods C114. Alternative instrumental and wet chemistry methods not listed in Test Methods C114 that measure the concentration of these chemical species in solution are permitted. When alternative methods are used, the test method used will be included in the report.

Table 2
Acceptance Criteria for Questionable Water Supplies

Property	Test Method	Limits
Compressive strength, Min % control at 7 days	ASTM C31, ASTM C39[1,2]	90
Time of set, deviation from control, h:min.	ASTM C403	From 1:00 early to 1:30 later

1. Base comparisons on fixed proportions and the same volume of test water compared to the control mix using 100% potable water or distilled water.
2. Base comparisons on sets consisting of at least two standard specimens made from a composite sample.

2.6. **Aggregate**.

2.6.1. **Coarse Aggregate**. Provide coarse aggregate consisting of durable particles of gravel, crushed blast furnace slag, recycled crushed hydraulic cement concrete, crushed stone, or combinations that are free of frozen material and injurious amounts of salt, alkali, vegetable matter, or other objectionable material, either free or as an adherent coating. Provide coarse aggregate of uniform quality throughout.

Provide coarse aggregate with the requirements shown in Table 3 unless otherwise shown on the plans.

Table 3
Coarse Aggregate Requirements

Description	Test Method	Limit
Weight of clay lumps, % Max	Tex-413-A	0.25
Weight of shale, % Max		1.0
Weight of laminate and friable particle, % Max		5.0
L.A. abrasion wear, % Max	Tex-410-A	40
5-cycle magnesium sulfate soundness,[1,2], non-air-entrained concrete, % Max	Tex-411-A	25
5-cycle magnesium sulfate soundness,[1,3], air-entrained concrete, % Max		18
Loss by decantation, % Max	Tex-406-A	1.5

1. Recycled crushed hydraulic cement concrete is not subject to 5-cycle magnesium sulfate soundness requirements.
2. Allowed when air-entrained concrete is used at the Contractor's option.
3. Only when air-entrained concrete is required by the plans.

Increase the loss by decantation limit to 3.0% for all classes of concrete and 5.0% for Class A, B, and P if the material finer than the No. 200 sieve is determined to be at least 85% calcium carbonate in accordance with Tex-406-A, Part III, in the case of coarse aggregates made primarily from crushing stone, unless otherwise shown on the plans. Provide test results upon request.

Provide coarse aggregate or combination of aggregates conforming to the gradation requirements shown in Table 4 when tested in accordance with Tex-401-A unless otherwise specified.

Table 4
Coarse Aggregate Gradation Chart

Aggregate Grade No.[1]	Maximum Nominal Size	Percent Passing on Each Sieve								
		2-1/2"	2"	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#8
1	2"	100	80–100	50–85	–	20–40	–	–	0–10	–
2	1-1/2"	–	100	95–100	–	35–70	–	10–30	0–10	–
3	1-1/2"	–	100	95–100	–	60–90	25–60	–	0–10	–
4 (57)	1"	–	–	100	95–100	–	25–60	–	0–10	0–5
5 (67)	3/4"	–	–	–	100	90–100	–	20–55	0–10	0–5
6 (7)	1/2"	–	–	–	–	100	90–100	40–70	0–15	0–5
7	3/8"	–	–	–	–	–	100	70–95	0–25	–
8	3/8"	–	–	–	–	–	100	95–100	20–65	0–10

1. Corresponding ASTM C33 gradation shown in parentheses.

2.6.2. **Fine Aggregate**. Provide fine aggregate consisting of clean, hard, durable particles of natural, manufactured sand; recycled crushed hydraulic cement concrete; slag; lightweight aggregate; or a combination thereof. Provide fine aggregate free of frozen material and injurious amounts of salt, alkali, vegetable matter, or other objectionable material.

Provide fine aggregates in accordance with Table 5 unless otherwise shown on the plans.

Table 5
Fine Aggregate Requirements

Description	Test Method	Limit
Weight of clay lumps, % Max	Tex-413-A	0.50
Organic impurities[1]	Tex-408-A	Color not darker than standard
Sand equivalent, Min	Tex-203-F	80
Fineness modulus	Tex-402-A	2.3–3.1

1. Only when air-entrained concrete is specified.

Provide fine aggregate or combinations of aggregates conforming to the gradation requirements shown in Table 6 when tested in accordance with Tex-401-A unless otherwise specified.

Table 6
Fine Aggregate Gradation Chart (Grade 1)

Sieve Size	% Passing
3/8"	100
#4	95–100
#8	80–100
#16	50–85
#30	25–65
#50	10–35[1]
#100	0–10
#200	0–3[2]

1. 6–35 when sand equivalent value is greater than 85.
2. 0–6 for manufactured sand.

2.6.3. **Intermediate Aggregate**. Provide intermediate aggregate consisting of clean, hard, durable particles of natural, manufactured sand; slag; recycled crushed hydraulic cement concrete; lightweight aggregate; or a combination thereof when optimized aggregate gradation (OAG) concrete is specified or when used at the Contractor's option. Provide intermediate aggregate free of frozen material and injurious amounts of salt, alkali, vegetable matter, or other objectionable material.

Provide intermediate aggregate in accordance with Table 7.

Table 7
Intermediate Aggregate Requirements

Description	Test Method	Limit
Weight of clay lumps, % Max	Tex-413-A	0.50
L.A. abrasion wear,[1] % Max	Tex-410-A	40
5-cycle magnesium sulfate soundness,[1,2,3], non-air-entrained concrete, % Max	Tex-411-A	25
5-cycle magnesium sulfate soundness,[1,2,4], air-entrained concrete, % Max		18
Organic impurities[5]	Tex-408-A	Color not darker than standard
Loss by decantation,[1] % Max	Tex-406-A	1.5

1. Applies only to the portion retained on the No. 4 sieve, if more than 30% of the intermediate aggregate is retained on the No. 4 sieve.
2. Recycled crushed hydraulic cement concrete is not subject to 5-cycle magnesium sulfate soundness requirements.
3. Allowed when air-entrained concrete is used at the Contractor's option.
4. Only when air-entrained concrete is required by the plans.
5. Applies only to the portion passing the 3/8-in. sieve, if more than 30% of the intermediate aggregate is passing the 3/8-in. sieve.

For the portion retained on the No. 4 sieve, if more than 30% of the intermediate aggregate is retained on the No. 4 sieve, and in the case of aggregates made mainly from crushing stone, unless otherwise shown on the plans, the loss by decantation may be increased to 3.0% for all classes of concrete and 5.0% for Class A, B, and P if the material finer than the No. 200 sieve is determined to be at least 85% calcium carbonate in accordance with Tex-406-A, Part III. Provide test results upon request.

2.7. **Mortar and Grout**. Furnish pre-packaged grouts in accordance with DMS-4675, "Cementitious Grouts and Mortars for Miscellaneous Applications," when specified for applications other than post-tension grouting.

When grouting or mortaring stone riprap is shown on the plans, provide mortar and grout consisting of one part hydraulic cement, two parts sand, and sufficient water to provide the desired consistency. Other mix proportions allowed as approved. Provide mortar with a consistency such that the mortar can be easily handled and spread by trowel. Provide grout of a consistency that will flow into and completely fill all voids.

Section 421.4.2.6., "Mix Design Options," does not apply for mortar and grout.

2.8. **Storage of Materials**.

2.8.1. **Cement and Supplementary Cementitious Materials**. Store all cement and supplementary cementitious materials in weatherproof enclosures that will protect the materials from dampness or absorption of moisture.

When permitted, small quantities of packaged cementitious material may be stored in the open, on a raised platform, and under waterproof covering for up to 48 hr.

2.8.2. **Aggregates**. Handle and store concrete aggregates in a manner that prevents contamination by foreign materials. Clear and level the sites for the stockpiles of all vegetation if the aggregates are stored on the ground, and do not use the bottom 6-in. layer of aggregate without cleaning the aggregate before use.

Maintain separate stockpiles and prevent intermixing when conditions require the use of two or more grades of coarse aggregates. Separate the stockpiles using physical barriers where space is limited. Store aggregates from different sources in different stockpiles unless the Engineer authorizes pre-blending of the aggregates. Minimize segregation in stockpiles. Remix and test stockpiles when segregation is apparent.

Sprinkle stockpiles to control moisture and temperature as necessary. Maintain reasonably uniform moisture content in aggregate stockpiles.

2.8.3. **Chemical Admixtures**. Store admixtures in conformance with manufacturer's recommendations in tanks that are clearly labeled and prevent admixtures from freezing.

3. EQUIPMENT

3.1. **Concrete Plants and Mixing Equipment**. Except for volumetric stationary plant or truck (auger) mixers, each plant and truck mixer must be certified by NRMCA or have an inspection report signed and sealed by a licensed professional engineer showing concrete measuring, mixing, and delivery equipment meets all requirements of ASTM C94. A new certification or signed and sealed report is required every time a plant is moved. Plants with a licensed professional engineer's inspection require re-inspection every 2 yr. Provide a copy of the certification or the signed and sealed inspection report to the Engineer. Remove equipment or facilities from service until corrected when they fail to meet specification requirements.

When allowed as shown on the plans or by the Engineer, for concrete classes not identified as structural concrete in Table 8 or for Class C concrete not used for bridge-class structures, the Engineer may inspect and approve all plants and trucks instead of NRMCA or non-Department engineer-sealed certifications. The criteria and frequency of Engineer approval of plants and trucks are the same used for NRMCA certification.

Inspect and furnish inspection reports of the condition of blades and fins and their percent wear from the original manufacturer's design for all mixing and agitating equipment annually. Repair mixing equipment exhibiting 10% or more wear before use. If an inspection within 12 mo. is not practical, a 2-mo. grace period (for a maximum of 14 mo. between inspections) is permitted.

3.1.1. **Scales**. Check all scales before beginning of operations, after each move, or whenever their accuracy or adequacy is questioned, and at least once every 6 mo. Immediately correct deficiencies, and recalibrate. Provide a record of calibration showing scales in compliance with ASTM C94 requirements. Check batching accuracy of volumetric water batching devices at least every 90 days. Check batching accuracy of chemical admixture dispensing devices at least every 6 mo. Perform daily checks as necessary to ensure measuring accuracy. Check electronic aggregate moisture probes at least every 90 days in accordance with Tex-409-A, and be accurate to within 1.0% of the actual moisture content.

3.1.2. **Volumetric Mixers**. Provide volumetric mixers with rating plates defining the capacity and the performance of the mixer in accordance with the Volumetric Mixer Manufacturers Bureau or equivalent. Provide volumetric mixers that comply with ASTM C685. Provide test data showing mixers meet the uniformity test requirements in accordance with Tex-472-A.

Unless allowed on the plans or by the Engineer, volumetric truck (auger) mixers may not supply classes of concrete identified as structural concrete in Table 8.

3.1.3. **Agitators and Truck and Stationary Mixers**. Provide stationary and truck mixers capable of combining the ingredients of the concrete into a thoroughly mixed and uniform mass and capable of discharging the concrete so that the requirements of Tex-472-A are met.

Perform concrete uniformity tests on mixers or agitators in accordance with Tex-472-A as directed, to resolve issues of mix uniformity and mixer performance.

Perform the mixer or agitator uniformity test at the full rated capacity of the equipment. Remove all equipment that fails the uniformity test from service.

Inspect and maintain mixers and agitators. Keep them free of concrete buildup, and repair or replace worn or damaged blades or fins.

Ensure all mixers have a plate affixed showing manufacturer's recommended operating speed and rated capacity for mixing and agitating.

Truck mixers with automated water and chemical admixture measurement and slump and slump flow monitoring equipment meeting the requirement of ASTM C94 will be allowed. Provide data every 6 mo. substantiating the accuracy of slump, slump flow, temperature, water, and chemical admixture measurements. The slump measured by the automated system must be within 1 in. of the slump measured

in accordance with Tex-415-A. The concrete temperature measured by the automated system must be within 1°F of concrete temperature measured in accordance with Tex-422-A. The Engineer will not use the automated measurements for acceptance.

3.2. **Hauling Equipment**. Provide hauling equipment capable of maintaining the mixed concrete in a thoroughly mixed and uniform mass and discharging the concrete with a satisfactory degree of uniformity.

Provide equipment with smooth, mortar-tight metal containers equipped with gates that prevent accidental discharge of the concrete when using non-agitating equipment for transporting concrete.

Maintain hauling equipment clean and free of built-up concrete.

3.3. **Testing Equipment**. Provide strength-testing equipment when required in accordance with the Contract controlling test unless shown otherwise. Provide calibration records of strength-testing equipment to the Engineer within 1 week after each calibration. Furnish and maintain the following in conformance with the pertinent test procedure unless otherwise shown on the plans or specified.

- Test molds
- Curing facilities
- Maturity meters if used
- Wheelbarrow or other container acceptable for the sampling of the concrete

4. CONSTRUCTION

4.1. **Classification of Concrete Mix Designs**. Provide classes of concrete meeting the requirements shown in Table 8.

A higher-strength class of concrete with equal or lower water-to-cementitious material (w/cm) ratio may be substituted for the specified class of concrete when approved.

4.2. **Mix Design Proportioning**. Furnish mix designs using ACI 211, Tex-470-A, or other approved procedures for the classes of concrete shown in Table 8 unless a design method is shown on the plans. Perform mix design proportioning by absolute volume method unless otherwise approved. Perform cement replacement using equivalent weight method unless otherwise approved.

Do not exceed the maximum w/cm ratio shown in Table 8 when designing the mixture.

4.2.1. **Cementitious Materials**. Do not exceed 700 lb. of cementitious material per cubic yard of concrete unless otherwise specified or approved.

- Use cement of the same type and from the same source for monolithic placements, unless otherwise approved.
- Do not use SCMs when white hydraulic cement is specified.

4.2.2. **Aggregates**. Recycled crushed hydraulic cement concrete may be used as a coarse or fine aggregate in Class A, B, E, and P concrete. Limit recycled crushed concrete fine aggregate to at most 20% of the fine aggregate.

Use light-colored aggregates when white hydraulic cement is specified.

Table 8
Concrete Classes

Class of Concrete	Design Strength[1], Min f'_c (psi)	Max w/cm Ratio	Cement Types	Mix Design Options	Exceptions to Mix Design Options	General Use[2]
A	3,000	0.60	I, II, I/II, IL, IP, IS, IT, V	1, 2, 4, and 7	When the cementitious material content does not exceed 520 lb./cu. yd.., any coal ash or natural pozzolan listed in the MPL may be used at a cement replacement of 20%–50%. Limit the alkali loading to 4.0 lb./cu. yd. or less when using Option 7.	Curb, gutter, curb and gutter, concrete retards, sidewalks, driveways, backup walls, anchors, non-reinforced drilled shafts
B	2,000	0.60				Riprap, traffic signal controller foundations, small roadside signs, anchors
C[3]	3,600	0.45	I, II, I/II, IP, IL, IS, IT, V	1–8	N/A	Drilled shafts, bridge substructure, traffic rail, culverts except top slab of direct traffic culverts, headwalls, wing walls, inlets, manholes, traffic barrier
E	3,000	0.50	I, II, I/II, IL, IP, IS, IT, V	1–8	When the cementitious material content does not exceed 520 lb./cu. yd., any coal ash or natural pozzolan listed on the MPLs may be used at a cement replacement of 20%–50%. Limit the alkali loading to 4.0 lb./cu. yd. or less when using Option 7.	Seal concrete
F[3]	Note[4]	0.45	I, II, I/II, IP, IL, IS, IT, V		N/A	Railroad structures; occasionally for bridge piers, columns, bents, post-tension members
H[3]	Note[4]	0.45	I, II, I/II, III, IP, IL, IS, IT, V	1–4, 8	Mix design Options 1–8 allowed for cast-in-place concrete and the following precast elements unless otherwise shown on the plans. ■ Bridge deck panels ■ Retaining wall systems ■ Coping ■ Sound walls ■ Wall columns ■ Traffic rail ■ Traffic barrier ■ Long/arch-span culverts ■ Precast concrete products in accordance with Item 462, 464, and 465 Do not use Type III cement in mass placement concrete.	Precast concrete, post-tension members
S[3]	4,000	0.45	I, II, I/II, IP, IL, IS, IT, V	1–8	N/A	Bridge slabs, top slabs of direct traffic culverts, approach slabs
P	See Item 360, "Concrete Pavement."	0.50	I, II, I/II, IL, IP, IS, IT, V	1–8	When the cementitious material content does not exceed 520 lb./cu. yd., any coal ash or natural pozzolan on the MPLs may be used at a cement replacement of 20%–50%.	Concrete pavement

Class of Concrete	Design Strength[1], Min f'_c (psi)	Max w/cm Ratio	Cement Types	Mix Design Options	Exceptions to Mix Design Options	General Use[2]
CO[3]	4,600	0.40	I, II, I/II, IP, IL, IS, IT, V	1–8	N/A	Bridge deck concrete overlay
LMC[3]	4,000	0.40				Latex-modified concrete overlay
SS[3]	3,600	0.45		1–8	Use a minimum cementitious material content of 658 lb./cu. yd. of concrete. Limit the alkali loading to 4.0 lb. per cubic yard or less when using Option 7.	Slurry displacement shafts, underwater drilled shafts
K[3]	Note[4]	0.40	I, II, I/II, III, IP, IL, IS, IT, V	1–8	N/A	Bridge repair
HES	Note[4]	0.45	I, IL, II, I/II, III	N/A	Mix design options do not apply. Limit of 700 lb. of cementitious material per cubic yard is not pertinent.	Concrete pavement, concrete pavement repair
"X" (HPC)[3,5,6]	Note[7]	0.45	I, II, I/II, III, IP, IL, IS, IT, V	1–4, and 8	N/A	N/A
"X" (SRC)[3,5,6]	Note[7]	0.45	I/II, II, IP, IL (MS or HS), IS, IT (MS or HS), V	1–4, and 7	When using coal ash, use only coal ashes allowed for SRC in accordance with the coal ash MPL. Type III-MS may be used where allowed. Type I, Type IL, and Type III cements may be used when natural pozzolans are used or when coal ashes allowed for SRC in accordance with the coal ash MPL are used, and with a Max w/cm of 0.40. Use Option 7 for precast concrete where allowed.	N/A

1. Design strength must be attained within 56 days.
2. For information only.
3. Structural concrete classes.
4. As shown on the plans or specified.
5. "X" denotes class of concrete as shown on the plans or specified.
6. (HPC): High Performance Concrete, (SRC): Sulfate Resistant Concrete.
7. Same class of concrete as shown on the plans.

4.2.2.1. **Coarse Aggregate**. Use Grade 2 or 3 coarse aggregate for Class P concrete. Use Grade 8 aggregate in extruded curbs unless otherwise approved. Unless otherwise specified, do not use Grade 1 aggregate in drilled shafts. Use coarse aggregate grades for all other classes of concrete with a maximum nominal size no larger than:

- 1/5 the narrowest dimension between sides of forms;
- 1/3 the depth of slabs;
- 2/3 the minimum clear spacing between individual reinforcing bars or wire, bundles of bars, individual tendons, bundles of tendons, or ducts for cast-in-place concrete; or
- 3/4 the minimum clear spacing between individual reinforcing bars or wires, bundles of bars, individual tendons, bundled tendons, or ducts for precast concrete.

4.2.2.2. **Fine Aggregate**. Use fine aggregate with an acid insoluble residue of at least 60% by weight when tested in accordance with Tex-612-J in all concrete subject to direct traffic.

Use the following equation to determine whether the aggregate combination meets the acid insoluble residue requirement when blending fine aggregate or using an intermediate aggregate.

$$\frac{(A_1 \times P_1)+(A_2 \times P_2)+(A_{ia} \times P_{ia})}{100} \geq 60\%$$

where:

A_1 = acid insoluble (%) of fine aggregate 1
A_2 = acid insoluble (%) of fine aggregate 2
A_{ia} = acid insoluble (%) of intermediate aggregate passing the 3/8 in. sieve
P_1 = percent by weight of fine aggregate 1 of the fine aggregate blend
P_2 = percent by weight of fine aggregate 2 of the fine aggregate blend
P_{ia} = percent by weight of intermediate aggregate passing the 3/8-in. sieve

Alternatively to the above equation, blend fine aggregate with a Micro-Deval loss of less than 12%, when tested in accordance with Tex-461-A, with at least 40% of a fine aggregate with an acid insoluble residue of at least 60%.

Use the following equation to determine whether the aggregate combination meets the sand equivalency requirement when blending fine aggregate or using an intermediate aggregate.

$$\frac{(SE_1 \times P_1)+(SE_2 \times P_2)+(SE_{ia} \times P_{ia})}{100} \geq 80\%$$

where:

SE_1 = sand equivalency (%) of fine aggregate 1
SE_2 = sand equivalency (%) of fine aggregate 2
SE_{ia} = sand equivalency (%) of intermediate aggregate passing the 3/8 in. sieve
P_1 = percent by weight of fine aggregate 1 of the fine aggregate blend
P_2 = percent by weight of fine aggregate 2 of the fine aggregate blend
P_{ia} = percent by weight of intermediate aggregate passing the 3/8-in. sieve

4.2.3. **Chemical Admixtures**. Do not use Type C, E, F, or G admixtures in Class S bridge deck concrete. Do not use chemical admixtures containing calcium chloride in any concrete.

Use a 30% calcium nitrite solution when a corrosion-inhibiting admixture is required. Dose the admixture at the rate of gallons of admixture per cubic yard of concrete shown on the plans. Use set retarding admixtures, as needed, to control setting time to ensure concrete containing corrosion inhibiting admixtures remains workable for the entire duration of the concrete placement. Perform setting time testing and slump loss tests during trial batch testing.

4.2.4. **Air Entrainment**. When air-entrained concrete is shown on the plans, target an entrained air content of 4.0% for Class P concrete and 5.5% for all other classes of concrete. Use an approved air-entraining admixture when air-entrained concrete is specified, or when an air-entraining admixture is used at the Contractor's option. Unless otherwise shown on the plans, acceptance of concrete loads will be based on a tolerance of ±1.5% from the target air content. If the air content is more than 1.5 but less than 3.0% above the target air, the concrete may be accepted based on strength tests. For specified concrete strengths above 5,000 psi, a reduction of 1% entrained air content is permitted.

4.2.5. **Slump**. Provide concrete with a slump in accordance with Table 9 unless otherwise specified. When approved, the slump of a given concrete mix may be increased above the values shown in Table 9 using chemical admixtures, provided the admixture-treated concrete has the same or lower w/cm ratio and does not exhibit segregation or excessive bleeding. Request approval to exceed the slump limits shown in Table 9 sufficiently in advance for proper evaluation by the Engineer.

Table 9
Placement Slump Requirements

General Use	Placement Slump Range (in.)
Walls (>9 in. thick), caps, columns, piers	3–7
Bridge slabs, top slabs of direct traffic culverts, approach slabs, concrete overlays	3–6
Latex-modified concrete for bridge deck overlays	3–8
Inlets, manholes, walls (<9 in. thick), bridge railing, culverts, concrete traffic barrier, concrete pavement (formed)	4–6
Precast concrete	4–9
Underwater concrete placements	6–8-1/2
Drilled shafts, slurry displaced, underwater drilled shafts	See Item 416, "Drilled Shaft Foundations"
Curb, gutter, curb and gutter, concrete retards, sidewalk, driveways, seal concrete, anchors, riprap, small roadside sign foundations, concrete pavement repair, concrete repair	As approved

4.2.6. **Mix Design Options**.

4.2.6.1. **Option 1**. Replace cement with at least the minimum dosage listed on the MPL for the coal ash or natural pozzolan used in the mixture. Conduct Option 8 testing to determine the minimum replacement dosage as listed on the MPL. Do not replace more than 50% of the cement. Up to 70% of the cement may be replaced when concrete is used for mass concrete placements.

4.2.6.2. **Option 2**. Replace 35–50% of the cement with slag cement. Up to 70% of the cement may be replaced when concrete is used for mass concrete placements.

4.2.6.3. **Option 3**. Replace 35–50% of the cement with a combination of coal ash, slag cement, MFA, natural pozzolan, or at least 3% silica fume; however, no more than 10% may be silica fume. Up to 70% of the cement may be replaced when concrete is used for mass concrete placements.

4.2.6.4. **Option 4**. Use Type IP, IS, or IT cement as allowed in Table 8 for each class of concrete. When replacing blended cements with additional SCMs, the replacement limits in Option 3 will apply to the final cementitious mixture. When using fly ash or natural pozzolans not having a minimum dosage listed on the MPL in the final cementitious mixture, perform Option 8 testing.

4.2.6.5. **Option 5**. Option 5 is left intentionally blank.

4.2.6.6. **Option 6**. Use a lithium nitrate admixture at a minimum dosage determined by testing conducted in accordance with Tex-471-A. Before use of the mix, provide an annual certified test report signed and sealed by a licensed professional engineer, from a laboratory on the MPL, certified by the Materials and Tests Division (MTD) as being capable of testing in accordance with Tex-471-A.

4.2.6.7. **Option 7**. Ensure the total alkali contribution from the cement in the concrete does not exceed 3.5 lb. per cubic yard of concrete when using hydraulic cement not containing SCMs calculated as follows.

$$\text{lb. alkali per cu. yd.} = \frac{\left(\text{lb. cement per cu. yd.}\right) \times \left(\%\ Na_2O \text{ equivalent in cement}\right)}{100}$$

In the above calculation, use the maximum cement alkali content reported on the cement mill certificate.

4.2.6.8. **Option 8**. Use Table 10 when deviating from Options 1–3 or when required by the coal ash MPL. Perform required testing annually and submit results to the Engineer. Laboratories performing ASTM C1260, C1567, and C1293 testing must be listed on the Department's MPL. Before use of the mix, provide a certified test report signed and sealed by a licensed professional engineer demonstrating the proposed mixture conforms to the requirements of Table 10.

Provide a certified test report signed and sealed by a licensed professional engineer, when high-performance concrete (HPC) is required, and less than 20% of the cement is replaced with SCMs, demonstrating ASTM C1202 test results indicate the permeability of the concrete is less than 1,500 coulombs tested immediately after either of the following curing schedules.

- Moisture cure specimens 56 days at 73°F.
- Moisture cure specimens 7 days at 73°F followed by 21 days at 100°F.

Table 10
Option 8 Testing and Mix Design Requirements

Scenario	ASTM C1260 Result		Testing Requirements for Mix Design Materials or Prescriptive Mix Design Options[1]
	Mix Design Fine Aggregate	Mix Design Coarse Aggregate	
A	>0.10%	>0.10%	Determine the dosage of SCMs needed to limit the 14-day expansion of each aggregate[1] to <0.10% when tested individually in accordance with ASTM C1567.
B	≤0.10%	≤0.10%	Use the minimum replacement listed in the coal ash MPL, or When Option 8 is listed on the MPL, use at least 40% coal ash with a maximum CaO[2] content of 25%, or Use any ternary combination that replaces 35–50% of cement.
	≤0.10%	ASTM C1293 1 yr. Expansion ≤0.04%	Use a minimum of 20% of any coal ash; or Use any ternary combination that replaces 20–50% of cement.
C	≤0.10%	>0.10%	Determine the dosage of SCMs needed to limit the 14-day expansion of course and intermediate[1] aggregate to <0.10% when tested individually in accordance with ASTM C1567.
D	>0.10%	≤0.10%	Use the minimum replacement listed in the coal ash MPL, or When Option 8 is listed in the MPL, use a minimum of 40% coal ash with a maximum CaO[2] content of 25%, or Use any ternary combination that replaces 35% to 50% of cement.
	> 0.10%	ASTM C1293 1 yr. Expansion ≤ 0.04%	Determine the dosage of SCMs needed to limit the 14-day expansion of each fine aggregate to <0.10% when individually tested in accordance with ASTM C1567.

1. Intermediate size aggregates will fall under the requirements of mix design coarse aggregate.
2. Average the CaO content from the previous ten values as listed on the test certificate.

4.2.7. **Optimized Aggregate Gradation (OAG) Concrete**. The gradation requirements shown in Table 4 and Table 6 do not apply when OAG concrete is specified or used by the Contractor, unless otherwise shown on the plans.

The fineness modulus for fine aggregate shown in Table 5 does not apply when OAG concrete is used. Establish the optimized aggregate gradation in accordance with Tex-470-A. Use at least 420 lb. per cubic yard of cementitious material when OAG concrete is used unless otherwise approved.

Make necessary adjustments to individual aggregate stockpile proportions during OAG concrete production when the gradation deviates more than 2% from the optimized gradation requirements.

4.2.8. **Self-Consolidating Concrete (SCC)**. Provide SCC meeting the requirements shown in Table 11 when approved for use in precast concrete. Use concrete with a slump flow that can be placed without vibration and will not segregate or excessively bleed.

Request approval to exceed the slump flow limits sufficiently in advance for proper evaluation by the Engineer.

Table 11
Mix Design Requirements for SCC

Tests	Test Method	Acceptable Limits
Slump flow for precast concrete	ASTM C1611	22–27[1]
T_{50}, sec.	ASTM C1611	2–7
VSI rating	ASTM C1611	0 or 1
Passing ability, in.	ASTM C1621	≤2
Segregation column, %	ASTM C1610	≤10
Bleeding, %	ASTM C232	≤2.5

1. These slump flow limits are generally acceptable for most applications. However, slump flow limits may be adjusted during mix design approval process and when approved.

4.3. **Concrete Trial Batches**. Perform trial batches when required by the plans, or when previous satisfactory field data is not available. Submit previous satisfactory field data to the Engineer showing the proposed mix design conforms to specification requirements when trial batches are not required and before concrete is placed. Trial batch test results will be reported to the Contractor and the concrete supplier. Trial batches are not required for Class A, B, or E concrete unless establishing target values as described below.

Perform trial batches for all self-consolidating concrete mix designs.

Make all trial batches using the proposed ingredients in a mixer that is representative of the mixers to be used on the project when required. Make the batch size at least 50% of the mixer's rated capacity. Alternatively, use an AASHTO-accredited laboratory to perform laboratory trial batches using all the proposed ingredients. Perform fresh concrete tests for air content and slump, and make, cure, and test strength specimens for compliance with specification requirements. Test at least one set of design strength specimens, consisting of two specimens per set, at 7-day, 28-day, and at least one additional age unless otherwise directed. Before placing, provide the Engineer the option of witnessing trial batches, including the testing of the concrete. If not provided this option, the Engineer may require additional trial batches, including testing, before the concrete is placed.

Trial batches for precast concrete will be performed in accordance with Tex-703-I to show proposed mix design meets the requirements of the pertinent class of concrete, or Table 11 when SCC is used.

Establish a compressive strength target value in accordance with Tex-427-A for each Class A, B, and E concrete.

When changes are made to the type, brand, or source of aggregates, cement, SCM, water, or chemical admixtures, submit previous satisfactory field data, data from a new trial batch, or other evidence showing the change will not adversely affect the relevant properties of the concrete. Submit the data for approval before making changes to the mix design. A change in vendor does not necessarily constitute a change in materials or source. The Engineer may waive new trial batches when there is a prior record of satisfactory performance with the ingredients. During concrete production, dosage changes of chemical admixtures used in the trial batches will not require a re-evaluation of the mix design.

The Contractor has the option of performing trial batches in conjunction with concrete placements except for SCC mixtures, when new trial batches are required during the course of the project. If the concrete fails to meet any requirement, the Engineer will determine acceptability and payment adjustments. Establishing target strength for Class A, B, and E concrete may be conducted during these placements.

Establish the strength–maturity relationship in accordance with Tex-426-A when the maturity method is specified or permitted. When using the maturity method, any changes in any of the ingredients, including changes in proportions, will require the development of a new strength–maturity relationship for the mix.

4.3.1. **Mix Design of Record**. Once a trial batch or previously satisfactory field data substantiates the mix design, the proportions and mixing methods used become the mix design of record. Do not exceed mix design w/cm ratio.

4.4. **Production Testing**.

4.4.1. **Aggregate Moisture Testing**. Determine moisture content in accordance with Tex-409-A or Tex-425-A for coarse, intermediate, and fine aggregates at least twice per week, when there is an apparent change, or for new shipments of aggregate. When aggregate hoppers or storage bins are equipped with properly maintained electronic moisture probes for continuous moisture determination, moisture tests in accordance with Tex-409-A or Tex-425-A are not required.

When producing SCC, and when aggregate hoppers or storage bins are not equipped with electronic moisture probes, determine the moisture content of the aggregates before producing the first concrete batch each day. Thereafter, determine the moisture content every 4 hr. or when there is an apparent change while SCC is being produced.

4.4.2. **Aggregate Gradation Testing**. Perform a sieve analysis in accordance with Tex-401-A on each stockpile used in the blend at least 1 day before producing OAG concrete. Perform sieve analysis on each stockpile after every 10,000 cu. yd. of Class P OAG concrete produced, and every 1,000 cu. yd. for all other structural-class concrete. Provide sieve analysis data to the Engineer.

4.5. **Measurement of Materials**.

4.5.1. **Non-Volumetric Mixers**. Measure aggregates by weight. Correct batch weight measurements for aggregate moisture content. Measure mixing water, consisting of water added to the batch, ice added to the batch, water occurring as surface moisture on the aggregates, and water introduced in the form of admixtures, by volume or weight. Measure ice by weight. Measure cement and SCMs in a hopper and on a separate scale from those used for other materials. When measuring by cumulative weight, measure the cement first and ensure the cement meets the cement tolerance shown in Table 12 before measuring the SCMs. Measure concrete chemical admixtures by weight or volume. Measure batch materials within the tolerances shown in Table 12.

Table 12
Mix Design Batching Tolerances—Non-Volumetric Mixers

Material	Tolerance (%)
Cement, wt.	-1 to +3
SCM, wt.	-1 to +3
Cement + SCM (cumulative weighing), wt.	-1 to +3
Water, wt. or volume	±3[1]
Fine aggregate, wt.	±2
Coarse aggregate, wt.	±2
Fine + coarse aggregate (cumulative weighing), wt.	±1
Chemical admixtures, wt. or volume	±3

1. Allowable deviation from target weight, not including water withheld or moisture in the aggregate. The Engineer will verify the w/cm ratio is within specified limits.

Ensure the quantity measured, when measuring cementitious materials at less than 30% of scale capacity, is accurate to no less than the required amount and no more than 4% in excess. Ensure the cumulative quantity, when measuring aggregates in a cumulative weigh batcher at less than 30% of the scale capacity, is measured accurately to ±0.3% of scale capacity or ±3% of the required cumulative weight, whichever is less.

Measure cement in number of bags under special circumstances when approved. Use the weights specified on the packaging. Weighing bags of cement is not required. Ensure fractional bags are not used except for small hand-mixed batches of approximately 5 cu. ft. or less and when an approved method of volumetric or weight measurement is used.

4.5.2. **Volumetric Mixers**. Provide an accurate method of measuring all ingredients by volume and calibrate equipment to assure correct measurement of materials within the specified tolerances. Base tolerances on volume-weight relationship established by calibration and measure the various ingredients within the tolerances shown in Table 13. Correct batch measurements for aggregate moisture content.

Table 13
Mix Design Batching Tolerances—Volumetric Mixers

Material	Tolerance
Cement, wt. %	0 to +4
SCM, wt. %	0 to +4
Fine aggregate, wt. %	±2
Coarse aggregate, wt. %	±2
Admixtures, wt. or volume %	±3
Water, wt. or volume %	±1

4.6. **Mixing and Delivering Concrete**.

4.6.1. **Mixing Concrete**. Operate mixers and agitators within the limits of the rated capacity and speed of rotation for mixing and agitation as designated by the manufacturer of the equipment. Provide concrete in a thoroughly mixed and uniform mass with a satisfactory degree of uniformity when tested in accordance with Tex-472-A.

Do not top-load new concrete onto returned concrete.

Adjust mixing times and batching operations as necessary when the concrete contains silica fume to ensure the material is completely and uniformly dispersed in the mix. The dispersion of the silica fume within the mix will be verified by MTD using cylinders made from trial batches. Make necessary changes to the batching operations, if uniform dispersion is not achieved, until uniform and complete dispersion of the silica fume is achieved.

Mix concrete by hand methods or in a small motor-driven mixer when permitted, for small placements of less than 2 cu. yd. For such placements, proportion the mix by volume or weight.

4.6.2. **Delivering Concrete**. Deliver concrete to the project in a thoroughly mixed and uniform mass, and discharge the concrete with a satisfactory degree of uniformity. Conduct testing in accordance with Tex-472-A when there is a reason to suspect the uniformity of concrete and as directed.

Maintain concrete delivery and placement rates sufficient to prevent cold joints.

Adding chemical admixtures or the portion of water withheld is permitted only at the jobsite, under the supervision of the Engineer, to adjust the slump or slump flow of the concrete. Do not add water or chemical admixtures to the batch after more than an amount needed to conduct slump testing has been discharged. Turn the drum or blades at least 30 additional revolutions at mixing speed to ensure thorough and uniform mixing of the concrete. When this water is added, do not exceed the approved mix design w/cm ratio.

When truck mixers are equipped with automated water or chemical admixture measurement and slump or slump flow monitoring equipment, the addition of water or chemical admixtures during transit is allowed. Reports generated by this equipment must be submitted to the Engineer daily.

Before unloading, furnish the delivery ticket for the batch of concrete containing the information required in accordance with ASTM C94. The Engineer will verify all required information is provided on the delivery tickets. The Engineer may suspend concrete operations until the corrective actions are implemented if delivery tickets do not provide the required information. The Engineer will verify the design w/cm ratio is not exceeded.

An electronic ticket delivery system (e-ticketing) may be used instead of printed tickets. The use of e-ticketing will require written approval. At minimum, the system will:

- provide electronic, real-time e-tickets meeting the requirements above;
- automatically generate e-tickets using software and hardware fully integrated with the batch plant scales used to weigh the material;

- be able to record all water and chemical admixture additions performed at the jobsite or in transit when allowed;
- provide the ability to associate fresh concrete test results with each e-ticket;
- be designed in such a way that data input cannot be altered by the Contractor or the Engineer;
- provide the Engineer access to the e-ticketing data in real-time using a web-based or app-based system compatible with iOS; and
- provide offline capabilities to prevent data loss if power or connectivity is lost.

The Engineer may discontinue use of the e-ticketing and require printed tickets as needed if the e-ticketing system fails to meet the above requirements.

Begin the discharge of concrete delivered in truck mixers within the times shown in Table 14. Concrete delivered after these times and concrete that has not begun to discharge within these times will be rejected. The discharge times shown in Table 14 may be extended provided slump loss testing is conducted in accordance with Tex-430-A to show concrete will maintain the minimum required slump for the requested discharge time extension. Extended discharge times will be allowed when the concrete temperature at time of discharge is no more than 10°F higher than the slump loss test concrete temperature.

Table 14
Concrete Discharge Times for Truck Mixers

Fresh Concrete Temperature, °F	Max Time After Batching for Concrete Not Containing Type B or D Admixtures, min.	Max Time After Batching for Concrete Containing Type B or D Admixtures,[1] min.
90 and above	45	75
75 ≤T <90	60	90
T <75	90	120

1. Concrete must contain at least the minimum manufacturer's recommended dosage of Type B or D admixture.

4.7. **Placing, Finishing, and Curing Concrete**. Place, finish, and cure concrete in conformance with the pertinent Items.

4.8. **Sampling and Testing of Concrete**. Unless otherwise specified, all fresh and hardened concrete is subject to testing as follows.

4.8.1. **Certification of Testing Personnel**. Contractor personnel performing testing must be either ACI-certified or qualified by a Department-recognized equivalent written and performance testing program for the tests being performed. Personnel performing these tests are subject to Department approval. Use of a commercial laboratory is permitted at the Contractor's option.

4.8.2. **Fresh Concrete**. Provide safe access and assistance to the Engineer during sampling. Fresh concrete will be sampled for testing at the point of discharge from the delivery equipment or end of belt conveyors.

4.8.3. **Testing Concrete**. The Engineer, unless specified in other Items or shown on the plans, will test the fresh and hardened concrete in accordance with the following methods.

- **Slump**. Tex-415-A
- **Air Content**. Tex-414-A or Tex-416-A, only when air-entrained concrete is shown on the plans
- **Temperature**. Tex-422-A
- **Making and Curing Strength Specimens**. Tex-447-A
- **Compressive Strength**. Tex-418-A
- **Flexural Strength**. Tex-448-A
- **Maturity**. Tex-426-A

Flexural strength and maturity specimens will not be made unless specified in other Items or shown on the plans.

Concrete with slump less than minimum required after all addition of water withheld will be rejected, unless otherwise allowed by the Engineer. Concrete with slump exceeding maximum allowed may be used at the Contractor's option. If used, Engineer will make, test, and evaluate strength specimens in accordance with Article 421.5., "Acceptance of Concrete." Acceptance of concrete not meeting air content or temperature requirements will be determined by Engineer. Fresh concrete exhibiting segregation and excessive bleeding will be rejected.

4.8.3.1. **Strength Specimen Handling**. After strength test specimens are molded, protect and cure in conformance with pertinent test methods. When necessary, deliver Contractor-molded specimens to curing facilities, remove specimens from their molds, and place specimens in curing tanks within 24–48 hr. after molding, in conformance with pertinent test methods. The Engineer will deliver Department-molded specimens to curing facilities, remove specimens from their molds, and place specimens in curing tanks within 24–48 hr. after molding, in conformance with pertinent test methods.

5. ACCEPTANCE OF CONCRETE

The Engineer will sample and test the fresh and hardened concrete for acceptance. The test results will be reported to the Contractor and the concrete supplier. Investigate the quality of the materials, the concrete production operations, and other possible problem areas to determine the cause for any concrete that fails to meet the required strengths as specified below. Take necessary actions to correct the problem, including redesign of the concrete mix. The Engineer may suspend all concrete operations under the pertinent Items if the Contractor is unable to Identify, document, and correct the cause of the low strengths in a timely manner. Resume concrete operations only after obtaining approval for any proposed corrective actions. Concrete failing to meet the required strength as specified below will be evaluated in accordance with Article 421.6., "Measurement and Payment."

5.1. **Structural Class of Concrete**. For concrete classes identified as structural concrete shown in Table 8, the Engineer will make and test 7-day and 28-day specimens, and, if necessary, 56-day specimens. The Engineer will base acceptance on attaining the design strength shown in Table 8 or design strength shown on the plans.

5.2. **Class P and Class High Early Strength (HES)**. The Engineer will base acceptance in accordance with Item 360 and Item 361, "Repair of Concrete Pavement."

5.3. **All Other Classes of Concrete**. For concrete classes not identified as structural concrete in Table 8, the Engineer will make and test 7-day specimens. The Engineer will base acceptance on attaining design strength or attaining the 7-day target value established in accordance with Tex-427-A.

6. MEASUREMENT AND PAYMENT

The work performed, materials furnished, equipment, labor, tools, and incidentals will not be measured or paid for directly, but will be subsidiary to pertinent Items.

The following procedure will be used to evaluate concrete where one or more project acceptance test specimens fail to meet the required design strength specified in this Item or shown on the plans.

- The concrete for a given placement will be considered structurally adequate and accepted at full price if the average of 28-day or 56-day set of specimens made at the time of placement meets the required design strength, provided no single specimen test result is less than 85% of the required design strength.
- The Engineer will perform a structural review of the concrete to determine its adequacy to remain in service if the average 28-day or 56-day set of specimens made at the time of placement is less than the required design strength or if any single specimen test result is less than 85% of the required design strength. If the concrete is determined to be structurally adequate, the Engineer will determine the limits of the payment adjustment using the formula below.

- If the in situ concrete strength is needed for the structural review, take cores at locations designated by the Engineer in accordance with Tex-424-A. The Engineer will test the cores. The coring and testing will be at the Contractor's expense.
- If all the tested cores meet the required design strength, the concrete will be paid for at full price.
- If any of the tested cores do not meet the required design strength, but the average strength attained is determined to be structurally adequate, the Engineer will determine the limits of the payment adjustment using the following formula.

$$A = B_p\left[-5.37\left(\frac{S_a}{S_s}\right)^2 + 11.69\left(\frac{S_a}{S_s}\right) - 5.32\right]$$

where:

A = Amount to be paid per unit of measure for the entire placement in question.
S_a = Actual average strength from cylinders or cores. Use values from cores, if taken.
S_s = Minimum required strength (specified).
B_p = Unit bid price.

- If the structural review determines the concrete is not adequate to remain in service, the Engineer will determine the limits of the concrete to be removed.
- The decision to reject structurally inadequate concrete or to apply the payment adjustment factor will be made no later than 7 days after 28-day or 56-day design strength specimens, or cores, if taken, are tested.

Item 422
Concrete Superstructures

1. DESCRIPTION

Construct reinforced concrete bridge slabs, decks, flat slabs, slab and girder units (pan formed), approach slabs, or other bridge superstructure elements as specified.

2. MATERIALS

2.1. **Concrete**. Provide concrete in accordance with Item 421, "Hydraulic Cement Concrete." Provide Class S or Class S (HPC) concrete for all cast-in-place concrete unless otherwise shown on the plans. Provide the class of concrete for precast components shown on the plans or in conformance with governing Items.

2.2. **Reinforcing Steel**. Provide reinforcing steel in accordance with Item 440, "Reinforcement for Concrete."

2.3. **Structural Grout**. Provide grout in accordance with DMS-4675, "Cementitious Grouts and Mortars for Miscellaneous Applications," or as shown on the plans.

2.4. **Expansion Joint Material**. Provide materials in accordance with DMS-6310, "Joint Sealants and Fillers."

- Provide preformed bituminous fiber expansion joint material unless specified otherwise.
- Provide a Class 4, 5, or 7 low-modulus silicone sealant unless otherwise directed.
- Provide asphalt board that conforms to dimensions shown on the plans.
- Provide re-bonded neoprene filler that conforms to the dimensions shown on the plans.

2.5. **Foam Bedding Strips for Prestressed Concrete Panels**. Use extruded polystyrene in accordance with ASTM C578, Type VI (40-psi compressive strength) or as specified.

Provide a manufacturer's certification or data sheet stating the foam meets these requirements. Use an adhesive or bonding agent compatible with polystyrene as recommended by the polystyrene manufacturer.

2.6. **Evaporation Retardants**. Provide evaporation retardants in accordance with DMS-4650, "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants."

2.7. **Curing Materials**. Provide membrane curing compounds in accordance with DMS-4650.

Provide cotton mats that consist of a filling material of cotton "bat" or "bats" (at least 12 oz. per square yard) completely covered with unsized cloth (at least 6 oz. per square yard) stitched longitudinally with continuous parallel rows of stitching spaced at less than 4 in., or tuft both longitudinally and transversely at intervals less than 3 in. Provide cotton mats that are free of tears and in good general condition. Provide a flap at least 6 in. wide consisting of two thicknesses of the covering and extending along one side of the mat.

Provide polyethylene sheeting that is at least 4 mils thick and free of visible defects. Provide opaque white sheeting when the ambient temperature during curing exceeds 90°F.

Provide burlap-polyethylene mats made from burlap impregnated on one side with a film of opaque white-pigmented polyethylene, free of visible defects. Provide laminated mats that have at least one layer of an impervious material such as polyethylene, vinyl plastic, or other acceptable material (either as a solid sheet or impregnated into another fabric) and are free of visible defects.

Provide burlap material that complies with AASHTO M 182, Class 3 (10 oz. per square yard) with the following additions.

- Manila hemp may also be used to make burlap.
- Do not use burlap fabricated from bags.
- Do not use burlap containing any water-soluble ingredient that will retard the setting time of concrete.

Provide used burlap complying with the requirements stated above, and that only has been used previously for curing concrete. "Like new" cleanliness is not expected, but contamination with any substance foreign to the concrete curing process, such as grease or oil, will be cause for rejection.

2.8. **Epoxy**. Provide epoxy materials in accordance with DMS-6100, "Epoxies and Adhesives," unless otherwise specified.

3. EQUIPMENT

3.1. **Fogging Equipment**. Use fogging equipment that can apply water in a fine mist, not a spray. Produce the fog using equipment that pumps water or water and air under high pressure through a suitable atomizing nozzle. Use hand-held mechanical equipment portable enough to use in the direction of any prevailing wind and adaptable for intermittent use to prevent excessive wetting of the concrete.

3.2. **Transporting and Placing Equipment**. Use appropriate transporting and placing equipment such as buckets, chutes, buggies, belt conveyors, pumps, or other equipment as necessary. Do not transport or convey concrete by equipment made of aluminum. Use carts with pneumatic tires for carting or wheeling concrete over newly placed slabs.

Use tremies that are watertight to control the fall of concrete and of large enough diameter to allow the placement of the concrete but less than 14 in. in diameter.

Use pumps with lines at least 5 in. inside diameter (ID) where Grade 2 or smaller coarse aggregate is used and at least 8 in. ID for Grade 1 coarse aggregate.

3.3. **Vibrators**. Use immersion-type vibrators for consolidation of concrete. Provide at least two standby vibrators for emergency use. Furnish vibrator head covered by a rubberized or elastomeric cover when used near epoxy-coated reinforcing steel.

3.4. **Screeds and Work Bridges for Bridge Slabs**. Use a self-propelled transverse screed or a mechanical longitudinal screed for bridge slabs. Use transverse screeds that can follow the skew of the bridge for skews greater than 15° unless otherwise approved. Equip transverse screeds with a pan float and skew kit. Manually operated screeding equipment may be used if approved for top slabs of culverts, small placements, or unusual conditions. Use screeds that are rigid and heavy enough to hold true to shape and have sufficient adjustments to provide for the required camber or section. Equip the screeds, except those of the roller drum type, with metal cutting edges.

Use sufficient work bridges for finishing operations for bridge slabs. Mount a carpet drag to a work bridge or a movable support system that can vary the area of carpet in contact with the concrete. Use carpet pieces long enough to cover the entire width of the placement. Splice or overlap the carpet as necessary. Ensure enough carpet is in contact longitudinally with the concrete being placed to provide the desired surface finish. Use artificial grass-type carpeting with a molded polyethylene pile face with a blade length between 5/8 and 1 in. and minimum weight of 70 oz. per square yard. Ensure the carpet has a strong, durable backing not subject to rot and the facing is adequately bonded to the backing to withstand the intended use. A burlap drag, attached to the pan float on a transverse screed, may be used instead of the carpet drag.

3.5. **Temperature Recording Equipment**. Use strip chart temperature-recording devices, recording maturity meters in accordance with Tex-426-A, or other approved devices that are accurate within ±2°F within the range of 32–212°F.

3.6. **Artificial Heating Equipment**. Use artificial heating equipment as necessary for maintaining the concrete temperatures in accordance with Section 422.4.6.11., "Placing Concrete in Cold Weather."

3.7. **Sawing Equipment**. Use sawing equipment capable of cutting grooves in completed bridge slabs and top slabs of direct traffic culverts. Provide grooves that are 1/8–3/16 in. deep, nominally 1/8 in. wide, and spaced at 1 in. Use sawing equipment capable of cutting grooves in hardened concrete within 18 in. of the barrier rail or curb.

3.8. **Spraying Equipment**. Use mechanically powered pressure sprayers with appropriate atomizing nozzles for the application of membrane curing. Mechanically driven spraying equipment, adaptable to the rail system used by the screeds, may be used for applying membrane curing to bridge slabs. Use hand-pressurized spray equipment with two or three fan-spray nozzles if approved. Ensure the spray from each nozzle overlaps the spray from adjacent nozzles by approximately 50%.

3.9. **Concrete Testing Equipment**. Provide testing equipment for the Engineer's use in accordance with Section 421.3.3., "Testing Equipment."

4. CONSTRUCTION

Obtain approval for proposed construction methods before starting work. Approval of construction methods and equipment does not relieve the Contractor's responsibility for safety or correctness of methods, adequacy of equipment, or completion of work in full accordance with the Contract. Attend the preconstruction (pre-pour) meetings for bridge slabs conducted by the Engineer. Provide and obtain approval for proposed finishing methods, interim curing methods, and final curing methods.

Unless otherwise shown on the plans, it is the Contractor's option to perform testing on structural concrete (structural classes of concrete are identified in Table 8 of Section 421.4.1., "Classification of Concrete Mix Designs") to determine the in situ strength to address the schedule restrictions listed below. The Engineer may require the Contractor to perform this testing for concrete placed in cold weather. Make enough test specimens for Contractor-performed testing to ensure strength requirements are met for the operations listed below. Make at least one set of test specimens for each element cast each day. Cure these specimens under the same conditions as the portion of the structure involved for all stages of construction. Ensure safe handling, curing, and storage of all test specimens. Provide testing personnel, and sample and test the hardened concrete in accordance with Section 421.4.8., "Sampling and Testing of Concrete." The maturity method, Tex-426-A, may be used for in-situ strength determination for schedule restrictions if approved. Coring will not be allowed for in-situ strength determination for schedule restrictions. Provide the Engineer the opportunity to witness all testing operations. Report all test results to the Engineer.

If the Contractor does not wish to perform schedule restriction testing, the Engineer's 7-day lab-cured tests, performed in accordance with Article 421.5., "Acceptance of Concrete," will be used for schedule restriction determinations. The Engineer may require additional time for strength gain to account for field curing conditions such as cold weather.

4.1. **Schedule Restrictions and Inspection Hold-Points**.

4.1.1. **Placement of Superstructure Members**. Place or cast superstructure members after the substructure concrete has attained a compressive strength of 3,000 psi.

4.1.2. **Longitudinal Screeding of Bridge Slabs**. Place a longitudinal screed directly on previously placed concrete slabs to check and grade an adjacent slab only after the previously placed slab has aged at least 24 hr. Place and screed the concrete after the previously placed slabs have aged at least 48 hr. Maintain curing of the previously placed slabs during placement.

4.1.3. **Staged Placement of Bridge Slabs on Continuous Steel Units**. Ensure the previously placed concrete attains a compressive strength of 3,000 psi when staged placement of a slab is required or used before

placing the next stage placement. Multiple stages may be placed in a single day if approved by the Engineer of Record.

4.1.4. **Storage of Materials on Structure**. Obtain approval to store materials on completed portions of a structure once a compressive strength of 3,000 psi has been attained. Maintain proper curing if materials will be stored on structures before completion of curing.

4.1.5. **Placement of Equipment and Machinery**. Do not place erection equipment or machinery on the structure until the concrete has attained the design strength specified in Section 421.4.1., "Classification of Concrete Mix Designs," unless otherwise approved.

4.1.6. **Carting of Concrete**. Cart, wheel, or pump concrete over completed slabs after the completed concrete has attained a compressive strength of 3,000 psi. Maintain curing during these operations.

4.1.7. **Placing Bridge Rails**. Reinforcing steel and concrete for bridge rails may be placed on bridge slabs once the slab concrete has attained a compressive strength of 3,000 psi. Ensure the slab concrete has attained its design strength specified in Section 421.4.1., "Classification of Concrete Mix Designs," before placing railing concrete if slipforming methods are used for railing concrete.

4.1.8. **Opening to Construction Traffic**. Bridges may be opened to all construction traffic when the design strength specified in Section 421.4.1., "Classification of Concrete Mix Designs," has been attained if curing is maintained. Avoid crossing bridges at high speeds until railing concrete, if present, has attained a compressive strength of 3,000 psi.

4.1.9. **Opening to Full Traffic**. Bridges may be opened to the traveling public when the design strength specified in Section 421.4.1., "Classification of Concrete Mix Designs," has been attained for all structural elements, including railing subject to impact from traffic and when curing has been completed for all slabs. Obtain approval before opening bridges to the traveling public.

4.1.10. **Inspection Hold-Points**. Notify the Engineer of progress of work and when work is complete before beginning the next stage of work.

- Beam erection and bracing
- Formwork, including setting of precast panels
- Placing reinforcing steel
- Screed dry run and pre-pour clear cover checks
- Attend pre-pour meeting conducted by the Engineer
- Post-curing crack inspection

4.2. **Forms**. Submit forming plans for decks or slabs on beams or girders, overhangs, cast-in-place spans, and bracing systems for girders when the overhang exceeds 3 ft. 6 in. Submit similar plans for other units of the superstructure as directed. Show all essential details of proposed forms and bracing. Have a licensed professional engineer design, seal, and sign these plans. Department approval is not required, but the Department reserves the right to request modifications to the plans. The Contractor is responsible for the adequacy of these plans.

Design job-fabricated formwork assuming a weight of 150 pcf for concrete, and include a minimum live load allowance of 50 psf of horizontal surface of the form. Do not exceed 125% of the allowable stresses used by the Department for the design of structures.

Use conventional forms, permanent metal deck forms, or prestressed concrete panels for slabs on beams or girders unless specified otherwise. Use permanent metal deck forms or conventional forms for thickened slabs, diaphragms, or other regions as shown on the plans where prestressed concrete panels are not used. Provide prestressed concrete panels as shown on the plans and in accordance with Item 424, "Precast Concrete Structural Members (Fabrication)." Provide copies of the precast panel layout drawings from the panel fabricator.

Use only material that is inert, nonbiodegradable, and nonabsorptive for forms to be left in place.

Overhang form supports that transmit a horizontal force to a steel girder or beam or to a prestressed concrete beam are permitted provided a satisfactory structural analysis has been made of the effect on the girder or beam as shown on the submitted formwork plans.

Use beam bracing as shown on the plans when overhang brackets are used on prestressed concrete beam spans with slab overhangs not exceeding 3 ft. 6 in. Provide and design additional support or bracing for the outside beams regardless of the type of beam used for spans with overhangs exceeding this amount.

Attachment of forms or screed supports for bridge slabs to steel I-beams or girders may be by welding subject to the following requirements.

- Do not weld to tension flanges or to areas indicated on the plans.
- Weld in accordance with Item 448, “Structural Field Welding.”

When setting forms of any type, consider:

- deflections due to cast-in-place slab concrete and railing shown in the dead load deflection diagram,
- differential beam or girder deflections due to skew angles and the use of certain stay-in-place slab forming systems, and
- deflection of the forming system due to the wet concrete.

Securely stake forms to line and grade and maintain in position for bridge approach slabs. Rigidly attach inside forms for curbs to the outside forms.

Construct all forms to permit their removal without marring or damaging the concrete. Clean all forms and footing areas of any extraneous matter before placing concrete. Provide openings in forms if needed for the removal of laitance or foreign matter.

Treat the facing of all forms with bond-breaking coating of composition that will not discolor or injuriously affect the concrete surface. Take care to prevent coating of the reinforcing steel.

Complete all preparatory work before placing concrete.

4.2.1. **Precast Panels**. Profile each beam to determine the actual camber or sag of the beams before placing panels. Adjust the profile grade line, panel elevation, and bearing seat elevations as needed to obtain the required cover over the slab reinforcement and slab thickness while maintaining ride quality. Make adjustments over suitable increments when a profile grade line adjustment is necessary, depending on span lengths, so the revised grade line will produce a uniform profile and good riding qualities. Obtain approval for the grade adjustments before placement. Consider actual beam camber in adjacent spans or slab placements when adjusting the grade line. Inspect each panel before being placed for cracks and other damage. Refer to Section 424.4.3.1., “Defects and Breakage,” for rejection criteria due to cracking and other damage.

4.2.2. **Permanent Metal Decking**. Submit signed and sealed design calculations in addition to the required formwork drawings. Design and install formwork as shown on the plans and formwork drawings. The plans will govern in cases where the plans and the formwork drawings conflict.

4.2.3. **Conventional Forms**. Provide properly seasoned good-quality lumber free of imperfections that would affect its strength or impair the finished surface of the concrete. Provide timber or lumber that meets or exceeds the requirements for species and grade shown on the submitted formwork plans.

Maintain forms or form lumber that will be reused so that it stays clean and in good condition. Do not use any lumber that is split, warped, bulged, or marred or that has any defect that will produce inferior work; remove such lumber from the work.

Use plywood at least 3/4 in. thick. Use plywood for forming surfaces that remain exposed that meets the requirements for B-B Plyform Class I or Class II Exterior of the U.S. Department of Commerce Voluntary Product Standard PS 1.

Space studs and joists so that the facing form material remains in true alignment under the imposed loads.

Place forms with the form panels symmetrically (long dimensions set in the same direction) for surfaces exposed to view and receiving only an ordinary surface finish as defined in Section 420.4.13., "Ordinary Surface Finish." Make horizontal joints continuous.

Make molding for chamfer strips or other uses of materials of a grade that will not split when nailed and can be maintained to a true line without warping. Dress wood molding on all faces. Fill forms at all sharp corners and edges with triangular chamfer strips measuring 3/4 in. on the sides unless otherwise shown on the plans.

4.3. **Placing Reinforcement**. Place reinforcement as provided in Item 440. Do not weld reinforcing steel supports to I-beams or girders or to reinforcing steel except as shown on the plans.

4.4. **Drains**. Install and construct weep holes and roadway drains as shown on the plans.

4.5. **Extending Existing Slabs**. Verify pertinent dimensions and elevations of the existing structure before ordering any required materials.

4.5.1. **Removal**. Remove portions of the existing structure to the lines and dimensions shown on the plans or as directed. Dispose of these materials as shown on the plans or as directed. Remove any metal railing without damaging it, and stack it neatly on the right of way at locations that do not interfere with traffic or construction or at locations shown on the plans. All removed metal railing remains the property of the Department unless otherwise shown on the plans. Repair any portion of the remaining structure damaged as a result of the construction. Do not use explosives to remove portions of the existing structure unless approved in writing. Do not use a demolition ball, other swinging weight, or impact equipment unless shown on the plans. Use pneumatic or hydraulic tools for final removal of concrete at the "break" line. Use removal equipment, as approved, that will not damage the remaining concrete.

4.5.2. **Reuse of Removed Portions of Structure**. Detach and remove all portions of the old structure that are to be incorporated into the extended structure to the lines and details as shown on the plans or as directed. Move the unit to be reused to the new location specified using approved methods. Place the reinforcement and extension concrete as shown on the plans.

4.5.3. **Breaking Back Bridge Slabs**. Saw the top surface of the slab for bridge slabs and direct traffic slabs of box culverts along the "break" line to a depth of 1/2 in. before breaking back. Do not cut the reinforcement at the "break" line. Sever the concrete at the "break" line. Do not damage the remaining reinforcement within one lap length of the "break" line during removal of the designated portion of the existing structure.

4.5.4. **Splicing Reinforcing Steel**. Splice new reinforcing bars to exposed bars in the existing structure using lap splices in accordance with Item 440 unless otherwise shown on the plans. The new reinforcing steel does not need to be tied to the existing steel where spacing or elevation does not match that of the existing steel, provided the lap length is attained. Weld in accordance with Item 448 when welded splices are permitted. Install any required dowels in accordance with Section 422.4.6.10., "Installation of Dowels and Anchor Bolts."

4.5.5. **Concrete Preparation**. Roughen and clean concrete surfaces that are in contact with new construction before the placing of forms. Prepare these construction joint surfaces in accordance with Section 422.4.6.7., "Construction Joints."

4.6. **Placing Concrete**. Do not place concrete unless approval is obtained for the hold-point inspections in accordance with Section 422.4.1.10., "Inspection Hold-Points," and the pre-pour meeting has been conducted. Give the Engineer sufficient advance notice before placing concrete in any unit of the structure to permit the final inspection of forms, reinforcing steel placement, and other preparations. Obtain approval for

proposed curing methods based on forecast weather conditions for the expected duration of the pour and use the evaporation rate nomograph as mentioned below to determine the required curing options.

Follow the sequence of placing concrete shown on the plans or specified.

Do not place concrete when impending weather conditions would impair the quality of the finished work. Place concrete in early morning or at night or adjust the placement schedule for more favorable weather if conditions of wind, humidity, and temperature are such that concrete cannot be placed without the potential for plastic shrinkage cracking. Consult the evaporation rate nomograph in PCA's *Design and Control of Concrete Mixtures* or the evaporation rate spreadsheet available on the Department's website for shrinkage cracking potential. Adequately illuminate the entire placement site when mixing, placing, and finishing concrete in non-daylight hours as approved.

Furnish adequate shelter to protect the concrete against damage from rainfall or from freezing temperatures in accordance with this Item if changes in weather conditions require protective measures after work starts. Continue operations during rainfall only if approved. Use protective coverings for the material stockpiles. Cover aggregate stockpiles only to the extent necessary to control the moisture conditions in the aggregates.

Allow at least 1 curing day after the concrete has achieved initial set before placing strain on projecting reinforcement to prevent damage to the concrete.

4.6.1. **Placing Temperature**. Place superstructure concrete only when its temperature at the time of placement is between 50 and 85°F. Increase the minimum placement temperature to 60°F if slag cement is used in the concrete.

4.6.2. **Transporting Time**. Begin the discharge of concrete delivered in truck mixers within the times shown in Table 14 of Item 421.

4.6.3. **Workability of Concrete**. Place concrete with a slump as specified in Section 421.4.2.5., "Slump." Placing concrete with slump exceeding maximum specified may result in bridge deck cracking and be subject to Section 422.4.10., "Defective Work." Water may be added to the concrete before discharging any concrete from the truck to adjust for low slump, provided the maximum mix design water-cement ratio is not exceeded. Mix concrete after introduction of any additional water or chemical admixtures in accordance with Section 421.4.6., "Mixing and Delivering Concrete." Do not add water or chemical admixtures after any concrete has been discharged.

4.6.4. **Transporting Concrete**. Use a method and equipment capable of maintaining the rate of placement shown on the plans or required by this Item to transport concrete to the forms. Transport concrete by buckets, chutes, buggies, belt conveyors, pumps, or other methods.

Protect concrete transported by conveyors from sun and wind to prevent loss of slump and workability. Shade or wrap with wet burlap pipes through which concrete is pumped as necessary to prevent loss of slump and workability.

Arrange and use chutes, troughs, conveyors, or pipes so the concrete ingredients will not be separated. Terminate such equipment in vertical downspouts, when necessary, to prevent segregation. Extend open troughs and chutes, if necessary, down inside the forms or through holes left in the forms.

Keep all transporting equipment clean and free of hardened concrete coatings. Discharge water used for cleaning clear of the concrete.

4.6.5. **Preparation of Surfaces**. Thoroughly wet all forms, prestressed concrete panels, T-beams, slab beams, and concrete box beams on which concrete is to be placed before placing concrete on them. Remove free water from the surface or beam lines before placing concrete. Provide surfaces that are in a moist, saturated surface-dry (SSD) condition when concrete is placed on them. Ensure the surface of the existing concrete is in an SSD condition just before placing subsequent concrete. Prewet the existing concrete by ponding water on the surface for 24 hr. before placing subsequent concrete. Use high-pressure water blasting to achieve

SSD conditions 15–30 min. before placing the concrete if ponding is not possible. An SSD condition is achieved when the surface remains damp when exposed to sunlight for 15 min.

Ensure the subgrade or foundation is moist before placing concrete for bridge approach slabs.

4.6.6. **Expansion Joints**. Construct joints and devices to provide for expansion and contraction as shown on the plans and in accordance with this Section and Item 454, "Bridge Expansion Joints."

Prevent bridging of concrete or mortar around expansion joint material in bearings and expansion joints.

Use forms adaptable to loosening or early removal in construction of all open joints and joints to be filled with expansion joint material. Loosen these forms as soon as possible after final concrete set to permit free movement of the span without requiring full form removal and avoid expansion or contraction damage to the adjacent concrete.

Ensure that finished joints conform to the plan details with the concrete sections completely separated by the specified opening or joint material.

Remove all concrete within the joint opening soon after form removal and again where necessary after surface finishing to ensure full effectiveness of the expansion joint.

4.6.7. **Construction Joints**. A construction joint is formed by placing plastic concrete in direct contact with concrete that has attained its initial set. Monolithic placement means the manner and sequence of concrete placing do not create a construction joint.

Make construction joints of the type and at the locations shown on the plans. Do not make joints in bridge slabs not shown on the plans unless approved. Additional joints in other members are not permitted without approval. Place authorized additional joints using details equivalent to those shown on the plans for joints in similar locations.

Make construction joints square and normal to the forms unless otherwise required. Use bulkheads in the forms for all vertical joints.

Thoroughly clean the hardened concrete surface of all loose material, laitance, dirt, and foreign matter, and saturate it with water. Remove all free water and moisten the surface before concrete or bonding grout is placed against it. Ensure the surface of the existing concrete is in an SSD condition just before placing subsequent concrete. Prewet the existing concrete by ponding water on the surface for 24 hr. before placing subsequent concrete. Use high-pressure water blasting to achieve SSD conditions 15–30 min. before placing the concrete if ponding is not possible. An SSD condition is achieved when the surface remains damp when exposed to sunlight for 15 min.

Draw forms tight against the existing concrete to avoid mortar loss and offsets at joints.

Bonding agents are not required unless specified otherwise. Coat the joint surface with bonding mortar, grout, epoxy, or other material as shown on the plans or in conformance with other Items if a bonding agent is required. Provide Type V epoxy in accordance with DMS-6100 for bonding fresh concrete to hardened concrete. Place the bonding epoxy on a clean, dry surface, and place the fresh concrete while the epoxy is still tacky. Place bonding mortar or grout on a surface that is SSD and place the concrete before the bonding mortar or grout dries. Place other bonding agents in conformance with the manufacturer's recommendations.

4.6.8. **Handling and Placing**. Minimize segregation of the concrete and displacement of the reinforcement when handling and placing concrete. Produce a uniform, dense, compact mass.

Do not allow concrete to free-fall more than 5 ft. Remove any hardened concrete splatter ahead of the plastic concrete.

Fill each part of the forms by depositing concrete as near its final position as possible. Do not deposit large quantities at one point and run or work the concrete along the forms.

Avoid cold joints in a monolithic placement. Sequence successive layers or adjacent portions of concrete so they can be vibrated into a homogeneous mass with the previously placed concrete before it sets.

4.6.9. **Consolidation**. Carefully consolidate concrete and flush mortar to the form surfaces using immersion type vibrators. Do not use vibrators that operate by attachment to forms or reinforcement except where approved on steel forms.

Vibrate the concrete immediately after deposit. Systematically space points of vibration to ensure complete consolidation and thorough working of the concrete around the reinforcement and embedded fixtures, and into the corners and angles of the forms. Insert the vibrator vertically where possible, except for slabs where it may be inserted in a sloping or horizontal position. Vibrate the entire depth of each lift, allowing the vibrator to penetrate several inches into the preceding lift. Do not use the vibrator to move the concrete to other locations in the forms. Do not drag the vibrator through the concrete. Thoroughly consolidate concrete along construction joints by operating the vibrator along and close to but not against the joint surface. Continue the vibration until the concrete surrounding reinforcements and fixtures is completely consolidated. Hand-spade or rod the concrete if necessary to ensure flushing of mortar to the surface of all forms. Concentrate vibration efforts along the beam lines when precast concrete panels are used for deck construction.

4.6.10. **Installation of Dowels and Anchor Bolts**. Install dowels and anchor bolts by casting them in place or by grouting with grout, epoxy, or epoxy mortar unless specified otherwise. Form or drill holes for grouting. Use only epoxy when installing horizontal dowels into the edges of slabs. Follow the manufacturer's recommended installation procedures for pre-packaged grout or epoxy anchor systems. Test anchors if required on the plans or by other Items.

Drill holes for anchor bolts to accommodate the bolt embedment required by the plans. Make holes for dowels at least 12 in. deep unless otherwise shown on the plans. Make the hole diameter at least twice the dowel or bolt diameter, but the hole need not exceed the dowel or bolt diameter plus 1-1/2 in. when using cementitious grout or epoxy mortar. Make the hole diameter 1/16–1/4 in. greater than the dowel or bolt diameter when using neat epoxy, unless specified otherwise by the epoxy manufacturer.

Thoroughly clean holes of all loose material, oil, grease, or other bond-breaking substance, and blow them clean with filtered compressed air. Use a wire brush followed by oil-free compressed air to remove all loose material from the holes, repeating as necessary until no more material is removed. Ensure holes are in a surface-dry condition when epoxy type materials are used and in a surface-moist condition when cementitious grout is used. Develop and demonstrate for approval a procedure for cleaning and preparing the holes for installation of the dowels and anchor bolts. Completely fill the void between the hole and dowel or bolt with grouting material. Follow exactly the requirements for cleaning in conformance with the product specifications for pre-packaged systems.

Provide a Type III epoxy in accordance with DMS-6100 when neat epoxy is used for anchor bolts or dowels. Provide Type VIII epoxy in accordance with DMS-6100 when an epoxy grout is used. Provide grout, epoxy, or epoxy mortar as the binding agent unless otherwise shown on the plans.

Provide other anchor systems as shown on the plans.

4.6.11. **Placing Concrete in Cold Weather**. Protect concrete placed under weather conditions where weather may adversely affect results. Permission given by the Engineer for placing during cold weather does not relieve the Contractor of responsibility for producing concrete equal in quality to that placed under normal conditions. If concrete placed under poor conditions is unsatisfactory, remove and replace it as directed at Contractor's expense.

Do not place concrete in contact with any material coated with frost or with a temperature of 32°F or lower. Do not place concrete when the ambient temperature in the shade is below 40°F and falling unless

approved. Place concrete when the ambient temperature in the shade is at least 35°F and rising or above 40°F.

Provide and install recording thermometers, maturity meters, or other suitable temperature measuring devices to verify all concrete is effectively protected. Maintain the temperature of the top surface of bridge slabs and top slabs of direct traffic culverts at 50°F or above for 72 hr. from the time of placement and above 40°F for an additional 72 hr.

Use additional covering, insulated forms, or other means and, if necessary, supplement the covering with artificial heating. Avoid applying heat directly to concrete surfaces. Cure as specified in Section 422.4.8., "Final Curing," during this period until all requirements for curing have been satisfied.

Have on hand all necessary heating and covering material, ready for use, before permission is granted to begin placement when impending weather conditions indicate the possible need for temperature protection. Distress caused by concrete drying out as a result of delayed set and strength gain associated with cold weather are a result of the Contractor's actions and are subject to repair in accordance with Section 422.4.10., "Defective Work."

4.6.12. **Placing Concrete in Hot Weather**. Use an approved Type B or Type D set retarding agent in all concrete for superstructures and top slabs of direct traffic culverts, except concrete containing slag cement, when the temperature of the air is above 85°F, unless otherwise directed.

Keep the concrete at or below the maximum temperature at time of placement as specified above. Sprinkle and shade aggregate stockpiles or use ice, liquid nitrogen systems, or other approved methods as necessary to control the concrete temperature.

4.6.13. **Placing Concrete in Superstructure**. Place simple span bridge slabs without transverse construction joints by using either a self-propelled transverse finishing machine or a mechanical longitudinal screed unless otherwise shown on the plans. Use of manually operated screeding equipment may be permitted for small placements or for unusual conditions such as narrow widening, variable cross-slopes, or transitions. Support the screed adequately on a header or rail system stable enough to withstand the longitudinal or lateral thrust of the equipment. Adjust the profile grade line as necessary to account for variations in beam camber and other factors to obtain the required slab thickness and concrete cover over the slab reinforcement. Set beams and verify their surface elevations in a sufficient number of spans so that when adjustment is necessary, the profile grade line can be adjusted over suitable increments to produce a smooth riding surface. Take dead load deflection into account in setting the grades of headers and rail systems. Use construction joints when required or permitted for slab placements on steel or prestressed concrete beams, as shown on the plans. Release falsework under the spans before placing concrete on steel girder or truss spans, and swing the spans free on their permanent supports.

Provide additional camber to offset the initial and final deflections of the span as shown on the plans for concrete flat slab, concrete slab, and girder spans cast in place on falsework. Provide camber of approximately 3/8 in. for 30-ft. spans and 1/2 in. for 40-ft. spans to offset initial and final deflections for concrete slab and girder spans using pan forms, unless otherwise directed. Provide a camber of 1/8 in. for 10-ft. spans but no more than 1/2 in. for concrete flat slab, concrete slab, and girder spans not using pan forms when dead load deflection is not shown on the plans.

Provide a camber of 1/4 in. in addition to deflection for slabs without vertical curvature on steel or prestressed concrete beams. Provide camber for specified vertical curvature and transverse slopes.

Make one or more passes with the screed over the bridge slab segment before placing concrete on it to ensure proper operation and maintenance of grades and clearances. Use an approved system of checking to detect any vertical movement of the forms or falsework. Maintain forms for the bottom surface of concrete slabs, girders, and overhangs to the required vertical alignment during concrete placing.

Level, strike off, and screed the surface while carrying a slight excess of concrete ahead of the screed to fill all low spots as soon as the concrete has been placed and vibrated in a section wide enough to permit

working. Move longitudinal screeds across the concrete with a saw-like motion while their ends rest on headers or templates set true to the roadway grade or on the adjacent finished slab. Move transverse screeds longitudinally approximately 1/5 of the drum length for each complete out-and-back pass of the carriage. Screed the surface of the concrete enough times and at intervals to produce a uniform surface true to grade and free of voids.

Fog unformed surfaces of slab concrete in bridge slabs and in top slabs of direct traffic culverts from the time of initial strike-off of the concrete until finishing is completed and required interim curing is in place. Do not use fogging to add finishing water, and do not work moisture from the fog spray into the fresh concrete.

Retard the concrete for simple spans only if necessary to complete finishing operations or as required by this Section. Bring the top of curb and sidewalk section to the correct camber and alignment when filling curb forms and finish them in accordance with this Item.

4.6.13.1. **Transverse Screeding**. Install rails for transverse finishing machines that are supported from the beams or girders so the supports may be removed without damage to the slab. Prevent bonding between removable supports and the concrete in an acceptable manner. Do not allow rail support parts that remain embedded in the slab to project above the upper mat of reinforcing steel. Rail or screed supports attached to I-beams or girders are subject to the requirements of this Item. Place concrete at a minimum rate of 30 ft. of bridge slab per hour for transverse screeding unless otherwise shown on the plans. Deposit concrete parallel to the skew of the bridge so all girders are loaded uniformly along their length. Deposit slab concrete between the exterior beam and adjacent beam before placing concrete in the overhang portion of the slab. Furnish personnel and equipment capable of placing, finishing, and curing the slab at an acceptable rate to ensure compliance with the specifications. Place concrete in transverse strips. Start placement at the lowest end on profile grades greater than 1-1/2%.

At the Contractor's option, attach a pan drag and either a carpet or burlap drag to the screed assembly to float and provide surface micro-texture in one operation. Adjust the contact pressure of the pan drag to smooth high spots and fill any depressions left by the screed. Adjust the weight or position of the carpet or burlap drag to produce a smooth sandy micro-texture without blemishes, marks, or scratches deeper than 1/16 in. Fill screed rail support holes and holes from the Engineer's depth checks for slab thickness and reinforcing cover with concrete and finish them to match the rest of the slab.

4.6.13.2. **Longitudinal Screeding**. Use of temporary intermediate headers will be permitted for placements over 50 ft. long if the rate of placement is rapid enough to prevent a cold joint and if these headers are designed for easy removal to permit satisfactory consolidation and finish of the concrete at their locations, unless otherwise shown on the plans. Deposit slab concrete between the exterior beam and the adjacent beam before placing concrete in the overhang portion of the slab. Place concrete in longitudinal strips starting at a point in the center of the segment adjacent to one side, except as this Section specifies, and complete the strip by placing uniformly in both directions toward the ends. Start placing at the lowest end for spans on a profile grade of 1-1/2% or more. Use strips wide enough that the concrete within each strip remains plastic until placement of the adjacent strip. Place the concrete in proper sequence to be monolithic with the adjacent longitudinal strips of the slabs where monolithic curb construction is specified.

4.6.13.3. **Placements on Continuous Steel Units**. Place slabs on continuous steel units in a single, continuous operation without transverse construction joints using a self-propelled transverse finishing machine or a mechanical longitudinal screed, unless otherwise shown on the plans. Retard the initial set of the concrete sufficiently to ensure concrete remains plastic in at least three spans immediately preceding the slab being placed. Use construction joints, when required for slab placements on steel beams or girders, as shown on the plans. Ensure the previously placed concrete attains a compressive strength of 3,000 psi when staged placement of a slab is required on the plans before placing the next stage concrete. Multiple stages may be placed in a single day if approved. Use an approved placing sequence that will not overstress any of the supporting members where plans permit staged placing without specifying a particular order of placement.

4.6.13.4. **Slab and Girder Units**. Place girders, slab, curbs of slab, and girder spans monolithically unless otherwise shown on the plans. Fill concrete girder stems first and place the slab concrete within the time limits specified in this Item. Place concrete in the stems for a short distance if using a transverse screed, and then place the

concrete in transverse strips. Fill the outside girder stem first, beginning at the low end or side, if using a longitudinal screed, and continue placement in longitudinal strips.

4.7. **Finish and Interim Curing of Bridge Slabs**. Obtain approval of the proposed interim curing methods, equipment, and materials at the pre-pour meeting before placing concrete. Consider forecast weather conditions to determine the interim curing methods to use.

Use work bridges or other suitable facilities to perform all finishing operations and to provide access, if necessary, for the Engineer to check measurements for slab thickness and reinforcement cover.

Work the screeded surface to a smooth finish using a long-handled wood or metal float, or hand-float it from work bridges over the slab. Floating may not be necessary if the pan float attached to a transverse screed produces an acceptable finish. Avoid overworking the surface of the concrete. Avoid use of finish water.

Perform sufficient checks, witnessed by the Engineer, using a long-handled 10-ft. straightedge on the plastic concrete to ensure the final surface will be within specified tolerances. Make the check with the straightedge parallel to the centerline. Lap each pass half over the preceding pass. Remove all high spots and fill and float all depressions more than 1/16 in. deep with fresh concrete. Continue checking and floating until the surface is true to grade and free of depressions, high spots, voids, or rough spots. Fill screed-rail support holes with concrete and finish them to match the top of the slab.

Provide a uniform micro-texture using a carpet drag, burlap drag, or broom finish. Finish the surface to a smooth sandy texture without blemishes, marks, or scratches deeper than 1/16 in. Apply the surface texturing using a work bridge or platform immediately after completing the straightedge checks. Draw the carpet or burlap drag longitudinally along the concrete surface, adjusting the surface contact area or pressure to provide a satisfactory coarsely textured surface. A broom finish may be performed using a fine-bristle broom transversely. For bridge approach slabs, the carpet drag, burlap drag, or broom finish may be applied either longitudinally or transversely.

Evaporation protection is required if the evaporation rate exceeds 0.10 lb. per square foot per hour in accordance with the *Evaporation Calculation for Concrete Worksheet* as shown on the Department's website, in accordance with the evaporation rate nomograph in PCA's *Design and Control of Concrete Mixtures*, or if shown on the plans.

4.7.1. **Evaporation Protection**. Use one of the following methods for evaporation protection.

4.7.1.1. **Evaporation Retardant**. Coat the concrete surface immediately after the carpet or burlap drag, or broom finish with a single application of evaporation retardant at a rate recommended by the manufacturer. Do not allow more than 10 min. to elapse between the texturing at any location and application of evaporation retardant. The evaporation retardant may be applied using the same work bridge used for surface texturing. Do not work the concrete surface once the evaporation retardant has been applied.

4.7.1.2. **Wet Burlap**. Place pre-wet burlap no more than 10 ft. behind the finishing operation. A work bridge may be required to avoid marring the surface. Ensure the wet burlap covers the entire surface. Use sprayers, hoses, sprinklers, or other similar methods to keep the burlap continuously wetted until application of the final curing.

4.7.2. **Interim Curing**. Apply interim curing using one of the following options after applying the evaporation protection (if needed).

4.7.2.1. **Membrane Cure**. Apply membrane interim curing at a rate of approximately 180 sq. ft. per gallon. Apply before the water sheen disappears but do not place over standing water. Fog as necessary to maintain the wet sheen. Do not spray membrane curing on a dry surface.

4.7.2.2. **Wet Burlap**. Place pre-wet burlap no more than 10 ft. behind the finishing operation. Burlap used for evaporation protection will also be considered as the interim curing.

4.8. **Final Curing**. Obtain approval of the proposed curing methods, equipment, and materials at the pre-pour meeting before placing concrete. Inadequate curing or facilities may delay all concrete placements on the project until remedial action is taken. Apply final curing as soon as possible after interim curing without damaging the surface finish. Check the adequacy of the curing each day of the curing period. Take corrective action or modify the curing methods as needed to maintain a moist concrete surface.

A curing day is a calendar day when the temperature, taken in the shade away from artificial heat, is above 50°F for at least 19 hr. or, on colder days, if the temperature of all surfaces of the concrete is maintained above 40°F, for the entire 24 hr. The required curing period begins when all concrete has attained its initial set. Tex-440-A may be used to determine when the concrete has attained its initial set.

Cure all superstructure concrete according to the following, unless otherwise shown on the plans:

- Concrete using Type I or Type III cement: 8 days
- Concrete using Type I/II or Type II cement: 10 days
- Concrete with any type of supplementary cementing materials: 10 days

Place polyethylene sheeting, burlap-polyethylene blankets, laminated mats, or insulating curing mats in direct contact with the slab when the air temperature is expected to drop below 40°F during the first 72 hr. of the curing period. Weigh down these curing materials using dry mats to maintain direct contact with the concrete and provide insulation against cold weather. Supplemental heating or insulation may be required in cold and wet weather if the insulating cotton mats become wet or the concrete drops below the specified curing temperature. Avoid applying heat directly to concrete surfaces.

Use one of the following water curing methods for final curing. Keep all exposed surfaces of the concrete wet continuously for the required curing time. Use water for curing that meets the requirements for concrete mixing water in accordance with Section 421.2.5., “Water.” Do not use seawater or water that stains or leaves an unsightly residue.

4.8.1. **Cotton Mats**. Keep the concrete continuously wet by maintaining wet cotton mats in direct contact with the concrete for the required curing time. Weight the mats adequately to provide continuous contact with all concrete. Cover surfaces that cannot be cured by direct contact with mats, forming an enclosure well anchored to the forms or ground so outside air cannot enter the enclosure. Provide sufficient moisture inside the enclosure to keep all surfaces of the concrete wet. Use of soaker hoses and plastic covering is acceptable provided the concrete surface remains continuously wet for the required curing duration.

4.8.2. **Burlap Mats**. The burlap used for interim curing may also be used for final curing if kept continuously wetted and completely covered with plastic sheeting. Overlap plastic sheeting and weigh down sufficiently so air cannot enter underneath the plastic.

4.8.3. **Burlap-Polyethylene Mats**. Place these mats over soaker hoses or by other similar methods to keep the concrete surface wetted for the duration of the curing period. Overlap the mats and weight down sufficiently so air cannot enter underneath the mats.

4.9. **Removal of Forms and Falsework**. Forms for vertical surfaces may be removed after the concrete has aged 12 hr. after initial set, provided the removal can be executed without damage to the concrete, unless otherwise directed.

Remove forms for inside curb faces and for bridge rails whenever removal can be executed without damage to the curb or railing.

Leave in place weight-supporting forms and falsework spanning more than 1 ft., except as directed otherwise, until the concrete has attained a compressive strength of 2,500 psi. Remove forms for other structural components as necessary.

Forms or parts of forms may be removed only if constructed to permit removal without disturbing forms or falsework required to be left in place for a longer period on other portions of the structure.

Remove all metal appliances used inside forms for alignment to a depth of at least 1/2 in. from the concrete surface. Make the appliances so that metal may be removed without undue chipping or spalling of the concrete, and so that it leaves a smooth opening in the concrete surface when removed. Do not burn off rods, bolts, or ties.

Remove all forms and falsework unless otherwise directed.

Apply an ordinary surface finish as the final finish to the bottom of bridge slabs between girders or beams, and vertical and bottom surfaces of interior concrete beams or girders, unless otherwise noted.

Form marks and chamfer edges do not need to be smoothed for the bottom of bridge slabs between girders or beams. Remove all fins, runs, drips, or mortar from surfaces that will be exposed.

4.10. **Defective Work**. The Contractor is responsible for the ride quality of the finished bridge slab. The Engineer will use a 10-ft. straightedge (1/8 in. in 10 ft.) to verify ride quality and determine locations where corrections are needed. Submit a plan for approval to produce a ride of acceptable quality if the Engineer determines the ride quality is unacceptable. Make all corrections for ride before saw-cutting grooves.

Repair defective work as soon as possible. Remove and replace at the expense of the Contractor any defect that cannot be repaired to the satisfaction of the Engineer.

The Engineer will inspect the deck or slab for plastic shrinkage and settlement cracking after completion of final curing and within 5 days after curing mats are removed. Seal any noted shrinkage cracks attributable to Contractor placing, curing, and finishing practices as well as transverse cracks over interior bents in continuous units using gravity feed crack repair as directed in accordance with Item 780, “Concrete Crack Repair,” at no cost to the Department.

4.11. **Final Surface Texture**. Saw-cut grooves in the hardened concrete of bridge slabs, bridge approach slabs, and direct traffic culverts to produce the final texturing after completion of the required curing period, unless otherwise specified. Cut grooves parallel to the structure centerline, unless otherwise shown on plans. Cut grooves along the slab within 18 in. of the barrier rail, curb, or median divider. Adjust groove cutting at skewed metal expansion joints in bridge slabs so all grooves end within 6 in. of the joint, measured perpendicular to the centerline of the metal joint. Leave no ungrooved surface wider than 6 in. adjacent to either side of the joint. Cut grooves continuously across construction joints or other joints in the concrete less than 1/2 in. wide. Apply the same procedure described above where barrier rails, curbs, or median dividers are not parallel to the structure centerline to maintain the 18-in. maximum dimension from the end of the grooves to the gutter line. Cut grooves continuously across formed concrete joints. Provide either a carpet drag or broom finish for micro-texture when saw-cut grooves are not required on the plans. In this case, ensure an adequate and consistent micro-texture is achieved by applying enough weight to the carpet and keeping the carpet or broom from getting plugged with grout. For surfaces that do not have adequate texture, the Engineer may require corrective action including diamond grinding or shot blasting.

Give a carpet drag, burlap drag, or broom finish to all concrete surfaces to be overlaid when the plans call for a concrete overlay (CO) to be placed on the slab (new construction). Saw-grooving is not required in this case. Provide an average texture depth for the finish of approximately 0.035 in. with no individual test falling below 0.020 in., unless otherwise shown on the plans, when tested in accordance with Tex-436-A. Revise finishing procedures to produce the desired texture if the texture depth falls below what is intended.

Give all concrete surfaces to be covered a lightly textured broom or carpet drag finish when the plans require an asphalt seal, with or without overlay, on the slab (new construction). Provide an average texture depth of approximately 0.025 in. when tested in accordance with Tex-436-A.

5. MEASUREMENT

Reinforced concrete slabs or decks on girders, beams, slab beams, double-T beams, or box beams placed under this Item will be measured by the square foot of slab surface area using the nominal dimensions and

configuration shown on the plans. Transverse measurement will be made from outer edge of slab to outer edge of slab (including raised median and sidewalk sections). Longitudinal measurement will be made between ends of units or spans. Diaphragms, haunch concrete, reinforcement, and optional steel diaphragms will be considered as a portion of the slab unless otherwise shown on the plans. An estimated quantity for the haunch between the slab and beams will be included for the Contractor's information only. No measurement will be made during construction for variation in the amount of haunch concrete due to variations in camber of the beams.

Approach slabs and cast-in-place superstructure elements including flat slabs, slab and girder units (pan formed), and shear keys will be measured by the cubic yard. For slab and girder spans using pan forms, a quantity will be included for the screed setting required to provide proper camber in the roadway surface after form removal.

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustment of quantities is required.

The quantities of concrete and reinforcing steel shown on the plans are based on a conventionally formed slab. These quantities include amounts for concrete diaphragms, brackets and other required attachments, and haunch concrete when required, based on the profile grade, theoretical camber, and dead load deflection of the beams. No additional measurement will be made for concrete or reinforcing steel due to a variation in camber of the beams from theoretical camber, or for additional quantities required by optional methods of forming.

Additional concrete that may be required by an adjustment of the profile grade line during construction, to ensure proper slab thickness, will not be measured for payment.

6. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for the various superstructure elements specified. This price is full compensation for furnishing, hauling, mixing, placing, curing, and finishing concrete; furnishing and placing reinforcing steel; grouting and pointing; furnishing and placing drains and expansion joint material (except where specifically furnished under another Item); furnishing and placing metal flashing strips; forms (removable and permanent) and falsework; prestressed concrete panels; furnishing and placing concrete and reinforcement for raised medians, sidewalks, sign mounts, luminaire brackets, and other concrete appurtenances; removing designated portions of existing slab; cleaning, bending, and cutting exposed existing reinforcing steel; welding reinforcing steel; doweling; cleaning and preparing concrete surfaces; and equipment, labor, tools, and incidentals.

Price will be adjusted in accordance with Article 421.6., "Measurement and Payment," when required to address non-compliance of project acceptance testing.

Diaphragm concrete will not be paid for directly, but will be subsidiary to the slab unless otherwise shown on the plans.

Structural steel, anchor bolts, armor joints, sealed expansion joints, rail (including the concrete parapet portion), and concrete median barrier will be measured and paid for in conformance with pertinent bid items.

In addition to the work described above, for extending structures the unit price bid is full compensation for removing and disposing of the designated portion of the existing structure; removing, stockpiling, and replacing headwall units for reuse; cleaning, bending, and cutting of exposed reinforcing steel; splicing or welding of new reinforcing steel to existing reinforcing steel; installation of dowels; and cleaning and preparing existing concrete surfaces.

Item 423
Retaining Walls

1. DESCRIPTION

Furnish, construct, and install retaining walls.

2. MATERIALS

2.1. **General**. Furnish materials in accordance with the following.

- Item 420, "Concrete Substructures"
- Item 421, "Hydraulic Cement Concrete"
- Item 440, "Reinforcement for Concrete"
- Item 445, "Galvanizing"
- Item 458, "Waterproofing Membranes for Structures"
- Item 556, "Pipe Underdrains"

Use concrete for retaining walls that conforms to the requirements of Table 1 unless otherwise shown on the plans.

Table 1
Concrete for Retaining Walls

Application	Concrete
Cast-in-place, non-reinforced	Class A
Cast-in-place, reinforced	Class C
Precast	Class H, f'_c = 4,000 psi

Furnish concrete for machine-made concrete block units in accordance with ASTM C90, Class 1, Type II, except the minimum 28-day compressive strength must be 4,000 psi with maximum moisture absorption of 7%.

Provide Type 1 filter fabric in accordance with DMS-6200, "Filter Fabric." Provide filter fabric rated as UV-resistant when used as part of the exposed facing for a temporary wall.

Joint fillers, pads, waterstops, and other incidental materials must be as shown on the plans or approved by the Engineer.

Epoxy coat all steel used in concrete panels and coping including connectors, dowels, stirrups, and reinforcing steel when the plans call for epoxy coating of steel earth reinforcements.

Construct permanent retaining walls approved for use in accordance with DMS-4800, "Proprietary Earth Retaining Wall System," and on the Approved System List for Concrete Block Retaining Walls Systems and Mechanically Stabilized Earth Panel Type Systems.

2.2. **Definitions**. This Item uses the following terms.

- **Permanent Wall**. A retaining wall with a design service life of 75 yr. All walls are presumed to be permanent walls unless otherwise shown on the plans.
- **Temporary Wall**. A retaining wall so designated by description, with a design service life of 3 yr.
- **Mechanically Stabilized Earth (MSE) Wall**. A wall consisting of a volume of select backfill with tensile earth reinforcement elements distributed throughout. Permanent MSE walls use a precast concrete

panel as a facing element. Provide the approved MSE panel type systems in accordance with DMS-4800. Temporary MSE walls use welded wire fabric with filter fabric backing as a facing element.

- **Concrete Block Wall**. A retaining wall that uses machine-made, precast concrete block units as facing elements. The walls may use a volume of select fill with tensile earth reinforcements distributed throughout, or may use only the facing unit and unit fill weight for support. Provide the approved concrete block retaining wall systems in accordance with DMS-4800.

2.3. **Fabrication**.

2.3.1. **Cast-in-Place**. Execute work in accordance with Item 420.

2.3.2. **Formed Precast**. Execute work in accordance with Item 424, "Precast Concrete Structural Members (Fabrication)."

2.3.3. **Machine-Made Precast**. Furnish machine-made concrete block units in accordance with ASTM C90, sampled and tested in accordance with ASTM C140. Furnish units with molded dimensions within 1/8 in. of specified dimensions, except height must be within 1/16 in.

2.4. **Backfill**.

2.4.1. **Non-Select**. Furnish non-select backfill for walls other than temporary and permanent MSE and concrete block walls as shown on the plans. Non-select fill will be in accordance with Item 132, "Embankment," of the type shown on the plans. Provide material with a maximum plasticity index of 30 if no type is specified, as determined in accordance with Tex-106-E.

2.4.2. **Select**. Select backfill is required in specific areas of permanent and temporary MSE and concrete block-type retaining walls. Provide select backfill that is free of organic or otherwise deleterious materials and that conforms to the gradation limits shown in Table 2, as determined in accordance with Tex-401-A.

Provide backfill that does not contain shale, caliche, or other soft, poor-durability coarse aggregate particles. Reclaimed asphalt pavement is not allowed. Manufactured sand is allowed for temporary walls with a service life of 3 yr. or less. Test each source of backfill for durability and soundness in accordance with Tex-411-A, five-cycle magnesium sulfate soundness. Backfill material with a maximum five-cycle soundness loss exceeding 25% will be rejected. Alternately, Tex-461-A Micro-Deval abrasion may be used if the corresponding results show loss is not greater than 20%; otherwise Tex-411-A governs aggregate verification.

Type AS, BS, and DS particles larger than 1/4 in. must be angular or completely crushed. Provide mechanically crushed gravel or stone backfill. Gravel from each aggregate source will have at least 95% two or more mechanically induced crushed faces, as determined in accordance with Tex-460-A, Part I. Rounded rock or rounded gravel is not allowed. Natural sand meeting the requirements of this Section is permitted for use.

Table 2
Select Backfill Gradation Limits

Type	Sieve Size	Percent Retained
AS	3”	0
	1/2”	50–100
	#4	See Note
	#40	85–100
	#200	95–100
BS	3”	0
	#4	See Note
	#40	40–100
	#200	85–100
CS	3”	0
	#4	See Note
	#200	75–100
DS	3”	0
	3/8”	85–100
	#200	95–100

Note—Use No. 4 sieve for determination of rock backfill in accordance with Section 2.4., “Backfill.”

When the backfill gradation results in 85% or more material retained on the No. 4 sieve, the backfill will be considered rock backfill. All Type DS backfill is considered rock backfill.

In addition to the requirements for Type CS select fill, the plasticity index in accordance with Tex-106-E may not exceed six.

Furnish Type BS backfill for permanent walls; Type CS backfill for temporary walls; and Type DS backfill for areas of walls subject to inundation unless otherwise shown on the plans, or below the 100-year flood elevation as shown on the plans.

Furnish backfill meeting the requirements of this Section but with a maximum particle size of 3/4 in. when nonmetallic or epoxy coated earth reinforcements are used.

2.4.3. **Drainage Aggregate for Concrete Block Wall**. Use drainage aggregate to fill the void within concrete block units and in the zone 1 ft. behind the units. Provide drainage aggregate that is free of organic or otherwise deleterious materials and that conforms to the gradation limits shown in Table 3 as determined in accordance with Tex-110-E.

Table 3
Drainage Aggregate Gradation Limits

Sieve Size	Percent Retained
1”	0
3/4”	25–50
1/2”	50–100
#4	75–100

2.4.4. **Cement-Stabilized Backfill**. Use cement-stabilized backfill when required or as approved. Stabilize Type CS backfill with 5% hydraulic cement by dry weight of the backfill material. Use a stationary plant to thoroughly mix the backfill material, cement, and water. Place and compact the backfill within 2 hr. of mixing. Provide special drainage provisions when cement-stabilized backfill is used, as shown on the plans.

2.4.5. **Electrochemical**. Provide backfill meeting the following additional requirements for permanent retaining wall systems using galvanized metallic earth reinforcements.

- The pH is between 5.5 and 10.0 as determined in accordance with Tex-128-E.
- Resistivity is more than 3,000 ohms centimeter (ohm-cm) as determined in accordance with Tex-129-E.

- Material with resistivity between 1,500 and 3,000 ohm-cm may be used if the chloride content is less than 100 parts per million (ppm) and the sulfate content is less than 200 ppm as determined in accordance with Tex-620-J.

Perform electrochemical testing on the raw, unstabilized backfill material when cement-stabilized backfill is used.

2.5. **Earth Reinforcements**. Furnish earth reinforcements that meet the design requirements. Galvanize or epoxy coat all steel elements for permanent walls in contact with soil. Epoxy coat in accordance with Item 440, except provide a minimum 18-mil coating thickness. Epoxy coat the reinforcing only when shown on the plans or as approved. Use connection hardware that is likewise nonmetallic or epoxy coated when using nonmetallic or epoxy coated earth reinforcements.

3. CONSTRUCTION

3.1. **General**. Construct retaining walls as shown on the plans and the approved working drawings, and in accordance with the following Items.

- Item 110, "Excavation"
- Item 132, "Embankment"
- Item 400, "Excavation and Backfill for Structures"
- Item 420, "Concrete Substructures"
- Item 458, "Waterproofing Membranes for Structures"
- Item 556, "Pipe Underdrains"

Construct required piling or drilled shafts in conformance with the pertinent specification.

3.2. **Options**. When optional design details are shown on the plans, the Contractor is required to use the same facing design within an area of continuous retaining walls.

Provide drawings for review indicating the proposed design arrangement when proposing the use of two or more systems.

3.3. **Submittals**. When proprietary wall systems are used for permanent or temporary walls, submit working drawings including casting drawings, construction drawings, and design calculations bearing the seal of a licensed professional engineer for review and approval in accordance with the Department's *Guide to Shop Drawing Submittals* process. Upon completion of construction, submit a set of reproducible as-built drawings.

3.3.1. **Casting Drawings**. Include all information necessary for casting wall elements, including railing and coping when prefabricated. Show shape and dimensions of panels; size, quantity, and details of the reinforcing steel; quantity, type, size, and details of connection and lifting hardware; and additional necessary details.

3.3.2. **Construction Drawings**. Include a numbered panel layout showing horizontal and vertical alignment of the walls as well as the existing and proposed ground lines. Include all information needed to erect the walls, including the proposed leveling pad elevations; the type and details of the soil reinforcing system (if applicable); the details and manufacturer of all pads, fillers, and filter fabric; the limits and dimensions of structural backfill; details necessary to incorporate coping, railing, inlets, drainage, and electrical conduit; and additional necessary details.

Leveling pad elevations may vary from the elevations shown on the plans. Provide at least 1 ft. of cover from the top of the leveling pad to finished grade unless a different minimum cover or a specified minimum leveling pad elevation is shown.

3.3.3. **Design Calculations**. Include calculations covering the range of heights and loading conditions on the project. Calculations for both internal and external stability as shown on the plans will be required. Include a

summary of all design parameters used; material types, strength values, and assumed allowables; loads and loading combinations; and factor-of-safety parameters.

3.4. **Permanent MSE Walls**. Grade the foundation for the structure level to a width equal to or exceeding the length of the reinforcing system. Perform proof rolling on retaining wall foundation area to identify any loose, soft, or unsuitable materials in accordance with Item 216, “Proof Rolling.” Material not meeting a maximum rut depth of 1 in. per pass of pneumatic tire roller should continue to be rolled or removed and replaced with suitable material. Pneumatic tire rolling will be waived for portions of wall with a reinforcement length of 8 ft.; for these conditions, proof rolling will be required using a smooth-wheeled vibratory roller or other approved roller.

Place drilled shafts and piling located within the MSE volume before construction of the wall. Place any required pipe underdrain before construction of the wall. Complete MSE wall construction before construction of abutment caps and abutment wing walls. Completion of walls and abutment should be in conjunction with project phasing or allow for completion of walls that meets the proper placement and compaction at abutments.

Place the concrete leveling pad as shown on the construction drawings. Provide a wood float finish and wait at least 24 hr. before beginning panel erection. No curing or strength testing of the leveling pad concrete is required.

Shim the first row of panels as necessary to achieve correct alignment. Use plastic shims or other material that will not deteriorate. Remove and replace the leveling pad or provide a grout level-up as directed if the required shim height exceeds 1 in.

Place filter fabric behind the wall along the joint between the leveling pad and the panels. Grout areas where filter fabric spans more than 6 in. at leveling pad steps.

Place and compact fill material over the leveling pad to an elevation even with or above the surrounding ground after backfilling the first row of panels. Do not allow water to accumulate and stand at the base of the wall.

Place filter fabric behind all wall joints and at the intersection of retaining walls with other structures, including riprap. Cover joints at least 6 in. on each side and use adhesive to hold the filter fabric in place.

Exercise care while lifting, setting, and aligning panels to prevent damage to the panels. Discontinue any operation that results in chipping, spalling, or cracking of panels. Remove and replace damaged panels, or repair as approved.

Provide external bracing for the initial row of panels. Use wooden wedges, clamps, or other means necessary to maintain position and stability of panels during placement and compaction of backfill. Remove wooden wedges as soon as the panel or coping above the wedged element is erected and backfilled. Remove all wedges after completing the wall.

Review plumbness and position of each row of panels before placing the subsequent row. Remove and rebuild any portion of the wall that is out of tolerance. Modify panel batter and bracing, and backfill material, placement, and compaction methods as required to maintain wall tolerances.

Construct walls to a local vertical and horizontal alignment tolerance of 3/4 in. when measured along a 10-ft. straightedge relative to vertical and horizontal wall control line. Construct walls to an overall vertical tolerance (plumbness from top to bottom) of 1/2 in. per 10 ft. of wall height. Construct walls so the maximum offset at any panel joint is between 3/8 in. and 3/4 in. and no joint is open to the extent the filter fabric is visible from the front of the wall.

Place backfill to closely follow the erection of each row of panels. Place the select and embankment backfill to the same elevation where possible, and operate the compaction equipment over the interface. Do not

create a continuous, distinct, vertical joint between the select and embankment backfill. Complete the embankment after construction of the retaining wall.

Maintain the stability of the interface area between the existing ground and the select fill when building a wall against existing ground. Remove and recompact any material that loosens, caves, or fails.

Compact backfill to provide at least 95% of density determined in accordance with Tex-114-E. Field density determination will be made in accordance with Tex-115-E.

Sprinkle backfill as required to ensure adequate uniformly distributed moisture in each lift before and during compaction. Place fill in lifts of 8 in. or less (loose measurement). Place fill in a manner that avoids segregation of the fill. Decrease the lift thickness if necessary to obtain the required compaction. Use hand-operated or walk-behind compaction equipment in the 3-ft. wide strip adjacent to the wall panels. Do not displace panels or distort or damage the reinforcement system during compaction. Modify backfill material, placement, and compaction methods as necessary to meet density requirements while maintaining wall tolerances.

Place rock backfill or material the Engineer determines too coarse for density testing in accordance with Section 132.3.4.1., "Ordinary Compaction."

Place and compact the backfill to the reinforcement level, at each earth reinforcement level, before placing the reinforcement. Place earth reinforcements perpendicular to the face of the wall. Remove slack in connections before placing backfill. Pre-tension each layer of reinforcement to remove slack before placing backfill for systems using nonmetallic earth reinforcements. Use devices capable of mechanically applying and holding the required force. Do not operate tracked equipment directly on any reinforcement.

Cover the rock backfill with filter fabric before placing the 2 ft. of backfill immediately below the pavement structure or top of wall when rock backfill is used. Overlap the fabric at least 18 in. at splices, and extend it past the edge of the rock backfill at least 18 in. Use backfill that contains sufficient fines to fill the voids in a compacted state above the filter fabric. Place a horizontal layer of filter fabric as specified above when transitioning from rock backfill to finer grained backfill anywhere within the wall volume.

Prevent surface water or rainwater from damaging the retaining walls during construction. Shape the backfill to prevent water from ponding or flowing on the backfill or against the wall face. Remove and replace any portion of the retaining wall damaged or moved out of tolerance by erosion, sloughing, or saturation of the retaining wall or embankment backfill.

3.5. **Temporary MSE Walls**. Provide a facing system rigid enough to maintain a smooth and straight wall face both during and after construction.

Grade and compact the foundation for the structure in accordance with Section 423.3.4., "Permanent MSE Walls."

Place earth reinforcement and facing system as shown on the approved working drawings. Backfill the 2-ft. zone immediately behind the facing with clean, coarse rock meeting the requirements of Coarse Aggregate Grade 1, 2, or 3 of Item 421, or with Type DS backfill as described in Section 423.2.4.2., "Select." Cement-stabilized backfill as described in Section 423.2.4.4., "Cement-Stabilized Backfill," or crushed concrete may be used in place of the coarse rock.

Place and compact backfill in accordance with Section 423.3.4., "Permanent MSE Walls."

Construct walls to a vertical and horizontal alignment tolerance of 3 in. when measured along a 10-ft. straightedge. Construct walls to an overall vertical tolerance (plumbness from top to bottom) of 2 in. per 10 ft. of wall height. Place adjacent facing elements so the maximum out-of-plane offset at any facing element joint is less than 1 in. Place facing elements and filter fabric with no gaps in the facing or fabric.

Prevent surface water or rainwater from damaging the retaining walls during and after construction. Place temporary berms or curbs, shape the backfill, or use other approved methods to prevent water from flowing against or over the wall face. Remove and replace any portion of the wall damaged or moved out of tolerance by erosion, sloughing, or saturation of the retaining wall or embankment backfill.

3.6. **Concrete Block Retaining Walls**. The concrete block units may be sampled and tested by the Engineer before shipment or upon delivery to the construction site. Display samples of block units indicating the color, texture, and finish for approval. Store, transport, and handle all block units carefully to prevent cracking or damage.

Grade and compact the foundation for the structure, and place the leveling pad in Section 423.3.4., "Permanent MSE Walls."

Place the concrete block facing units as shown on the approved working drawings. Fill the voids within the units and fill the 1-ft. zone immediately behind the facing with drainage aggregate as described in Section 423.2.4.3., "Drainage Aggregate for Concrete Block Wall." Systems tested without unit fill may omit the fill as shown on the approved drawings. Systems with approved filter fabric details may omit the drainage aggregate in the 1-ft. zone immediately behind the facing.

Place reinforcements and backfill for walls using earth reinforcements in accordance with the requirements of Section 423.3.4., "Permanent MSE Walls." Pay particular attention to the connection details of the earth reinforcements to the concrete block units.

Construct walls to a vertical and horizontal alignment tolerance of 1-1/2 in. when measured along a 10-ft. straightedge. Construct walls to an overall vertical tolerance (deviation from the vertical or battered control line, top to bottom) of 1 in. per 10 ft. of wall height. Place adjacent facing elements so the maximum out-of-plane offset at any facing element joint is less than 1 in. Place facing elements with maximum 1/4-in. gaps between block units.

Prevent surface water or rainwater from damaging the retaining walls during construction. Shape the backfill to prevent water from ponding or flowing on the backfill or against the wall face. Remove and replace all portions of the retaining wall damaged or moved out of tolerance by erosion, sloughing, or saturation of the retaining wall or embankment backfill.

4. MEASUREMENT

This Item will be measured by the square foot of the front surface area of the wall. Unless otherwise shown on the plans, the area will be measured from 1 ft. below finished grade of the ground line on the face of the exterior wall to the top of the wall, including any coping required (not including railing).

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Retaining Walls" of the type or special surface finish specified. This price is full compensation for excavation in back of retaining walls and for footings; furnishing and placing footings, leveling pads, copings, and traffic railing foundations; furnishing, placing, and compacting backfill (except in embankment areas), including cement for stabilization; proof rolling; furnishing and placing concrete, reinforcing steel, waterproofing material, joint material, water stop, and filter fabric when required; fabricating, curing, and finishing all panels; furnishing and placing earth reinforcement, anchorage systems, and fasteners; wall erection; and equipment, labor, tools, and incidentals.

The underdrain filter material and drain pipe will be considered part of the quantities measured and paid for under Item 556.

Retaining wall backfill areas that are also in embankment areas will be considered part of the quantities measured and paid for under Item 132.

When drilled shafts are required, they will be measured and paid for in accordance with Item 416, “Drilled Shaft Foundations.” When piling is required, it will be measured and paid for as shown on the plans for piling of the appropriate type.

Item 427
Surface Finishes for Concrete

1. DESCRIPTION

Finish concrete surface as specified.

2. MATERIALS

Furnish materials in accordance with this Article for the type of surface finish specified.

2.1. **Coatings**.

2.1.1. **Adhesive Grout and Concrete Paint**. Provide coatings in accordance with DMS-8110, "Coatings for Concrete." Match color of coating with Federal Standard 595C color 35630, concrete gray, unless otherwise shown on the plans.

2.1.2. **Opaque Sealer**. Provide penetrating-type sealer in accordance with DMS-8110. Match color of coating with Federal Standard 595C color 35630, concrete gray, unless otherwise shown on the plans.

2.1.3. **Silicone-Based Paint**. Provide silicone resin emulsion paint (SREP) meeting the requirements of DMS-8141, "Paint, Silicon Resin for Concrete." Match color of coating with Federal Standard 595C color 35630, concrete gray, unless otherwise shown on the plans.

2.1.4. **Epoxy Waterproofing**. Provide Type X epoxy in accordance with DMS-6100, "Epoxies and Adhesives," or another approved waterproofing epoxy designed to limit the moisture vapor transmission into a concrete or steel surface. Match color of coating with Federal Standard 595C color 35630, concrete gray, unless otherwise shown on the plans.

2.2. **Exposed Aggregate Finish**. Provide approved aggregates meeting the grading requirements shown on the plans. Provide gravel consisting of predominantly rounded particles unless otherwise shown on the plans. Use crushed stone when a bush-hammered finish is desired. Provide a concrete surface retardant. Provide clear Type II permanent anti-graffiti coating in accordance with DMS-8111, "Anti-Graffiti Coatings."

3. EQUIPMENT

The Engineer may require demonstration of the equipment's capabilities.

3.1. **Water Blasting**. Use equipment capable of supplying a minimum pressure at the nozzle end of 3,000 psi.

3.2. **Abrasive Blasting**. Use equipment with filters to produce oil-free air and water-free air when dry air is required.

3.3. **Slurry Blasting**. Use equipment capable of combining air and abrasives with water to form wet blast media capable of cleaning and preparing surface without creating dust.

3.4. **Spraying**. Use equipment with fluid and air pressure regulators and gauges to allow for adjustment to produce a uniform spray pattern for coating applications.

3.5. **Off-the-Form Finish Forms**. Use nonstaining, nonporous, high-quality forming materials (e.g., steel or medium-density and high-density overlaid plywood forms). Use steel or high-density overlaid plywood forms when the same form will be used more than twice.

3.6. **Form Liners**. Provide form liners capable of producing a patterned finish as shown on the plans. Use form liners that provide a clean release from the concrete surface without pulling or breaking the textured concrete.

4. CONSTRUCTION

Provide the finish shown on the plans for the specific surface areas.

4.1. **Surface Areas of Finish**. "Surface area of finish" designates the areas where the specified surface is to be applied.

4.1.1. **Surface Area I**. Surface Area I includes the following:

- surfaces of railing;
- exterior vertical faces of fascia beams, slabs, slab spans, arches, and box girders;
- the outside bottom surface of fascia beams and girders;
- the underside of overhanging slabs to the point of juncture of the supporting beam;
- the entire underside of slab spans when shown on the plans;
- vertical and underside surfaces of bents and piers;
- all surfaces of tie beams, abutments, bridge wingwalls, culvert headwalls and wingwalls, and retaining walls exposed to view after all backfill and embankment are placed; and
- all other exposed surfaces shown on the plans to require surface treatment.

4.1.2. **Surface Area II**. Surface Area II includes surfaces of railing, all wingwalls, and the exterior vertical faces of slabs.

4.1.3. **Surface Area III**. Surface Area III includes only the top and roadway faces of all concrete railing and bridge wingwalls.

4.1.4. **Surface Area IV**. Surface Area IV includes areas shown on the plans.

4.2. **Coatings**. Apply the coating specified on the plans.

4.2.1. **Preparation**. Clean the surface thoroughly before applying a coating by chemical cleaning, if required, and by blast cleaning.

Provide containment that keeps public property, private property, and the environment from being adversely affected by the cleaning and painting operations. Do not discharge washwater into any body of water or conveyance without TCEQ approval. Collect and properly dispose of any paint or debris dislodged by cleaning operations.

4.2.1.1. **Chemical Cleaning**. Clean surfaces contaminated with oil, grease, or other contaminants by scrubbing the area with an approved detergent or other concrete cleaning material before blast cleaning. Do not use a solvent that will stain the surface or inhibit coating adhesion. Perform the following test to check for surface contamination of oil type materials.

- Spray the surface with a fine mist of potable water.
- Examine the area to see if water beads up.
- Clean the surface if beading is found.

4.2.1.2. **Blast Cleaning**. Blast clean the designated surface to remove all surface material (including existing coatings), curing compound, and other contaminants before applying a specified coating, leaving a lightly etched uniformly textured surface. Use an approved abrasive propelled by oil-free air with or without the addition of potable water, or blast with potable water with or without the addition of an approved abrasive at sufficient pressure to effectively clean and prepare the surface. Maintain the stand-off distance of the nozzle to at most 12 in. from the surface being cleaned when water blasting.

Do not damage concrete surface by gouging, spalling, or exposing coarse aggregate by the blasting operation.

Blow clean oil- and moisture-free air on all surfaces with sufficient pressure to remove loose particles immediately before application of any coating. Perform the following test to check for surface cleanliness as directed.

- Press a 10-in. long strip of 2-in. wide clear packing tape on the surface by rubbing with moderate pressure.
- Grasp the free end of the tape and remove the tape from the surface with a sharp jerk.
- Examine the surface of the tape for clinging particles.

Continue cleaning the concrete surface until there are no particles clinging to the tape surface for subsequent tests. An additional test that can be used to check the surface for dust is to wipe the surface with a dark cloth and then examine the cloth for discoloration.

4.2.2. **Coating Application**. Mix coating materials in conformance with the manufacturer's instructions and thoroughly enough with a mechanical mixer at a speed that causes the mixture to rotate entirely in the container. Ensure complete mixing by probing the container using a stirring device searching for non-dispersed or settled material.

Apply coatings once the new concrete has aged at least 28 days, except for the adhesive grout coating. Do not apply coatings when weather conditions will be detrimental to the final surface finish as determined by the Engineer. Do not apply coatings when surface temperature of the concrete exceeds 110°F.

Apply coatings on a dry surface. Do not thin material unless approved. Apply when ambient temperature is between 50°F and 100°F. Apply coatings to obtain a consistent color, texture, and appearance. Apply concrete paint in two coats for a total maximum application rate of 150 sq. ft. per gallon. Apply opaque sealer in two coats for a total maximum application rate of 200 sq. ft. per gallon. Apply silicone resin paint in two coats at a rate not exceeding 300 sq. ft. per gallon per coat. Wait at least 12 hr. between coats for silicone resin paint. Apply epoxy waterproofing at a maximum application rate of 100 sq. ft. per gallon. For epoxy waterproofing, apply a thin uniform film of mixed epoxy to the substrate using a short nap roller or brush. The epoxy may be sprayed in conformance with the thinning requirements of the manufacturer. No more than 15% reduction is permitted.

Repair coatings that exhibit peeling, flaking, or discoloration or have been damaged during construction. Remove defective or damaged coating. Clean and recoat repair area in accordance with this Item.

4.2.2.1. **Epoxy Waterproofing**. Mix epoxy in conformance with manufacturer's instructions. Apply the coating on a dry surface at a maximum application rate of 100 sq. ft. per gallon. Apply a thin uniform film of mixed epoxy to the substrate using a short nap roller or brush. The epoxy may be sprayed in conformance with the thinning requirements of the manufacturer. No more than 15% reduction is permitted.

Match the color of the applied coating with the color standard as shown on the plans. Apply when ambient temperature is between 50°F and 100°F.

4.2.2.2. **Adhesive Grout**. Apply coating on a moistened surface to a uniform minimum thickness of 1/16 in. Apply when ambient temperature is at least 50°F.

4.3. **Special Surface Finishes**. Submit a work plan to the Engineer for any special finish shown on the plans. Include in the work plan the type of aggregates, materials, variation of panel or pattern arrangement, dimensions, construction methods, and other features affecting the work as necessary for the "Special Surface Finish" specified.

4.3.1. **Blast Finish**. Provide surface profile as shown on the plans, or meet the minimum requirements of Section 427.4.2.1., "Preparation." Construct a 4 × 4-ft. sample panel using the same concrete used in construction of the member to receive the blast finish. Prepare the surface of the sample panel to meet the

specified finish, and obtain approval of the sample finish. Use the approved sample panel finish as the standard for surfaces requiring a blast finish.

4.3.2. **Slurry Coat Finish**. Provide cementitious slurry coat finish to concrete surfaces within 14 days of placing concrete or later as approved. Water blast surface to moisten surface before application when application of slurry coat occurs more than 14 days after placing concrete. Do not apply slurry coat finish to surfaces receiving another type of coating finish.

Submit for approval proposed slurry recipe including cement, latex concrete additive, with or without sand, and other additives before application. The Engineer will direct the level of surface texture the slurry coat will have, whether to include sand, and what fineness of sand is to be used. Tint mixture of slurry as specified on the plans and as directed. Maintain consistent slurry throughout project, only modifying recipe to account for color variations noticed as work progresses.

Rub in slurry using carborundum stone, stiff bristle brush, or other approved device. Limit thickness of applied slurry to a maximum of 1/16 in. Demonstrate application methods for slurry coat and obtain approval of proposed surface. Apply slurry coat to obtain a tightly adhering cementitious finish to concrete surface. Remove material and reapply if slurry coat is not tightly adhering or is cracked.

4.3.3. **Rub Finish**. Provide a finish to the surface by rubbing the surface with a carborundum stone or other approved material. Begin rubbing the surface immediately after forms have been removed. Provide blast finish or other finish as directed at no additional cost to the Department if rubbing surface is delayed to the point where the surface is dry and unable to be rubbed to produce an acceptable finish. Perform the requirements to obtain the ordinary surface finish specified in Section 420.4.13., "Ordinary Surface Finish," concurrently with rubbing the surface. Rub concrete-patching areas after the patch material has thoroughly set and blend the patch in with the surrounding area to produce a surface with uniform color and texture where concrete patching is performed.

Keep the surface continuously wet after form removal until the rubbing is complete. Rub the surface sufficiently to bring the wetted concrete surface to a paste, producing a smooth, dense surface without pits, form marks, or other irregularities. Do not use cement grout to form the paste on the surface. Stripe the surface using a brush to conceal the rubbing pattern and allow the paste to reset. Wash the concrete with potable water after the paste has sufficiently set to leave it with a neat and uniform appearance and texture. Apply membrane curing, if required, in accordance with Item 420, "Concrete Substructures," after rubbing is complete.

4.3.4. **Off-the-Form Finish**. Provide a finish with minimal surface defects and uniform color and texture by using non-staining, non-porous, high-quality forming materials. Use the same type of forming materials for like elements for the entire structure.

Use mortar-tight forms to prevent leakage and discoloration. Seal joints using compressible gasket material, caulk, or tape, or by other suitable means that are not detrimental to the concrete finish, if necessary. Use one brand and type of form-release agents for all surfaces unless another product produces a similar concrete surface appearance. Do not use barrier-type (e.g., wax, fuel oil, and carrier oil) release agents. Use form-release agents containing a rust inhibitor on steel forms. Clean rust off steel forms before use. Use plywood that will not cause discoloration of the concrete surface.

Direct special attention to consolidation and vibration of the concrete around the form surfaces to minimize bug holes. Modify concrete placement and vibration techniques if surface contains an excessive amount of bug holes. Remove all forms without interruption once form removal begins to prevent discoloration due to differing form curing times.

Do not use membrane curing on surfaces with off-the-form finish.

Repair honeycombed and spall areas with least dimension larger than 2 in. in accordance with the concrete surface repair procedures in Item 420 to obtain an ordinary surface finish as defined in Section 420.4.13., "Ordinary Surface Finish." Patch honeycombed and spall areas with least dimension greater than 3/4 in. but

smaller than 2 in. by filling defect with repair material omitting the chipping operation. Do not patch honeycombed and spall areas with least dimension smaller than 3/4 in. Perform required repairs as soon as forms are removed. Match repair material color and texture with surrounding concrete surfaces. Minimize the area of repair by not smearing the repair material over acceptable concrete surfaces while attempting to blend the repair with the surrounding concrete. Cut out form ties at least 1/2 in. below the surface, and patch accordingly. Perform repair work as soon as possible after removing forms so that concrete and repair materials have similar ages. Replace or refurbish the forms when the Engineer determines defective formwork is causing an excessive amount of repair work.

4.3.5. **Form Liner Finish**. Provide patterned finish as shown on the plans. Do not splice form liner panels in a way that causes a noticeable transition or line between pieces. Wash and clean form liners after each use when the forms can be reused. Replace form liners that have become damaged or worn.

Construct a sample panel for each form liner finish. Approval is required to verify the sample panel meets the requirements shown on the plans and in conformance with specifications before beginning work. Upon approval, the sample panel becomes the model panel to which all other work will be compared. Deviation in color, grade, or depth from the model panel is grounds for rejection of the form liner finish. Removal of defective work may be necessary as determined by the Engineer and in accordance with the surface finish requirements in Item 420 to obtain an ordinary surface finish as defined in Section 420.4.13., "Ordinary Surface Finish."

Seal all form liner joints in a manner acceptable to the Engineer to prevent leakage at the surface.

4.3.6. **Exposed Aggregate Finish**. Provide exposed aggregate finish as shown on the plans. Provide a depth of finish between 3/8 in. and 1/2 in. unless directed otherwise.

Apply a concrete surface retarder that penetrates approximately 1/4 in. into the forms or concrete surface to help achieve the desired finish. Apply two or three coats to wood forms to account for absorption if necessary. Tape or caulk form joints to prevent escape of the retarder during the placing operations. Protect the form surfaces from sun and rain while exposed to the atmosphere. Re-treat form surfaces with retarder if disturbed. Protect adjacent areas of concrete not requiring exposed aggregate finish from the retarder.

Remove forms 12–15 hr. after concrete placement but not before concrete has gained sufficient strength to support the self-weight of the member, unless directed otherwise. Expose the aggregate for the finish immediately after form removal. Remove the grout paste covering the aggregate to be exposed by an approved method. Do not loosen the aggregate by the grout removal operation. Maintain required curing on all surfaces except for the time while the aggregate is being exposed. Cure using wet mats or membrane after the aggregate is exposed.

Repair defective areas as determined by the Engineer.

Re-clean exposed aggregate surfaces by an approved method. Apply a coat of clear Type II permanent anti-graffiti coating to cleaned exposed aggregate surface. Apply anti-graffiti coatings by spray, roller, or brush at the application rates recommended by the manufacturer and in accordance with Item 740, "Graffiti Removal and Anti-Graffiti Coating."

5. MEASUREMENT

When surface finishes for concrete are shown on the plans to be a pay item, measurement will be by the square foot of the type of surface finish specified. This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurement or calculations will be made if adjustments of quantities are required.

6. PAYMENT

Unless otherwise shown on the plans, the work performed, materials furnished, equipment, labor, tools, and incidentals will not be paid for directly, but will be subsidiary to pertinent Items.

When a surface finish for concrete is specified as a pay item, the work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Adhesive Grout Finish," "Concrete Paint Finish," "Opaque Sealer Finish," "Silicone Resin Paint Finish," "Epoxy Waterproof Finish," or "Blast Finish." This price is full compensation for materials; cleaning and preparing surfaces; application of materials; and equipment, labor, tools, and incidentals.

Slurry coat, rub, off-the-form, form liner, or exposed aggregate finishes (including anti-graffiti coating) will not be paid for under this Item, but will be subsidiary to other pertinent Items.

Item 429
Concrete Structure Repair

1. DESCRIPTION

Remove and repair unsound, delaminated, or spalled concrete.

2. MATERIALS

Submit all proposed repair materials for approval. Provide materials in accordance with the *Concrete Repair Manual* and the following.

- Item 421, "Hydraulic Cement Concrete"
- Item 431, "Pneumatically Placed Concrete"
- Item 440, "Reinforcement for Concrete"
- DMS-4655, "Concrete Repair Materials"
- DMS-6100, "Epoxies and Adhesives"

2.1. **Concrete Repair Materials**. Provide repair materials suitable for the appropriate horizontal, vertical, or overhead application meeting the requirements of DMS-4655. Use Type C trowel-applied materials in vertical and overhead applications less than 3 in., unless otherwise shown on the plans. Use neat Type A (Rapid) or Type D (Standard) materials in horizontal or form-and-pour applications less than 3 in. thick and extended Type A or Type D for repairs exceeding 3 in. in depth. Type D materials should be used instead of Type A when rapid strength gain is not necessary. Use Type B ultra-rapid hardening materials only if shown on the plans. The Engineer may disallow any product based on its structural compatibility.

2.2. **Pneumatically Applied Materials**. Pneumatically applied concrete or mortar may be used, if approved, for any repair thickness. Provide and place pneumatically applied concrete in accordance with Item 431. Prepare trial batches of any proposed repair material and application method as directed.

2.3. **Epoxy Mortars**. Use Type VIII neat epoxy or epoxy mortar in accordance with DMS-6100 for repairs less than 1 in. thick unless otherwise shown on the plans.

2.4. **Concrete**. Provide Class C concrete for substructures and Class S or Class K concrete for decks, unless otherwise shown on the plans. For repair of other concrete elements, provide concrete of the class or design strength specified on the plans.

Submit a mix design for approval in accordance with Item 421, unless otherwise shown on the plans. Include all pertinent information regarding admixtures. Do not use corrosion-inhibiting admixtures unless shown on the plans or approved.

2.5. **Steel**. Provide steel pins, studs, or expansion bolts with a minimum diameter of 1/8 in. and a minimum length of 2 in. to attach reinforcement at the locations shown on the plans or as directed. Provide reinforcing steel, either welded wire fabric or reinforcing bars, as required by this Item or as shown on the plans.

2.6. **Mechanical and Adhesive Anchors.** When mechanical or adhesive anchors are required to bind repair material to the parent concrete, provide anchors conforming to one of the following.

- Provide stainless steel expansion anchors. Other anchors, such as galvanized or zinc-painted metal, may be used with approval.
- Provide reinforcing steel or threaded stainless steel pins (1/2-inch diameter minimum) anchored in place using a Type III epoxy anchoring adhesive, in accordance with DMS-6100.

3. EQUIPMENT

The Engineer may require demonstration of the equipment's abilities.

3.1. **Abrasive Blasting**. Provide equipment capable of removing oil, dirt, slurry, curing compound, laitance, and other similar materials from the surface of the concrete.

3.2. **Water Blasting**. Provide equipment capable of supplying a minimum pressure at the nozzle end of 3,000 psi at a minimum flow rate of 3 gpm. Use a 0° rotary, vibratory, or wobble-type nozzle.

3.3. **Sawing**. Provide equipment capable of sawing concrete to the depth specified when required.

3.4. **Power-Driven Chipping Tools**. Provide tools not heavier than a nominal 30-lb. class for bulk removal of concrete.

3.5. **Chipping Hammers**. Provide chipping hammers not heavier than a nominal 15-lb. class to remove concrete beneath any reinforcing bars.

3.6. **Hand Tools**. Provide applicable hand tools for placing, consolidating, striking-off, and finishing stiff plastic concrete.

4. CONSTRUCTION

Follow the procedures in accordance with the *Concrete Repair Manual* unless approved otherwise. The Contractor may propose alternate repair methods for review and approval before commencing work.

Submit for approval all materials and methods of application at least 3 weeks before beginning any repair work.

Repair locations will be as shown on the plans or as directed.

Place repair material while the concrete substrate is in a saturated surface dry (SSD) condition. Obtain an SSD condition by applying a high-pressure water blast to the surface for at least 15 min. An SSD condition is achieved when the surface remains damp until the repair material is applied. The surface must be free of standing water. Remove all free (ponded) water just before placing repair material.

Do not use a proprietary epoxy bonding layer instead of an SSD substrate unless approved. If use of a proprietary bonding agent is authorized, mix it in conformance with the manufacturer's requirements. Use only Department-approved Type V or Type VII material in accordance with DMS-6100.

4.1. **Crack Repair**. Repair cracks in accordance with Item 780, "Concrete Crack Repair."

4.2. **Repair of Defective Work**. Repair or replace defective areas and patched areas that have debonded after completion of curing, as directed, at the Contractor's expense.

5. MEASUREMENT

This Item will be measured by the square foot, in place, as measured on the specified horizontal, vertical, or overhead surfaces of the completed repair. When a repair involves multiple surfaces, such as a corner, measurement will be made of all surfaces repaired. Bridge deck repairs will be measured by the square foot in place of the completed repair. Measurement will be made before blending repair edges with parent material in accordance with the *Concrete Repair Manual.*

6. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Concrete Structure Repair" of the kind specified. This price is full compensation for furnishing, placing, and curing all repair materials; removing concrete; saw-cutting; cleaning reinforcing steel; surface preparation; supplying and installing replacement or supplemental reinforcing steel, drive pins, studs, anchors, or expansion bolts; and equipment, labor, tools, and incidentals.

Item 431
Pneumatically Placed Concrete

1. DESCRIPTION

Furnish and place pneumatically applied concrete for the construction of portions of structures, repairing concrete structures, encasement of structural steel members, lining ditches and tunnels, soil-nail walls, retaining walls, and other work as shown on the plans or as directed.

2. MATERIALS

Provide pre-bagged concrete materials for concrete structure repair and class of concrete shown on the plans for other work unless otherwise shown on the plans.

Submit pre-bagged materials information for approval. Material testing may be required before approval and installation test panels will be required in accordance with Section 431.2.4., "Proportioning and Mixing."

Provide materials in accordance with the following, with the exceptions noted in accordance with Section 431.2.1., "Exceptions to Item 421, 'Hydraulic Cement Concrete,'" Section 431.2.2., "Exceptions to Item 440, 'Reinforcement for Concrete,'" and Section 431.2.3., "Exception to DMS-6310, 'Joint Sealants and Fillers.'"

- Item 420, "Concrete Substructures"
- Item 421, "Hydraulic Cement Concrete"
- Item 440, "Reinforcement for Concrete"
- DMS-4655, "Concrete Repair Materials"
- DMS-6310, "Joint Sealants and Fillers"

2.1. **Exceptions to Item 421, "Hydraulic Cement Concrete."** Provide a fine aggregate that meets the requirements of Item 421, Table 6, Grade 1, and a coarse aggregate that meets the requirements of Item 421, Table 4, Grade 7, unless otherwise shown on the plans.

2.2. **Exceptions to Item 440, "Reinforcement for Concrete."** Provide mushroom-headed steel anchors or expansion anchor hook bolts with a minimum diameter of 1/8 in. and a minimum length of 2 in. to attach reinforcement for the repair of concrete structures as shown on the plans or as directed. Reinforcing steel may be either welded wire fabric or reinforcing bars unless otherwise shown on the plans.

2.3. **Exception to DMS-6310, "Joint Sealants and Fillers."** Provide a preformed bituminous fiber material unless otherwise noted on the plans.

2.4. **Proportioning and Mixing**. Submit for approval a proposed mix design conforming to the basic mix design requirements shown in Table 1 unless otherwise shown on the plans.

Table 1
Classes of Concrete

Class	Ratio of Cement to Total Aggregate[1]	Minimum 7-Day Compressive Strength (psi)[2]
I	1:4	3,000
II	1:5	2,500

1. More cement may be used when approved.
2. Higher minimum strengths may be specified.

Measure the cement and aggregates by volume and mix with enough water to achieve the desired consistency. Use as little water as possible to achieve sufficient adhesion. Mix concrete sufficiently dry so it will not sag or fall from vertical or inclined surfaces or separate in horizontal work.

Prepare test panels using the same air pressure, nozzle tip, and position to be used for the production work to verify the mix design before approval. Apply a 3-in. layer of concrete to a plywood sheet with minimum dimensions of 18 in. × 18 in. for each test panel. Cure the test panels in the same manner as the proposed work.

Take three cores, each 2 in. in diameter, out of each test panel and test in compression at 7 days in accordance with Tex-424-A. The mix design will be approved when the average strength of the three cores conforms to the strengths shown in Table 1 or strength shown on the plans. Provide additional test panels as directed if there are any changes in materials, equipment, or nozzle operator during the work.

3. CONSTRUCTION

3.1. **Qualification**. Provide experienced personnel able to produce concrete satisfying plan requirements and of uniform quality as required. Provide documentation of nozzle operator's qualification for the process proposed and orientation of the application meeting the minimum requirements when shown on the plans.

Demonstrate nozzle operator's abilities by constructing test panels before commencement of work. Orient test panels to match application direction of placement. Include reinforcing steel in the test panel with similar spacing as in member. Qualification test panels may be used for mix verification in accordance with Section 431.2.4., "Proportioning and Mixing."

3.2. **Surface Preparation**. Grade the area of proposed work accurately to the elevation and dimensions shown on the plans when concrete is to be placed against soil. Compact with sufficient moisture to provide a firm foundation and to prevent absorption of water from the concrete but without free surface moisture.

Remove paint, rust, loose mill scale, grease or oil, and all other foreign materials that may reduce the bond of the concrete to the steel when concrete is used to encase structural steel members.

Remove all deteriorated or loose material by chipping with pneumatic, electric, or hand tools when concrete is placed against concrete or rock. Cut square or slightly undercut shoulders approximately 1 in. deep along the perimeter of repair areas. Sandblast the surface to clean all rust from exposed reinforcing steel and to produce a clean rough-textured surface on the concrete or rock. Place the concrete while the substrate is in a saturated surface-dry (SSD) condition. Achieve SSD conditions by high-pressure water blasting 15–30 min. before placing the repair material. An SSD condition is achieved when the surface remains damp until the concrete is applied. The surface must be free of standing water. Remove all free (ponded) water just before placing concrete.

Provide joints, side forms, headers, and shooting strips for backing or paneling. Use ground or gauging wires where necessary to establish thickness, surface planes, and finish lines.

3.3. **Reinforcement**. Place and secure reinforcement to ensure there is no displacement from impact of applying pneumatically placed concrete. Place reinforcing bars at a spacing not less than 2-1/2 in. Support reinforcing wire fabric or bars using mushroom-headed anchors, expansion hook bolts, or grouted rebar capable of resisting a pullout force of 2,500 lb. Space anchors no more than 12 in. center-to-center on overhead surfaces, 18 in. center-to-center on vertical surfaces, and 36 in. center-to-center on top horizontal surfaces. Use at least three anchors in each patch area. Do not use explosive force to shoot anchors into concrete. Check the resistance to pullout of the reinforcing anchors when directed. Notify the Engineer before installation of the anchors. Locate anchors so there is no damage to prestressing tendons or conduits embedded in the concrete.

Use reinforcement when performing repair work in all areas where the thickness of the concrete will exceed 1-1/2 in. Use a single layer of either 2 × 2—W1.2 × W1.2 or 3 × 3 —W1.5 × W1.5 of welded wire fabric, or

approved equivalent, unless otherwise shown on the plans. Use a single layer of wire fabric to reinforce each 4-in. thickness of patch or fractional part in areas where the concrete thickness exceeds 4 in. Encase completely each layer of wire fabric in concrete that has taken its initial set before installing the succeeding layer of wire fabric. Place the reinforcing fabric parallel to the finished surface and support it so it will be at least 3/4 in. out from the surface to be covered. Provide at least 1 in. of clearance between the finished concrete surface and all steel items, including anchors, reinforcing bars, and wire fabric. Lap adjacent fabric sheets at least 6 in. and tie together securely at a spacing of no more than 18 in. Pre-bend fabric before installing to fit around corners and into re-entrant angles.

Pre-bend the welded wire fabric for encasement of steel members using a template to conform as nearly as possible to the outlines of the members to be encased. Drill holes between 1/2 and 1 in. in diameter in the webs of the members as close as possible to the flanges to allow for attachment of the reinforcing fabric. Space these holes at approximately 3 ft. on center. Use 3/8-in. diameter rods placed through these holes to secure the reinforcing fabric. Hold the reinforcing fabric at least 3/4 in. out from the surface of the steel member. Lap adjacent fabric sheets at least 6 in. and tie together at a spacing of no more than 12 in.

3.4. **Pneumatic Placement of Concrete**. Pneumatically applied concrete can be either dry-mix or wet-mix. The dry-mix process consists of dry-mixed fine aggregate and hydraulic cement to which water is added immediately before its pneumatic expulsion from a nozzle. The wet-mix process consists of mechanically premixed concrete pneumatically applied through a nozzle.

3.4.1. **General**. Place the concrete when the ambient temperature is above 35°F and rising and material temperature is between 50°F and 90°F for wet-mix and below 100°F for dry-mix. Do not place concrete against a surface containing frost, ice, or standing water. Protect concrete from freezing or quick drying after placement. Apply the concrete using pneumatic equipment that sprays the mix onto the prepared surface at a velocity less than 100 ft. per second for construction of portions of structures, repairing concrete structures, or encasement of structural steel members. Minimize rebound and produce a compacted dense homogenous mass. Do not apply concrete if high winds will prevent proper application or if rain could wash out the concrete.

Hold the nozzle approximately 2–4 ft. from the surface and position it so the concrete impinges nearly at right angles to the surface being covered. Use shooting strips to ensure straight lines, square corners, and a plane surface of concrete. Place to keep the trapping of rebound to a minimum. Slope the concrete off to a thin edge at the end of each day's work or at similar stopping periods requiring construction joint. Thoroughly clean and wet previously placed concrete before placing an adjacent or additional section. Apply a sufficient number of coats to obtain the required thickness. Place coats on vertical and overhead surfaces in layers of such thickness to prevent sloughing, sagging, tearing, or debonding. Provide a sufficient interval between successive layers in sloping, vertical, or overhead work to allow initial but not final set. Clean the surface to remove the thin film of laitance to provide for a bond with succeeding applications. Remove rebound and accumulated loose sand from the surface to be covered before placing the original or succeeding layers of concrete. Correct any sags or other defects to the proper section as directed.

Place concrete to completely encase reinforcing steel. Encase reinforcing steel by shooting with sufficient velocity and plasticity that material flows around and behind reinforcement.

Apply the concrete using either the wet-mix or dry-mix process unless otherwise shown on the plans. Mix the materials thoroughly and uniformly using a paddle or drum-type mixer designed for pneumatic application. Wet-mix process applications can use transit-mix concrete. Do not use the wet-mix process for repair of damaged concrete.

Clean mixing and placing equipment at regular intervals. Inspect the nozzle liner and water and air injection system daily; replace worn parts as necessary.

Do not reuse rebound or overspray concrete.

3.4.2. **Dry-Mix Process**. Use a compressor or blower capable of delivering a sufficient volume of oil-free air at the pressure shown in Table 2. Maintain steady pressure throughout the placing process.

Use a water pump with the size and capacity to deliver water to the nozzle with a pressure at least 15 psi more than the required air pressure.

The values shown in Table 2 are based on a hose length of 150 ft. with the nozzle less than 25 ft. above the delivery equipment. Increase operating pressure approximately 5 psi for each additional 50 ft. of hose and approximately 5 psi for each 25 ft. the nozzle is raised.

Table 2
Compressor Capacities

Compressor Capacity, cu. ft/min.	Hose Diameter, in.	Maximum Size of Nozzle Tip, in.	Operating Air Pressure Available, psi
250	1	3/4	40
315	1-1/4	1	45
365	1-1/2	1-1/4	55
500	1-5/8	1-1/2	65
600	1-3/4	1-5/8	75
750	2	1-3/4	85

3.4.3. **Wet-Mix Process**. Operate the pump at a line pressure between 100 psi and 300 psi. Use delivery hoses between 1-1/2 in. and 3 in. in diameter. Use mixing equipment capable of thoroughly mixing the materials in sufficient quantity to maintain continuous placement.

3.5. **Construction Joints**. Use a square butt joint where the joint is subject to compressive stress or is over existing construction joints, unless otherwise shown on the plans. Use tapered or square butt joints at other locations. Square the outside 1 in. of tapered joints perpendicular to the surface.

3.6. **Finish**. Use a sharp trowel to cut off all high spots after the concrete has been placed to the desired thickness or screed to a true plane as determined by shooting strips or by the original concrete surface. Lightly apply cutting screeds, where used, to all surfaces so as not to disturb the concrete for an appreciable depth. Work in an upward direction when concrete is applied on vertical surfaces. Give the finished concrete a final flash coat of approximately 1/8 in. unless directed otherwise. Obtain a uniform appearance on all exposed surfaces unless otherwise shown on the plans.

3.7. **Curing**. Cure encasements with water for 4 days. Cure repairs and structural construction using either a piece of wet burlap taped over the repaired area with a covering of 4-mil minimum plastic sheet also taped in place or membrane curing as approved. Overlap the burlap with the plastic sheet and continuously tape the edges with a tape at least 3 in. wide (air duct tape or better) to completely enclose the mat and hold in moisture. Cure in this manner for 4 days. Curing is not required for soil-nail walls unless walls are the final exposed surfaces; in this case, cure at least 4 days in accordance with Item 420. Apply membrane curing in accordance with Section 420.2.7., “Curing Materials,” for tunnel and ditch linings and vertical or overhead patches as approved.

3.8. **Repair of Defects**. Repair or replace debonded areas as directed.

4. MEASUREMENT

Measurement of pneumatically placed concrete for encasement of structural members will be by the square foot of the actual contact area.

Measurement of pneumatically placed concrete for repair of concrete structures will be by the cubic foot in place using the surface area times the average depth of the patch. When pneumatically placed concrete for repair of concrete structures is allowed or specified for Item 429, “Concrete Structure Repair,” measurement and payment are in accordance with Article 429.5., “Payment.”

5. PAYMENT

When pneumatically placed concrete is specified as a bid item, the work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Pneumatically Placed Concrete (Encasement)” or for “Pneumatically Placed Concrete (Repair).” This price is full compensation for cement, aggregate, water, and reinforcement; furnishing and installing steel anchors; removal of deteriorated or unsound concrete; mixing, placing, and curing pneumatically placed concrete; and equipment, labor, tools, and incidentals. Pneumatically placed concrete used for work other than encasement or repair will not be paid for directly, but will be subsidiary to pertinent Items.

Item 432
Riprap

1. DESCRIPTION

Furnish and place concrete, stone, cement-stabilized, or special riprap.

2. MATERIALS

Furnish materials in accordance with the following.

- Item 420, "Concrete Substructures"
- Item 421, "Hydraulic Cement Concrete"
- Item 431, "Pneumatically Placed Concrete"
- Item 440, "Reinforcement for Concrete"
- DMS-6200, "Filter Fabric"

2.1. **Concrete Riprap**. Use Class B concrete unless otherwise shown on the plans.

2.2. **Pneumatically Placed Concrete Riprap**. Use Class II concrete that meets the requirements of Item 431, unless otherwise shown on the plans.

2.3. **Stone Riprap**. Use durable natural stone with a bulk specific gravity of at least 2.50 as determined in accordance with Tex-403-A, unless otherwise shown on the plans. Provide stone that, when tested in accordance with Tex-411-A, has weight loss of no more than 18% after five cycles of magnesium sulfate solution.

Perform a size verification test on the first 5,000 sq. yd. of finished riprap stone for all types of stone riprap at a location determined by the Engineer. Test the riprap stone in accordance with ASTM D5519, Test Method D, unless otherwise directed. Additional tests may be required. Do not place additional riprap until the initial 5,000 sq. yd. of riprap has been approved.

Provide grout or mortar in accordance with Item 421 when specified. Provide grout with a consistency that will flow into and fill all voids.

Provide filter fabric in accordance with DMS-6200. Provide Type 2 filter fabric for protection stone riprap, unless otherwise shown on the plans. Provide Type 2 filter fabric for Type R, F, or Common stone riprap when shown on the plans.

2.3.1. **Type R**. Use stones between 50 and 250 lb., with at least 50% of the stones heavier than 100 lb.

2.3.2. **Type F**. Use stones between 50 and 250 lb., with at least 40% of the stones heavier than 100 lb. Use stones with at least one broad flat surface.

2.3.3. **Common**. Use stones between 50 and 250 lb. Use stones that are at least 3 in. in their least dimension. Use stones that are at least twice as wide as they are thick. When shown on the plans or approved, material may consist of broken concrete removed under the Contract or from other approved sources. Cut exposed reinforcement flush with all surfaces before placement of each piece of broken concrete.

2.3.4. **Protection**. Use boulders or quarried rock that meets the gradation requirements shown in Table 1. Both the width and the thickness of each piece of riprap must be at least 1/3 of the length. When shown on the plans or as approved, material may consist of broken concrete removed under the Contract or from other approved

sources. Cut exposed reinforcement flush with all surfaces before placement of each piece of broken concrete. Determine gradation of the finished, in-place, riprap stone under the direct supervision of the Engineer in accordance with ASTM D5519, Test Method D, unless otherwise directed.

Table 1
In-Place Protection Riprap Gradation Requirements

Nominal Size	Maximum Weight (lb.)	90% Weight[1] (lb.)	50% Weight[2] (lb.)	Minimum 8% Weight[3] (lb.)
12 in.	200	80–180	30–75	3
15 in.	320	170–300	60–165	20
18 in.	530	290–475	105–220	22
21 in.	800	460–720	175–300	25
24 in.	1,000	550–850	200–325	30
30 in.	2,600	1,150–2,250	400–900	40
36 in.	4,400	2,200–3,900	800–1,700	140

1. The 90% weight is the stone weight heavier than 90% of the individual riprap stones, and lighter than 10% of individual riprap stones.
2. The 50% weight is the stone weight heavier than 50% of individual riprap stones, and lighter than 50% of individual riprap stones.
3. The 8% weight is the stone weight heavier than 8% of individual riprap stones, and lighter than 92% of individual riprap stones.

The Engineer may require in-place verification of the stone gradation. Determine the in-place gradation of the riprap stone by taking linear transects along the riprap and measuring the intermediate axis of the stone at select intervals. Place a tape measure along the riprap and determine the intermediate axis size of the stone at 2-ft. intervals. Measure at least 100 stones, either in a single transect or in multiple transects, then follow ASTM D5519, Test Method D to determine the gradation, unless otherwise directed. Table 2 is a guide for comparing the stone size in inches to the stone weight shown in Table 1.

Table 2
Protection Riprap Stone Size[1]

Nominal Size	Dmax (in.)	D90 (in.)	D50 (in.)	D8 (in.)
12 in.	13.76	10.14–13.29	7.31–9.92	3.39
15 in.	16.10	13.04–15.75	9.21–12.91	6.39
18 in.	19.04	15.58–18.36	11.10–14.21	6.59
21 in.	21.85	18.17–21.09	13.16–15.75	6.88
24 in.	23.53	19.28–22.29	13.76–16.18	7.31
30 in.	32.36	24.65–30.84	17.34–22.72	8.05
36 in.	38.56	30.61–37.04	21.85–28.09	12.22

1. Based on a specific gravity of 2.5 and using the following equation for the intermediate axis diameter: $D = (12 \text{ in./ft.}) * \{(W)/(Gs * 62.4 * 0.85)\}^{1/3}$

   where:
   D = intermediate axis diameter (in.)
   W = weight of stone (lb.)
   Gs = Specific gravity of stone

   Note—If the specific gravity of the stone is greater than 2.5, then the above equation can be used to determine the appropriate size using the actual specific gravity.

When bedding is required, provide bedding stone that, in place, meets the gradation requirements shown in Table 3 or as otherwise shown on the plans. If the nominal size of the protection riprap is less than or equal to 30 in., verify the gradation of the bedding material in accordance with Tex-401-A unless otherwise directed. If the nominal size of the protection riprap is equal to 36 in., verify the gradation of the bedding material in accordance with ASTM D5519, Test Method D, unless otherwise directed.

Table 3
Protection Riprap Bedding Material Gradation Requirements

Nominal Size <36 in.		Nominal Size = 36 in.	
Sieve Size (Sq. Mesh)	**% by Weight Passing**	**Sieve Size (Sq. Mesh)**	**% by Weight Passing**
3”	100	6”	100
1-1/2”	50–80	4”	35–75
3/4”	20–60	3”	45–60
#4	0–15	2”	0–15
#10	0–5	–	–

2.4. **Cement-Stabilized Riprap**. Provide aggregate that meets the requirements of Item 247, “Flexible Base,” for the type and grade shown on the plans. Use cement-stabilized riprap with 7% hydraulic cement by dry weight of the aggregate unless otherwise directed.

2.5. **Special Riprap**. Furnish materials for special riprap as shown on the plans.

3. CONSTRUCTION

Dress slopes and protected areas to the line and grade shown on the plans before the placement of riprap. Place riprap and toe walls as shown on the plans or as directed.

3.1. **Concrete Riprap**. Reinforce concrete riprap with 6 × 6 – W2.9 × W2.9 welded wire fabric or with No. 3 or No. 4 reinforcing bars spaced at a maximum of 18 in. in each direction unless otherwise shown on the plans. Alternative styles of welded wire fabric that provide at least 0.058 sq. in. of steel per foot in both directions may be used if approved. A combination of welded wire fabric and reinforcing bars may be provided when both are permitted. Provide a minimum 6-in. lap at all splices. Provide horizontal cover of at least 1 in. and no more than 3 in. at the edge of the riprap. Place the first parallel bar no more than 6 in. from the edge of concrete. Use approved supports to hold the reinforcement approximately equidistant from the top and bottom surface of the slab. Adjust reinforcement during concrete placement to maintain correct position.

Sprinkle or sprinkle and consolidate the subgrade before the concrete is placed as directed. All surfaces must be moist when concrete is placed.

Compact and shape the concrete once it has been placed to conform to the dimensions shown on the plans. Finish the surface with a wood float after it has set sufficiently to avoid slumping to secure a smooth surface or broom finish as approved.

Cure the riprap immediately after the finishing operation in accordance with Item 420.

3.2. **Stone Riprap**. Provide the following types of stone riprap when shown on the plans.

- **Dry Riprap**. Stone riprap with voids filled with only spalls or small stones.
- **Grouted Riprap**. Type R, F, or Common stone riprap with voids grouted after all the stones are in place.
- **Mortared Riprap**. Type F stone riprap laid and mortared as each stone is placed.

Use spalls and small stones lighter than 25 lb. to fill open joints and voids in stone riprap, and place to a tight fit.

Place mortar or grout only when the air temperature is above 35°F. Protect work from rapid drying for at least 3 days after placement.

For slope or wave protection, if filter fabric is required, place filter fabric with its long axis running up and down the slope unless otherwise approved. For stream bank protection, if filter fabric is required, place the filter fabric with its long axis parallel to the centerline of the channel unless otherwise approved. Overlap the uphill or upstream sheet over the downhill or downstream sheet. For above water applications, ensure

adjacent sheets of filter fabric have a minimum overlap of 2 ft. in each direction. Secure filter fabric in place with nails or pins. Use 12-in. long, 3/16-in. diameter nails with 1.5-in. washers, or U-shaped steel pins with each leg at least 9 in. long. Space nails or pins at a maximum of 10 ft. in each direction and 5 ft. along the seams. Along the seams, place nails or pins through both strips of filter fabric at approximately the midpoint of the overlap. Place additional nails or pins as necessary to hold the filter fabric in position. Alternative anchorage and spacing may be used when approved. Keep the fabric material free of tension, stress, folds, wrinkles, or creases.

Methods for underwater filter placement must be approved before installation. For underwater placement, filter fabric should be unrolled in the direction of flow, overlapped at least 3 ft., and secured with sandbags, rocks, nails, or pins to prevent distortion. To prevent segregation and transport, underwater installation of a granular filter must be by clamshell bucket or tremie, with the granular material released on or very near the bed, unless otherwise approved. Underwater placement of a granular filter is permitted only if the water velocity is less than 5 ft. per second unless otherwise approved.

Any defects, tears, holes, flaws, or damage to filter fabric may be cause for rejection. Repair torn or punctured filter fabric by placing an additional layer of filter fabric over the damaged area, ensuring a minimum overlap of 3 ft. beyond the damaged area in all directions, and securing the filter fabric in place with pins or nails. Store filter fabric out of direct sunlight and cover the filter fabric as soon as possible after placement, but within 3 days.

3.2.1. **Type R**. Construct riprap as shown in Figure 1 on the *Stone Riprap Standard* and as shown on the plans. Place stones in a single layer with close joints so most of their weight is carried by the earth and not the adjacent stones. Place the upright axis of the stones at an angle of approximately 90° to the embankment slope. Place each course from the bottom of the embankment upward with the larger stones in the lower courses.

Fill open joints between stones with spalls. Place stones to create a uniform finished top surface. Do not exceed a 6-in. variation between the tops of adjacent stones. Replace, embed deeper, or chip away stones that project more than the allowable amount above the finished surface.

Prevent earth, sand, or foreign material from filling the spaces between the stones when the plans require Type R stone riprap to be grouted. Wet the stones thoroughly after they are in place, fill the spaces between the stones with grout, and pack. Sweep the surface of the riprap using a stiff broom after grouting.

3.2.2. **Type F**.

3.2.2.1. **Dry Placement**. Construct riprap as shown in Figure 2 on the *Stone Riprap Standard*. Set the flat surface on a prepared horizontal earth bed and overlap the underlying course to secure a lapped surface. Place the large stones first, roughly arranged in close contact. Fill the spaces between the large stones with suitably sized stones placed to leave the surface evenly stepped and conforming to the contour required. Place stone to drain water down the face of the slope.

3.2.2.2. **Grouting**. Construct riprap as shown in Figure 3 on the *Stone Riprap Standard*. Size, shape, and lay large flat-surfaced stones to produce an even surface with minimal voids. Place stones with the flat surface facing upward parallel to the slope. Place the largest stones near the base of the slope. Fill spaces between the larger stones with stones of suitable size, leaving the surface smooth, tight, and conforming to the contour required. Place the stones to create a plane surface with a variation no more than 6 in. in 10 ft. from true plane. Provide the same degree of accuracy for warped and curved surfaces. Prevent earth, sand, or foreign material from filling the spaces between the stones. Wet the stones thoroughly after they are in place, fill the spaces between them with grout, and pack. Sweep the surface using a stiff broom after grouting.

3.2.2.3. **Mortaring**. Construct riprap as shown in Figure 2 on the *Stone Riprap Standard*. Lap courses as described for dry placement. Wet the stones thoroughly before placing mortar. Bed the larger stones in fresh mortar as they are being placed and shove adjacent stones into contact with one another. Spread excess mortar forced out during placement of the stones uniformly over them to fill all voids completely. Point up all joints roughly either with flush joints or shallow, smooth-raked joints as directed.

3.2.3. **Common**. Construct riprap as shown in Figure 4 on the *Stone Riprap Standard*. Place stones on a bed excavated for the base course. Bed the base course of stone well into the ground with the edges in contact. Bed and place each succeeding course in even contact with the preceding course. Use spalls and small stones to fill any open joints and voids in the riprap. Ensure the finished surface presents an even, tight surface, true to the line and grades of the typical sections.

Prevent earth, sand, or foreign material from filling the spaces between the stones when the plans require grouting common stone riprap. Wet the stones thoroughly after they are in place, fill the spaces between them with grout, and pack. Sweep the surface using a stiff broom after grouting.

3.2.4. **Protection**. Construct riprap as shown in Figure 5 on the *Stone Riprap Standard*. Place riprap stone on the slopes within the limits shown on the plans. Place stone for riprap on the filter fabric to produce a reasonably well-graded mass of riprap with the minimum practicable percentage of voids. Place riprap stone on top of the filter fabric, always starting at the bottom and working toward the top of any slope. Construct the riprap to the lines and grades shown on the plans or staked in the field. A tolerance of +6 in. and -0 in. from the slope line and grades shown on the plans is allowed in the finished surface of the riprap. Place riprap to its full thickness in a single operation. Avoid displacing the filter fabric. Ensure the entire mass of stones in its final position is free of objectionable pockets of small stones and clusters of larger stones. Do not place riprap in layers, and do not place it by dumping it into chutes, dumping it from the top of the slope, pushing it from the top of the slope, or any method likely to cause segregation of the various sizes. Obtain the desired distribution of the various sizes of stones throughout the mass by selective loading of material at the quarry or other source, or by other approved methods of placement that will produce the specified results. Rearrange individual stones using mechanical equipment or by hand if necessary to obtain a reasonably well-graded distribution of stone sizes. If required, use the bedding thickness shown on the plans and place stone for riprap on the bedding material to produce a reasonably well-graded mass of riprap with the minimum practicable percentage of voids.

3.3. **Pneumatically Placed Concrete Riprap, Class II**. Meet the requirements of Item 431. Provide reinforcement as shown on the plans and in accordance with Item 440. Support reinforcement with approved supports throughout placement of concrete.

Give the surface a wood-float finish or a gun finish as directed. Cure the riprap with membrane-curing compound immediately after the finishing operation in accordance with Item 420.

3.4. **Cement-Stabilized Riprap**. Follow the requirements of the plans and the provisions for concrete riprap except when reinforcement is not required. The Engineer will approve the design and mixing of the cement-stabilized riprap.

3.5. **Special Riprap**. Construct special riprap as shown on the plans.

4. MEASUREMENT

This Item will be measured by the cubic yard of material complete in place. Volume will be computed based on the measured area in place and the thickness and toe wall width shown on the plans.

If required on the plans, the pay quantity of the bedding material for stone riprap for protection to be paid for will be measured by the cubic yard as computed from the measured area in place and the bedding thickness shown on the plans.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Riprap" of the type, nominal size, and void-filling technique (dry, grout, or mortar) specified, as applicable. This price is full compensation for furnishing, hauling, and placing riprap and for filter fabric, expansion joint material, concrete and reinforcing steel, grout and mortar, scales, test weights, equipment, labor, tools, and incidentals.

Payment for excavation of toe wall trenches, for all necessary excavation below natural ground or bottom of excavated channel, and for shaping of slopes for riprap will be included in the unit price bid per cubic yard of riprap.

When bedding is required for protection stone riprap, payment will be made at the unit price bid for “Bedding Material” of the thickness specified. This price is full compensation for furnishing, hauling, placing, and maintaining the stone bedding material until placement of the riprap cover is completed and accepted; excavation required for placement of bedding material; and equipment, scales, test weights, labor, tools, and incidentals. No payment will be made for excess thickness of bedding or for material required to replace embankment material lost by rain wash, wind erosion, or otherwise.

Item 438
Cleaning and Sealing Joints

1. DESCRIPTION

Clean and seal joints in new or existing rigid concrete pavements and bridge decks. Resize joints in rigid concrete pavements and approach slabs as shown on the plans.

2. MATERIALS

Use sealants of the class shown on the plans that meet the requirements of DMS-6310, "Joint Sealants and Fillers," except as modified herein. Use primers recommended by the manufacturer of the sealant if required.

When a foam-type joint seal is specified, provide one of the listed systems shown on the plans with material meeting the requirements of Section 454.3.4., "Foam-Type Joint Seal."

Provide backer rods that are circular and are 25% larger than the joint opening. Use backer rods compatible with the sealant that do not react with or bond to the sealant.

3. EQUIPMENT

Use equipment that meets sealant manufacturer's recommendations. Use air compressors equipped with appropriate filters for removing oil and water from the air. Provide concrete saws with sufficient capacity to cut full depth of concrete pavement, approach slabs, and bridge decks.

4. CONSTRUCTION

Submit information from the sealant manufacturer showing recommended equipment and installation procedures before starting work. All equipment and procedures will be subject to approval. If the equipment causes damage to dowels, reinforcing steel, concrete, base, sub-base, or subgrade, repair the damage and change the procedure and equipment to prevent further damage.

When foam-type joint seal is shown on the plans, provide a technician associated with the joint seal manufacturer for training and installation of the initial joint. Provide written instructions from the manufacturer for joint seal installation. Measure all joint openings and size the width of joint seal in conformance with the manufacturer's specifications.

4.1. **Preparation**. Remove all debris, dirt, dust, saw cuttings, and other foreign material from joint by an approved method. Collect and dispose of all the removed material.

Remove existing preformed bituminous fiber board material or other spacer material the full depth of the joint along with all other debris in the joint opening. Resize the joint sealant space by sawing to the width and depth shown on the plans to accommodate the type of sealant specified.

Clean debris full depth of the joint, including from the diaphragm windows below the joints on concrete slab-and-girder (pan girder) and tee-beam bridges.

Abrasive-blast clean the vertical faces of joints armored with steel to remove all visible rust, paint, mill scale, and other forms of contamination, leaving a white metal appearance. Clean concrete and other surfaces by method approved and in conformance with the manufacturer's specifications before placing sealant. Air blast the joint after cleaning to remove all dust.

Saw-cut concrete pavement and concrete approach slab full depth to provide joint opening as shown on the plans and as directed. Clean all debris out of the joint full depth of concrete pavement.

4.2. **Sealing**. Place the sealant in conformance with the manufacturer's recommended procedures. Apply the primer, when required, at the specified rate and time interval before applying the sealant. Apply the sealant to dry joint surfaces unless otherwise recommended by the sealant manufacturer. Tool any sealant material that is not self-leveling to force the sealant against the joint surfaces.

Place approved support spacers into joints as shown on the plans for concrete pavement. Place a backer rod in the joint opening to prevent the sealant from flowing through the joint and to hold the sealant at its required elevation, unless directed otherwise. Set the top of the sealant and thickness of sealant as shown on the plans. Do not place sealant in an expansion-type joint if surface temperature is below 55°F or above 90°F.

5. MEASUREMENT

When shown on the plans to be a pay item, this Item will be measured by the foot of sealant placed.

6. PAYMENT

Unless otherwise shown on the plans, the work performed and materials furnished in accordance with this Item will not be paid for directly, but will be subsidiary to bid items of the Contract.

When shown as a pay item, the work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Cleaning and Sealing Existing Joints"; "Cleaning and Sealing Joints" of the class, if specified; "Cleaning and Sealing Joints (Foam)"; "Cleaning Existing Joints"; and "Resizing and Sealing Joints." This price is full compensation for furnishing all materials; sawing, routing, and cleaning the joint; installation of joint sealant; disposing of debris; and equipment, labor, tools, and incidentals.

Item 440
Reinforcement for Concrete

1. DESCRIPTION

Furnish and place reinforcement of the type, size, and details shown on the plans.

2. MATERIALS

Use deformed steel bar reinforcement unless otherwise specified or allowed.

2.1. **Approved Mills**. Before furnishing steel, producing mills of reinforcing steel for the Department must be pre-approved in accordance with DMS-7320, "Qualification Procedure for Reinforcing Steel Production Mills," by the Materials and Tests Division. The Department's MPL includes approved producing mills. Reinforcing steel obtained from unapproved sources will not be accepted.

2.2. **Deformed Steel Bar Reinforcement**. Provide deformed reinforcing steel conforming to one of the following:

- ASTM A615, Grade 60 or 80;
- ASTM A996, Type A, Grade 60;
- ASTM A996, Type R, Grade 60, permitted in concrete pavement only (Furnish ASTM A996, Type R bars as straight bars only and do not bend them. Bend tests are not required.); or
- ASTM A706, Grade 60 or 80.

Provide the grade of reinforcing steel shown on the plans. Provide Grade 60 if no grade is shown.

The nominal size, area, and weight of reinforcing steel bars this Item covers are shown in Table 1.

Table 1
Size, Area, and Weight of Reinforcing Steel Bars

Bar Size Number (in.)	Diameter (in.)	Area (sq. in.)	Weight per Foot (lb.)
3	0.375	0.11	0.376
4	0.500	0.20	0.668
5	0.625	0.31	1.043
6	0.750	0.44	1.502
7	0.875	0.60	2.044
8	1.000	0.79	2.670
9	1.128	1.00	3.400
10	1.270	1.27	4.303
11	1.410	1.56	5.313
14	1.693	2.25	7.650
18	2.257	4.00	13.60

2.3. **Smooth Steel Bar Reinforcement**. Provide steel conforming to ASTM A615 or meet the physical requirements of ASTM A36 for smooth bars that are larger than No. 3. Designate smooth bars by size number up to No. 4 and by diameter in inches above No. 4.

2.4. **Spiral Reinforcement**. Provide bars or wire for spiral reinforcement of the grade and minimum size or gauge shown on the plans.

Provide smooth or deformed wire conforming to ASTM A1064. Provide bars conforming to ASTM A615; ASTM A996, Type A; or ASTM A675, Grade 80, meeting dimensional requirements of ASTM A615.

2.5. **Weldable Reinforcing Steel**. Provide reinforcing steel conforming to ASTM A706 or with a maximum carbon equivalent (C.E.) of 0.55% if welding of reinforcing steel is required or desired. Provide a report showing the percentages of elements necessary to establish C.E. for reinforcing steel that does not meet ASTM A706, to be structurally welded. These requirements do not pertain to miscellaneous welds on reinforcing steel as defined in Section 448.4.2.1.1., "Miscellaneous Welding Applications."

Calculate C.E. using the following formula:

$$C.E. = \%C + \frac{\%Mn}{6}$$

Do not weld stainless reinforcing steel without permission from the Engineer. Provide stainless reinforcing steel suitable for welding, if required, and submit welding procedures and electrodes to the Engineer for approval.

All welding operations must be performed before any required hot-dip galvanizing.

2.6. **Welded Wire Reinforcement (WWR)**. Provide WWR conforming to ASTM A1064. Observe the relations shown in Table 2 among size number, diameter in inches, and area when ordering wire by size numbers, unless otherwise specified. Precede the size number for deformed wire with "D" and for smooth wire with "W."

Designate WWR as shown in the following example: 6 × 12 – W16 × W8 (indicating 6-in. longitudinal wire spacing and 12-in. transverse wire spacing with smooth No. 16 wire longitudinally and smooth No. 8 wire transversely).

Table 2
Wire Size Number, Diameter, and Area

Size No. (in.)	Diameter (in.)	Area (sq. in.)
31	0.628	0.310
30	0.618	0.300
28	0.597	0.280
26	0.575	0.260
24	0.553	0.240
22	0.529	0.220
20	0.505	0.200
18	0.479	0.180
16	0.451	0.160
14	0.422	0.140
12	0.391	0.120
10	0.357	0.100
8	0.319	0.080
7	0.299	0.070
6	0.276	0.060
5.5	0.265	0.055
5	0.252	0.050
4.5	0.239	0.045
4	0.226	0.040
3.5	0.211	0.035
2.9	0.192	0.029
2.5	0.178	0.025
2	0.160	0.020
1.4	0.134	0.014
1.2	0.124	0.012
0.5	0.080	0.005

Note—Size numbers (in.) are the nominal cross-sectional area of the wire in hundredths of a square inch. Fractional sizes between the sizes listed above are also available and acceptable for use.

2.7. **Welded Deformed Bar Mat Reinforcement**. Provide welded deformed bar mats in accordance with ASTM A184 except as otherwise noted in this Specification. Fabricate welded bar mats from deformed steel bars in accordance with ASTM A706 by securely connecting every intersection with a process of electrical resistance welding that employs the principle of fusion combined with pressure. The bars must be assembled by automatic machines or by other suitable mechanical means that will assure accurate spacing and alignment of all bars of the finished product

2.8. **Epoxy Coating**. Provide epoxy-coated reinforcing steel as shown on the plans. Before furnishing epoxy-coated reinforcing steel, an epoxy applicator must be pre-approved in accordance with DMS-7330, "Qualification Procedure for Reinforcing Steel Epoxy Coating Applicators." The Department's MPL includes approved applicators.

Furnish epoxy-coated reinforcing steel meeting the requirements in Table 3.

Table 3
Epoxy Coating Requirements for Reinforcing Steel

Material	Specification
Bar	ASTM A775 or A934
Wire or WWR	ASTM A884 Class A or B
Mechanical couplers	As shown on the plans
Hardware	As shown on the plans

Use epoxy coating material and coating repair material that complies with DMS-8130, "Epoxy Powder Coating for Reinforcing Steel." Patch no more than 1/4-in. total length in any foot at the applicator's plant.

Maintain identification of all reinforcing steel throughout the coating and fabrication process and until delivery to the project site.

Furnish one copy of a written certification verifying the epoxy-coated reinforcing steel meets the requirements of this Item and one copy of the manufacturer's control tests.

2.9. **Mechanical Couplers**. Use couplers of the type specified in DMS-4510, "Mechanical Couplers for Reinforcing Steel," Article 4510.6.1, "General Requirements," when mechanical splices in reinforcing steel bars are shown on the plans.

Furnish only couplers pre-qualified in accordance with DMS-4510. Ensure sleeve-wedge type couplers are not used on coated reinforcing. Sample mechanical couplers in accordance with Tex-743-I for testing before use on individual projects. Test the mechanical couplers for every project in which mechanical couplers are used in accordance with Tex-744-I. Furnish couplers only at locations shown on the plans.

Furnish couplers for stainless reinforcing steel with the same alloy designation as the reinforcing steel.

Provide hot-dip or mechanically galvanized couplers when splicing galvanized reinforcing steel or CGR.

2.10. **Fibers**. Supply fibers conforming to DMS-4550, "Fibers for Concrete," at the minimum dosage listed in the Department's MPL, when shown on the plans. Use non-metallic fibers when shown on the plans.

2.11. **Stainless Reinforcing Steel**. Provide deformed steel bars of the types shown in Table 4 and conforming to ASTM A955, Grade 60 or higher when stainless reinforcing steel is required on the plans.

Table 4
Acceptable Types of Deformed Stainless Steel Bar

Universal Numbering System designation	S31653	S31803	S24100	S32304
AISI type	316LN	2205	XM-28	2304

2.12. **Low-Carbon and Low-Chromium Reinforcing Steel**. Provide deformed steel bars conforming to ASTM A1035, Grade 100, Type CS when low carbon and low chromium reinforcing steel is required on the plans. Type CM will be permitted only if specifically allowed as shown on the plans.

2.13. **Glass-Fiber Reinforced Polymer (GFRP) Bars**. For reinforced concrete bridge decks, provide bars conforming to ASTM D7957/D7957M when GFRP bars are required on the plans. Provide GFRP bars with a minimum modulus of elasticity of 7,500 ksi when GFRP bars are required on the plans. Provide sample certification demonstrating the GFRP bar supplier has produced bar that meets the material specifications 2 mo. before fabrication. Furnish certification upon shipment that the GFRP bar supplied meets these requirements.

2.14. **Galvanized Reinforcement**. Provide galvanized reinforcing steel conforming to one of the following as shown on the plans:

- zinc-coated, hot-dip galvanized Class I or II steel reinforcement conforming to ASTM A767, Grade 60 or 80; or
- continuously hot-dip galvanized reinforcement (CGR) conforming to ASTM A1094 steel reinforcement, Grade 60 or 80.

3. CONSTRUCTION

3.1. **Bending**. Fabricate reinforcing steel bars in accordance with the CRSI *Manual of Standard Practice* to the shapes and dimensions shown on the plans. Fabricate in the shop if possible. Field-fabricate, if permitted, using an approved method. Replace improperly fabricated, damaged, or broken bars at no additional expense to the Department. Repair damaged or broken bars embedded in a previous concrete placement using an approved method.

Unless otherwise shown on the plans, the inside diameter of bar bends, in terms of the nominal bar diameter (d), must not be less than that shown in Table 5.

Table 5
Minimum Inside Diameter of Bar Bends

Bend	Bar Size No. (in.)	Diameter
Bends of 90° and greater in stirrups, ties, and other secondary bars that enclose another bar in the bend	3, 4, 5	4d[1]
	6, 7, 8	6d
Bends in main bars and in secondary bars not covered above	3–8	6d
	9, 10, 11	8d
	14, 18	10d[2]

1. For Grade 80 bars, minimum finished diameter is 5.0db.
2. Do not bend bars larger than No. 14 with grade designation of Grade 80 or higher

Bend-test representative specimens as described for smaller bars in the applicable ASTM specification where bending No. 14 or No. 18 Grade 60 bars is required. Make the required 90° bend around a pin with a diameter of 10 times the nominal diameter of the bar.

Bend stainless reinforcing steel in accordance with ASTM A955.

Do not bend hot-dip galvanized reinforcement. Only minor positioning adjustments are permitted.

Bending CGR is permitted after galvanizing.

3.2. **Tolerances**. Fabrication tolerances for bars are shown in Figure 1.

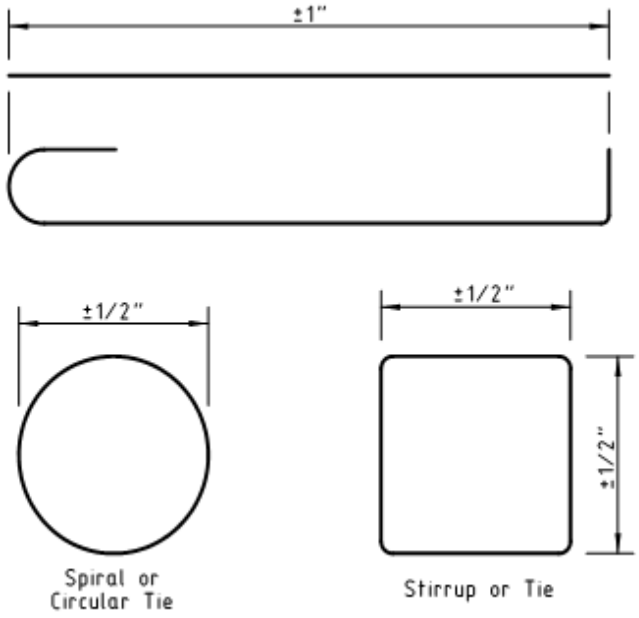

Figure 1
Fabrication Tolerances for Bars

3.3. **Storage**. Store reinforcement above the ground on platforms, skids, or other supports, and protect it from damage and deterioration. Ensure reinforcement is free of dirt, paint, grease, oil, and other foreign materials when it is placed in the work. Use reinforcement free of defects such as cracks and delaminations. Rust, surface seams, surface irregularities, or mill scale will not be cause for rejection if the minimum cross-sectional area of a hand wire-brushed specimen meets the requirements for the size of steel specified.

Do not allow stainless reinforcing steel to be in direct contact with uncoated reinforcing steel, or with galvanized reinforcing steel. This does not apply to stainless steel wires and ties. Store stainless reinforcing steel separately, off the ground on wooden supports.

3.4. **Splices**. Lap-splice, weld-splice, or mechanically splice bars as shown on the plans. Additional splices not shown on the plans will require approval. Splices not shown on the plans will be permitted in slabs no more than 15 in. in thickness, columns, walls, and parapets.

Do not splice bars less than 30 ft. in plan length unless otherwise approved. For bars exceeding 30 ft. in plan length, the distance center-to-center of splices must be at least 30 ft. minus one splice length, with no more than one individual bar length less than 10 ft. Make lap splices not shown on the plans, but otherwise permitted, in accordance with Table 6. Maintain the specified concrete cover and spacing at splices, and place the lap-spliced bars in contact, securely tied together.

Table 6
Minimum Lap Requirements for Steel Bar Sizes Through No. 11

Bar Size No. (in.)	Uncoated Lap Length	Coated Lap Length
3	1 ft. 4 in.	1 ft. 7 in.
4	1 ft. 10 in.	2 ft. 8 in.
5	2 ft. 8 in.	4 ft. 0 in.
6	3 ft. 8 in.	5 ft. 6 in.
7	4 ft. 10 in.	7 ft. 2 in.
8	6 ft. 0 in.	9 ft. 0 in.
9	7 ft. 4 in.	11 ft. 0 in.
10	8 ft. 11 in.	13 ft. 4 in.
11	10 ft. 6 in.	15 ft. 9 in.

Do not lap No. 14 or No. 18 bars.

Lap spiral steel at least one full turn.

Splice WWR using a lap length that includes the overlap of at least two cross wires plus 2 in. on each sheet or roll. Splices using bars that develop equivalent strength and are lapped in accordance with Table 6 are permitted.

Lap the existing longitudinal bars with the new bars as shown in Table 6 for box culvert extensions with less than 1 ft. of fill. Lap at least 1 ft. 0 in. for extensions with more than 1 ft. of fill.

Ensure welded splices conform to the requirements shown on the plans and Item 448, "Structural Field Welding." Field-prepare ends of reinforcing bars if they will be butt-welded. Delivered bars must be long enough to permit weld preparation.

Install mechanical coupling devices in conformance with the manufacturer's recommendations at locations shown on the plans. Protect threaded male or female connections, and ensure the threaded connections are clean when making the connection. Do not repair damaged threads.

Mechanical coupler alternate equivalent strength arrangements, to be accomplished by substituting larger bar sizes or more bars, will be considered if approved in writing before fabrication of the systems.

3.5. **Placing**. Place reinforcement as near as possible to the position shown on the plans. Do not vary bars from plan placement by more than 1/12 of the spacing between bars in the plane of the bar parallel to the nearest surface of concrete. Do not vary bars from plan placement by more than 1/4 in. in the plane of the bar perpendicular to the nearest surface of concrete. Provide a minimum 1-in. clear cover of concrete to the nearest surface of bar unless otherwise shown on the plans.

For bridge slabs, the clear cover tolerance for the top mat of reinforcement is -0, +1/2 in.

Locate the reinforcement accurately in the forms and hold it firmly in place before and during concrete placement by means of bar supports that are adequate in strength and number to prevent displacement and keep the reinforcement at the proper distance from the forms. Provide bar supports in accordance with the CRSI *Manual of Standard Practice*. Use Class 1 supports, approved plastic bar supports, precast mortar, or concrete blocks when supports are in contact with removable or stay-in-place forms. Use Class 3 supports in slab overlays on concrete panels or on existing concrete slabs. Bar supports in contact with soil or subgrade must be approved.

Use Class 1A supports with epoxy-coated reinforcing steel. Use Class 1 or Class 1A supports with CGR. Provide epoxy- or plastic-coated tie wires and clips for use with epoxy-coated reinforcing steel.

Use mortar or concrete with a minimum compressive strength of 5,000 psi for precast bar supports. Provide a suitable tie wire in each block for anchoring to the bar.

Place individual bar supports in rows at 4-ft. maximum spacing in each direction. Place continuous type bar supports at 4-ft. maximum spacing. Use continuous bar supports with permanent metal deck forms.

The exposure of the ends of longitudinals, stirrups, and spacers used to position the reinforcement in concrete pipe and storm drains is not cause for rejection.

Tie reinforcement for bridge slabs and top slabs of direct traffic culverts at all intersections, except tie only alternate intersections where spacing is less than 1 ft. in each direction. Tie the bars at enough intersections to provide a rigid cage of reinforcement for reinforcement cages for other structural members. Fasten mats of WWR securely at the ends and edges.

Clean mortar, mud, dirt, debris, oil, and other foreign material from the reinforcement before concrete placement. Do not place concrete until authorized.

Stop placement until corrective measures are taken if reinforcement is not adequately supported or tied to resist settlement, reinforcement is floating upward, truss bars are overturning, or movement is detected in any direction during concrete placement.

3.6. **Handling, Placing, and Repairing Epoxy-Coated Reinforcing Steel**.

3.6.1. **Handling**. Provide systems for handling coated reinforcing steel with padded contact areas. Pad bundling bands or use suitable banding to prevent damage to the coating. Lift bundles of coated reinforcement using a strongback, a spreader bar, multiple supports, or a platform bridge. Transport the bundled reinforcement carefully and store it on protective cribbing. Do not drop or drag the coated reinforcement.

3.6.2. **Placing**. Do not flame-cut coated reinforcement. Saw- or shear-cut only when approved. Coat cut ends in accordance with Section 440.3.6.3., “Repairing Coating.”

Do not weld or mechanically couple coated reinforcing steel except where specifically shown on the plans. Remove the epoxy coating at least 6 in. beyond the weld limits before welding and 2 in. beyond the limits of the coupler before assembly. Clean the steel of oil, grease, moisture, dirt, welding contamination (slag or acid residue), and rust to a near-white finish after welding or coupling. Check the existing epoxy for damage. Remove any damaged or loose epoxy back to sound epoxy coating.

Coat the splice area after cleaning with epoxy repair material to a thickness of 7–17 mils after curing. Apply a second application of repair material to the bar and coupler interface to ensure complete sealing of the joint.

3.6.3. **Repairing Coating**. Use material that complies with the requirements of this Item and ASTM D3963 for repairing of the coating. Make repairs in conformance with procedures recommended by the manufacturer of the epoxy coating powder. Apply at least the same coating thickness as required for the original coating for areas to be patched. Repair all visible damage to the coating.

Repair sawed and sheared ends, cuts, breaks, and other damage promptly before additional oxidation occurs. Clean areas to be repaired to ensure they are free of surface contaminants. Make repairs in the shop or field as required.

3.7. **Repair of Galvanized Reinforcing Steel**. Repair damaged galvanized surfaces in accordance with Section 445.3.4.2. “Repair Processes.”

3.8. **Handling and Placing Stainless Reinforcing Steel**. Handle, cut, and place stainless reinforcing steel bar using tools that are not used on carbon steel. Do not use carbon steel tools, chains, or slings when handling stainless steel. Use only nylon or polypropylene slings. Cut stainless steel reinforcing using shears, saws, abrasive cutoff wheels, or torches. Remove any thermal oxidation using pickling paste. Do not field bend stainless steel reinforcing without approval.

Use 16-gauge fully annealed stainless steel tie wire conforming to the material properties listed in Section 440.2.11., “Stainless Reinforcing Steel.” Support all stainless reinforcing steel on solid plastic, stainless steel, or epoxy-coated steel chairs. Do not use uncoated carbon steel chairs in contact with stainless reinforcing steel.

3.9. **Bending, Handling, Repairing, and Placing GFRP Bars**. Fabricate, handle, repair, and place GFRP bars in accordance with the AASHTO *LRFD Bridge Design Guide Specifications for GFRP-Reinforced Concrete*, Section 6, “Construction Specifications.”

4. MEASUREMENT AND PAYMENT

The work performed, materials furnished, equipment, labor, tools, and incidentals will not be measured or paid for directly, but will be subsidiary to pertinent Items.

Item 441
Steel Structures

1. DESCRIPTION

Fabricate and erect structural steel and other metals used for steel structures or for steel portions of structures.

2. MATERIALS

2.1. **Base Metal**. Use metal that meets Item 442, "Metal for Structures."

2.2. **Approved Electrodes and Flux-Electrode Combinations**. Use only electrodes and flux-electrode combinations conforming to AWS A5 specifications and pertinent classifications for the applicable welding processes. When requested, submit a current Certificate of Conformance (COC) containing all test results as required by the applicable AWS A5 specification and welding code. Provide proof of Buy America compliance for welding consumables when requested. For bridge main member fabrication, submit the COC annually.

2.3. **High-Strength Bolts**. Use fasteners that meet Item 447, "Structural Bolting." Use galvanized fasteners on field connections of bridge members when ASTM F3125, Grade A325 bolts are specified and steel is painted.

2.4. **Paint Systems**. Provide the paint system (surface preparation, primer, intermediate, and appearance coats as required) shown on the plans. Provide System IV if no system is specified.

2.4.1. **Standard Paint Systems**. Standard paint systems for painting new steel include the following.

2.4.1.1. **System III-B**. Provide paint in accordance with DMS-8101, "Structural Steel Paints—Performance." Provide inorganic zinc (IOZ) prime coat, epoxy intermediate coat, and urethane appearance coat for all outer surfaces except those to be in contact with concrete. Provide epoxy zinc prime coat for touchup of IOZ.

2.4.1.2. **System IV**. Provide paint in accordance with DMS-8101. Provide IOZ prime coat and acrylic latex appearance coat for all outer surfaces except those to be in contact with concrete. Provide epoxy zinc prime coat for touchup of IOZ.

2.4.2. **Paint Inside Tub Girders and Closed Boxes**. Provide IOZ primer meeting the requirements of DMS-8101 to all interior surfaces, including faying surfaces and splice plates.

2.4.3. **Special Protection System**. Provide the type of paint system shown on the plans or in conformance with special provisions to this Item. Special Protection Systems must have completed AASHTO Product Evaluation & Audit Solutions Structural Steel Coatings (SSC) testing regimen as a complete system, with full data available from AASHTO, and be approved before use.

2.4.4. **Galvanizing**. Provide galvanizing, as required, in accordance with Item 445, "Galvanizing."

2.4.5. **Paint over Galvanizing**. Paint over galvanized surfaces, when required, in accordance with Item 445.

2.4.6. **Field Painting**. Provide field paint, as required, in accordance with Item 446, "Field Cleaning and Painting Steel."

3. CONSTRUCTION

3.1. **General Requirements**.

3.1.1. **Applicable Codes**. Perform all fabrication of bridge members in accordance with AASHTO/NSBA Steel Bridge Collaboration S2.1. Follow all applicable provisions of the appropriate AWS code (D1.5 or D1.1) except as otherwise shown on the plans or in accordance with this Item. Weld sheet steel (thinner than 1/8 in.) in accordance with ANSI/AWS D1.3, *Structural Welding Code—Sheet Steel*. Unless otherwise stated, requirements of this Item are in addition to the requirements of S2.1 for bridge members. Follow the more stringent requirement in case of a conflict between this Item and S2.1. Perform all bolting in accordance with Item 447.

Fabricate railroad underpass structures in accordance with the AREMA *Manual for Railway Engineering* and this Item. In the case of a conflict between this Item and the AREMA manual, the more stringent requirements apply.

3.1.2. **Notice of Fabrication**. Give adequate notice before commencing fabrication as specified in Table 1. Include a schedule for all major fabrication processes and dates when inspections are to occur.

Table 1
Notice of Commencing Fabrication

Plant Location	Notice Required
In Texas	7 days
In the contiguous United States	21 days
Outside the contiguous United States	60 days

Perform no Department work in the plant before the Engineer authorizes fabrication. The Contractor must bear all costs associated with the Department's inspection when changes to their fabrication schedules occur and are not adequately conveyed to the Department in accordance with Table 1.

When any structural steel is fabricated outside the contiguous 48 states, the additional cost of inspection will be in accordance with Article 6.4., "Sampling, Testing, and Inspection."

3.1.3. **Bridge Members**. Primary bridge members include:

- web and flanges of plate, tub, and box girders;
- rolled beams and cover plates;
- floor beam webs and flanges;
- arch ribs and arch tie beams or girders;
- truss members;
- diaphragm members for curved plate girders or beams;
- pier diaphragm members for tub girders;
- splice plates for primary members; and
- any other member designated as "primary" or "main" on the plans.

Secondary bridge members include:

- bracing (diaphragms, cross frames, and lateral bracing); and
- all other miscellaneous bridge items not considered primary bridge members.

3.1.4. **Responsibility**. The Contractor is responsible for the correctness and completeness of shop drawings and for the fit of shop and field connections.

3.1.5. **Qualification of Plants and Personnel**.

3.1.5.1. **Plants**. Fabrication plants that produce bridge members must be approved in accordance with DMS-7370, "Steel Bridge Member Fabrication Plant Qualification." The Department's MPL has a list of approved bridge member fabrication plants.

Fabrication plants that produce the following non-bridge steel members must be approved in accordance with DMS-7380, "Steel Non-Bridge Member Fabrication Plant Qualification":

- Item 610, "Roadway Illumination Assemblies,"
- Item 613, "High Mast Illumination Poles,"
- Item 614, "High Mast Illumination Assemblies,"
- Item 650, "Overhead Sign Supports,"
- Item 654, "Sign Walkways,"
- Item 686, "Traffic Signal Pole Assemblies," and
- Special Specification, "Intelligent Transportation System (ITS) Pole with Cabinet."

The Materials and Tests Division (MTD) maintains a list of approved non-bridge fabrication plants on the Department MPL that produce these members.

Fabrication plants that produce metal bridge rail must be approved in accordance with DMS-7395, "Metal Railing Fabrication Plant Qualification." The Department's MPL has a list of approved metal bridge railing fabrication plants.

3.1.5.2. **Personnel**. Provide a QC staff qualified in conformance with the applicable AWS code. Provide an adequate number of qualified QC personnel for each specific production operation. QC must be onsite and independent of production personnel, as the Engineer determines. QC personnel must be proficient in using the applicable plans, specifications, and test methods, and in verifying compliance with the plant QC and production procedures. Welding inspectors must be current AWS Certified Welding Inspectors for bridge member plants and for non-bridge member plants requiring Department approval in accordance with DMS-7380 and DMS-7395. The QC staff must provide inspection of all materials and workmanship before the Department's inspection. Provide the Department inspector with adequate personnel and equipment needed to move material for inspection access. QC is solely the Contractor's responsibility.

3.1.5.3. **Nondestructive Testing (NDT)**. Personnel performing NDT must be qualified in conformance with the applicable AWS code and the employer's Written Practice. Level III personnel who qualify Level I and Level II technicians must be certified by ASNT within the areas in which the NDT Level III is qualified. In addition, NDT technicians must pass hands-on tests administered by MTD. This will remain current provided they continue to perform testing on Department materials as evidenced by test reports requiring their signature. A technician who fails any of the hands-on tests must wait 3 mo. or as approved before retesting. Qualification to perform NDT will be revoked when the technician's employment is terminated or when the technician does not perform a test on a Department project for 6 consecutive mo. The technician must pass a new hands-on test to be re-certified. Testing of similar weld joints for non-Department projects may be considered by the Engineer instead of re-testing, provided sufficient documentation is submitted with the signature of the project's Engineer. These requirements also apply to testing agencies and individual third-party contractors.

3.1.5.4. **Welding Procedure Specifications (WPSs) Qualification Testing**. For fabricators qualified in accordance with DMS-7370, DMS-7380, or DMS-7395, laboratories performing procedure qualification testing for WPSs must be accredited by a nationally recognized agency that performs testing in accordance with ISO/International Electrotechnical Commission (IEC) 17025 in the mechanical field of testing.

3.1.6. **Drawings**.

3.1.6.1. **Erection Drawings**. Submit erection drawings prepared by a licensed professional engineer, including calculations, for approval in accordance with Item 5, "Control of the Work," at least 4 weeks before erecting any portion of field-spliced (welded or bolted) girders, railroad underpasses, trusses, arches, or other

members for which erection drawings are required on the plans. Include drawings and calculations for any temporary structures used to support partially erected members. Erection drawings are not required for rolled I-beam units unless otherwise shown on the plans.

Prepare erection drawings following the procedures outlined in Section 2.2 of AASHTO/NSBA Steel Bridge Collaboration S10.1. At minimum, include:

- plan of work area showing structure location relative to supports and all obstructions;
- equipment to be used, including allowable load information;
- erection sequence for all pieces;
- member weights and center of gravity location of pieces to be lifted;
- locations of cranes, holding cranes, and temporary supports (falsework), including when to release load from temporary supports and holding cranes;
- details of falsework, including specific bracing requirements with maximum allowable design wind speed clearly indicated;
- girder lifting points;
- diaphragm and bracing requirements; and
- minimum connection requirements when more than the standard requirements.

Perform erection engineering evaluation of the structural adequacy and stability of constructing the bridge system for each step of the steel erection.

Do not proceed if site conditions differing from those depicted on the approved erection drawings could affect temporary support stresses, erected girders, or public safety in any manner. Revise erection drawings and resubmit to the Engineer for approval before proceeding.

3.1.6.2. **Shop Drawings**. Prepare and electronically submit shop drawings before fabrication for each detail of the general plans requiring the use of structural steel, forgings, wrought iron, or castings in accordance with the Bridge Division *Guide to Shop Drawing Submittals* available on the Department's website, and as directed for other items the standard specifications require.

Indicate joint details on shop drawings for all welds. Provide a title block on each sheet in the lower right corner that includes:

- project identification data, including federal and state project numbers,
- sheet numbering for the shop drawings,
- name of the structure or stream for bridge structures,
- name of owner or developer,
- name of the fabricator or supplier, and
- name of the Contractor.

Provide one complete approved 11 × 17-in. set in hardcopy to the Department Inspector at the fabrication plant. Stamp it "For Materials and Tests Division Inspector." The Engineer may require additional complete hardcopy sets.

3.1.6.2.1. **Bridge Members**. Prepare drawings in accordance with AASHTO/NSBA Steel Bridge Collaboration G1.3, "Shop Detail Drawing Presentation," unless otherwise approved. Print a bill of material on each sheet, including the Charpy V-Notch (CVN) and fracture-critical requirements, if any, for each piece. Indicate fracture-critical areas of members.

3.1.6.2.2. **Non-Bridge Members**. Furnish shop drawings for non-bridge members when shown on the plans or in conformance with pertinent Items.

3.1.7. **Welding Procedure Specifications (WPSs)**. Submit WPSs and test reports in conformance with the applicable AWS code to MTD before fabrication begins and notify the Engineer which procedures will be used for each joint or joint type. Do not begin fabrication until the Engineer approves WPSs.

Post the approved WPSs for the welding being performed on each welding machine or use another approved method of ensuring the welder always has access to the procedure information.

3.1.8. **Documentation**. Provide a completed Material Statement Form 1818 (D-9-USA-1) with supporting documentation [such as mill test reports (MTRs)] that the producing mill issues and qualified personnel verify. Ensure the documentation legibly reflects all information the applicable ASTM specifications require. Supply documents electronically to the Department.

Provide a copy of the shipping or storage invoice, as material is shipped or placed in approved storage, that reflects:

- member piece mark identification and calculated weight per piece from the Contract drawings,
- number of pieces shipped or in storage,
- total calculated weight for each invoice per bid item, and
- the unique identification number of the shipping or storage invoice.

The Inspector's acceptance of material or finished members will not prohibit subsequent rejection if the material or members are found to be damaged or defective. Replace rejected material promptly.

3.1.9. **Material Identification**. Assembly-mark individual pieces and issue cutting instructions to the shop using a system that will maintain identity of the original piece.

Identify structural steel by standard and grade of steel. Also differentiate between material toughness requirements (CVN or fracture-critical) as well as any other special physical requirements. In addition, identify structural steel for primary members by mill identification numbers (heat numbers). Use an approved identification system. Use either paint or low-stress stencils to make identification markings on the metal. Mark the material as soon as it enters the shop and carry the markings on all pieces through final fabrication. Transfer the markings before cutting steel for primary members of bridge structures into smaller pieces. Loss of identification marking on any piece, with no other positive identification, or loss of heat number identification on any primary member piece will render the piece unacceptable for use. Unidentifiable material may be approved for use after testing to establish acceptability to the satisfaction of the Engineer. Have an approved testing facility perform testing and a licensed professional engineer sign and seal the results.

Low-stress stencil marks must have a radius instead of a sharp point. Acceptable stencils include dot, vibration, and rounded-V stencils. Label these stencils so that they are easily distinguishable from other stencils that are not low-stress.

3.2. **Welding**.

3.2.1. **Details**.

3.2.1.1. **Rolled Edges**. Trim plates with rolled edges used for webs by thermal cutting.

3.2.1.2. **Weld Tabs**. Use weld tabs at least 2 in. long for manual and semi-automatic processes, at least 3 in. long for automatic processes, and in all cases at least as long as the thickness of the material being welded. Use longer weld tabs as required for satisfactory work. Duplicate the configuration of the weld tab to the joint detail being fabricated.

3.2.1.3. **Weld Termination**. Terminate fillet welds approximately 1/4 in. from the end of the attachment except for galvanized structures and flange-to-web welds, for which the fillet weld must run the full length of the attachment, unless otherwise shown on the plans.

3.2.1.4. **No-Paint Areas at Field-Welded Connections**. Keep surfaces within 4 in. of groove welds or within 2 in. of fillet welds free of shop paint.

3.2.1.5. **Galvanized Assemblies**. Completely seal all edges of tightly contacting surfaces by welding before galvanizing.

3.2.1.6. **Submerged-Arc Welding (SAW)**. Do not use hand-held semiautomatic SAW for welding bridge members unless altered to provide automatic guidance or otherwise approved.

3.2.1.7. **Non-Bridge Member Weathering Steel Welds**. Provide weld metal with atmospheric corrosion resistance and coloring characteristics similar to that of the base metal for weathering steel structures fabricated in accordance with AWS D1.1.

3.2.2. **Shop Splices**.

3.2.2.1. **Shop Splice Locations**. Keep at least 6 in. between shop splices and stiffeners or cross-frames. Obtain approval for shop splices added after shop drawings are approved.

3.2.2.2. **Grinding Splice Welds**. Grind shop groove welds in flange plates smooth and flush with the base metal on all surfaces, whether the joined parts are of equal or unequal thickness. Grind so the finished grinding marks run in the direction of stress and keep the metal below the blue brittle range (below 350°F). Groove welds in web plates, except at locations of intersecting welds, need not be ground unless shown on the plans except as required to meet AWS welding code requirements.

3.2.3. **Joint Restraint**. Never restrain a joint on both sides when welding.

3.2.4. **Stiffener Installation.**

3.2.4.1. **Flange Tilt**. Members must meet combined tilt and warpage tolerances before the installation of stiffeners. Cut stiffeners to fit acceptable flange tilt and cupping. Minor jacking that does not deform the material will be permitted.

3.2.4.2. **Stiffeners Near Field Splices**. Tack weld intermediate stiffeners within 12 in. of a welded field splice point in the shop. Weld the stiffeners in the field in accordance with Item 448, “Structural Field Welding,” after the splice is made.

3.2.5. **Nondestructive Testing (NDT)**. Perform magnetic particle testing (MT), radiographic testing (RT), or ultrasonic testing (UT) at the Contractor’s expense in accordance with AWS code D1.5 for bridge structures. The Engineer will periodically witness, examine, verify, and interpret NDT. Additional welds may be designated for NDT on the plans. Retest repaired groove welds in conformance with the applicable AWS code after repairs are made and have cooled to ambient temperature. Complete NDT and repairs before assembly of parts into a member, but after any heat-correction of weld distortion.

3.2.5.1. **Radiographic Testing (RT)**. Radiographs must have a density of at least 2.5 and no more than 3.5, as confirmed by a radiographer. The density in any single radiograph showing a continuous area of constant thickness must not vary in this area by more than 0.5. Use only ASTM System Class I radiographic film in accordance with ASTM E1815. Use low-stress stencils to make radiograph location identification marks on the steel.

3.2.5.2. **Ultrasonic Testing (UT)**. Have UT equipment calibrated yearly by an authorized representative of the equipment manufacturer or by an approved testing laboratory.

3.2.5.3. **Magnetic Particle Testing (MT)**. Use alternating current (AC) when using the yoke method unless otherwise approved. Welds may be further evaluated using half-wave rectified direct current (DC) for subsurface indications. Centerline cracking may be detected by aluminum prod method when approved.

3.3. **Bolt Holes**. Detail holes on shop drawings 1/16 in. larger in diameter than the nominal bolt size shown on the plans, unless another hole size is shown on the plans.

Thoroughly clean the contact surfaces of connection parts in accordance with Item 447 before assembling them for hole fabrication. Make holes in primary members full-size (by reaming from a subsize hole, drilling full-size, or punching full-size where permissible) only in assembly unless otherwise approved.

Ream and drill with twist drills guided by mechanical means unless otherwise approved. If subpunching holes, punch them at least 3/16 in. smaller than the nominal bolt size. Submit the proposed procedures for approval to accomplish the work from initial drilling or punching through check assembly when numerically controlled (N/C) equipment is used. Use thermal cutting for holes only with permission. Permission for thermal cutting is not required for making slotted holes, when slotted holes are shown on the plans, by drilling or punching two holes and then thermally cutting the straight portion between them. Perform all thermal cutting in accordance with Section 441.3.5.1., "Thermal Cutting."

Slightly conical holes that naturally result from punching operations are acceptable provided they do not exceed the tolerances of AASHTO/NSBA Steel Bridge Collaboration S2.1. The tolerance for anchor bolt hole diameter for bridge bearing assemblies is +1/8 in., -0.

3.4. **Dimensional Tolerances**. Meet tolerances in conformance with the applicable AWS specifications except as modified in this Section.

3.4.1. **Rolled Sections**. Use ASTM A6 mill tolerances for rolled sections, except AWS D1.5 camber tolerances apply to rolled sections with a specified camber.

3.4.2. **Flange Straightness**. Ensure flanges of completed girders are free of kinks, short bends, and waviness that depart from straightness or the specified camber by more than 1/8 in. in any 10 ft. along the flange. Rolled material must meet this straightness requirement before being laid out or worked. Plates must meet this requirement before assembly into a member. Inspect the surface of the metal for evidence of fracture after straightening a bend or buckle. The Engineer may require NDT.

3.4.3. **Alignment of Deep Webs in Welded Field Connections**. For girders 48 in. deep or deeper, the webs may be slightly restrained while checking compliance for lateral alignment at field-welded connections. In the unrestrained condition, webs 48 in. deep or deeper must meet the tolerances shown in Table 2. Girders under 48 in. deep must meet the alignment tolerances in accordance with AWS D1.5.

Table 2
Web Alignment Tolerances for Deep Girders

Web Depth (in.)	Maximum Web Misalignment (in.)
48	1/16
60	1/8
72	1/4
84	5/16
96	5/16
108	3/8
120	7/16
132	7/16
144	1/2

3.4.4. **Bearings**. Correct bearing areas of shoes, beams, and girders using heat, external pressure, or both. Grind or mill only if the actual thickness of the member is not reduced by more than 1/16 in. below the required thickness.

3.4.4.1. **I-Beams, Plate Girders, and Tub Girders**. The plane of the bearing area of beams and girders must be perpendicular to the vertical axis of the member within 1/16 in. in any 24 in.

3.4.4.2. **Closed Box Girders**. Meet these tolerances.

- The plane of the bearing areas of the box girder is perpendicular to the vertical axis of the girder within 1/16 in. across any horizontal dimension of the bearing.
- The planes of the beam supports on the box girder are true to the vertical axis of the supported beams or girders to 1/16 in. in any 24 in.

In the shop, verify the plane of all bearing areas with the box placed on its bearings to field grade, using an approved process for verification.

3.4.4.3. **Shoes**. Meet these tolerances.

- The top bolster has the center 75% of the long dimension (transverse to the girder) true to 1/32 in., with the remainder true to 1/16 in., and is true to 1/32 in. across its entire width in the short dimension (longitudinal to the girder).
- The bottom bolster is true to 1/16 in. across its diagonals.
- For a pin-and-rocker type expansion shoe, the axis of rotation coincides with the central axis of the pin.
- When the shoe is completely assembled, as the top bolster travels through its full anticipated range, no point in the top bolster plane changes elevation by more than 1/16 in. and the top bolster does not change inclination by more than 1°, for the full possible travel.

3.4.4.4. **Beam Supports**. Fabricate beam support planes true to the box girder bearing to 1/16 in. in the short direction and true to the vertical axis of the nesting girders to 1/16 in.

3.4.5. **End Connection Angles**. For floor beams and girders with end connection angles, the tolerance for the length back-to-back of connection angles is ±1/32 in. Do not reduce the finished thickness of the angles below that shown on the shop drawings if end connections are faced.

3.5. **Other Fabrication Processes**.

3.5.1. **Thermal Cutting**. Use a mechanical guide to obtain a true profile. Hand-cut only where approved. Hand-cutting of radii for beam copes, weld access holes, and width transitions is permitted if acceptable profile and finish are produced by grinding. Provide a surface finish on thermal-cut surfaces, including holes, in accordance with AWS D1.5 requirements for base metal preparation. Obtain approval before using other cutting processes.

3.5.2. **Oxygen-Gouging**. Do not oxygen-gouge quenched and tempered (Q&T), normalized, or thermo-mechanically controlled processed (TMCP) steel.

3.5.3. **Annealing and Normalizing**. Complete all annealing or normalizing (as defined in ASTM A941) before finished machining, boring, and straightening. Maintain the temperature uniformly throughout the furnace during heating and cooling so the range of temperatures at all points on the member is no more than 100°F.

3.5.4. **Machining**. Machine the surfaces of expansion bearings so the travel direction of the tool is in the direction of expansion.

3.5.5. **Camber**. Complete cambering in accordance with AASHTO/NSBA Steel Bridge Collaboration S2.1 before any heat-curving.

3.5.6. **Heat Curving**. Heat-curve in accordance with AASHTO/NSBA Steel Bridge Collaboration S2.1. The methods in the AASHTO bridge construction specifications are recommended. Attach cover plates to rolled beams before heat-curving only if the total thickness of one flange and cover plate is less than 2-1/2 in. and the radius of curvature is greater than 1,000 ft. Attach cover plates for other rolled beams only after heat-curving is completed. Locate and attach connection plates, diaphragm stiffeners, and bearing stiffeners after curving, unless girder shrinkage is accounted for.

3.5.7. **Bending of Quenched and Tempered (Q&T) Steels**. The cold-bending radius limitations for HPS 70W in AASHTO/NSBA Steel Bridge Collaboration S2.1 apply to all Q&T steels.

3.5.8. **Hammering**. Do not perform hammering on any portion of the member that causes the material to permanently deform. Avoid damage to the material by measures such as use of brass or aluminum hammers or by padding the area to be hammered.

3.6. **Nonconformance Reports (NCRs)**. Submit an NCR to the Engineer for approval when the requirements of this Item are not met. Submit NCRs in conformance with MTD's NCR guidelines document. Have readily available access to the services of a licensed professional engineer experienced in steel structures design

and fabrication. This licensed professional engineer may be responsible for reviewing potentially structurally deficient members in conformance with the NCR guidelines document. Receive Department approval before beginning repairs. Perform all repair work in strict compliance with the approved NCR and repair procedure.

3.7. **Shop Assembly**.

3.7.1. **General Shop Assembly**. Shop-assemble field connections of primary members of trusses, arches, continuous beam spans, bents, towers (each face), plate girders, field connections of floor beams and stringers (including for railroad structures), field-bolted diaphragms for curved plate girders and railroad underpasses, and rigid frames. Field-bolted cross-frames and rolled-section diaphragms do not require shop assembly. Complete fabrication, welding (except for shear studs), and field splice preparation before members are removed from shop assembly. Obtain approval for any deviation from this procedure. The Contractor is responsible for accurate geometry.

Use a method and details of preassembly consistent with the erection procedure shown on the erection plans and camber diagrams. The sequence of assembly may start from any location in the structure and proceed in one or both directions. An approved method of sequential geometry control is required unless the full length of the structure is assembled.

Verify by shop assembly the fit of all bolted and welded field connections between bent cap girders and plate girders or between plate girders and floor beams.

Do not measure horizontal curvature and vertical camber for final acceptance until all welding and heating operations are completed and the steel has cooled to a uniform temperature. Check horizontal curvature and vertical camber in a no-load condition.

3.7.2. **Bolted Field Connections**. Each shop assembly, including camber, alignment, accuracy of holes, and fit of milled joints, must be approved before the assembly is dismantled.

Assemble with milled ends of compression members in full bearing. Assemble non-bearing connections to the specified gap. Ream all subsize holes to the specified size while the connections are assembled, or drill full size while the connections are assembled. Notify the Engineer before shipping if fill plates or shims are added. Adding or increasing the thickness of shims or fill plates in bearing connections requires approval. Use drift pins and snug-tight bolts during the drilling process to ensure all planes of the connection (webs and flanges) can be assembled simultaneously. Do not use tack welds to secure plates while drilling.

Secure parts not completely bolted in the shop with temporary bolts to prevent damage in shipment and handling. Never use tack welds in place of temporary bolts.

Match-mark connecting parts in field connections using low-stress stencils in conformance with the diagram on the erection drawings.

3.7.3. **Welded Field Connections**. Mill or grind bevels for groove welds. Do not cut into the web when cutting the flange bevel adjacent to the web. End preparation, backing, and tolerances for girder splices must be in accordance with Item 448. Details for all other field welds must conform to the applicable AWS code unless otherwise shown on the plans.

In the shop, prepare ends of beams or girders to be field-welded taking into account their relative positions in the finished structure due to grade, camber, and curvature. Completely shop-assemble and check each splice. Match-mark the splice while it is assembled with low-stress stencils in conformance with the diagram on the erection drawings.

3.8. **Finish and Painting**.

3.8.1. **Shop Painting**. Perform shop painting of bridge members in accordance with DMS-8104, “Paint, Shop Application for Steel Bridge Members.” Grind corners on new steel items to be painted that are sharp or form

essentially 90° angles to an approximately 1/16-in. flat surface before blast cleaning. (A corner is the intersection of two plane faces.) This requirement does not apply to punched or drilled holes. Do not omit shop paint to preserve original markings.

Ensure painted faying surfaces meet the required slip and creep coefficients for bolted connections in accordance with DMS-8104.

Use a Class A slip (minimum slip coefficient of 0.33) if no slip coefficient or corresponding surface condition is specified. Perform all required testing at no expense to the Department.

Surface preparation and painting the interiors of tub girders and closed boxes must be in accordance with DMS-8104.

Measure the anchor profile after blast cleaning at random locations along the thermal cut surfaces. If specified anchor profile is not achieved over the entire flame-cut surface, grind the edges and re-blast to achieve the required anchor pattern.

3.8.2. **Weathering Steel**. Provide an SSPC-SP 6, "Commercial Blast Cleaning," blast in the shop to all fascia surfaces of unpainted weathering steel beams. Fascia surfaces include:

- exterior sides of outermost webs and undersides of bottom flanges of plate girders and rolled beams,
- all outer surfaces of tub girders and box girders,
- all surfaces of truss members,
- webs and undersides of bottom flanges of plate diaphragms,
- bottom surfaces of floor beams, and
- any other surfaces designated as "fascia" on the plans.

Do not mark fascia surfaces. Use one of the following methods as soon as possible to remove any markings or any other foreign material that adheres to the steel during fabrication and could inhibit the formation of oxide film:

- SSPC-SP 1, "Solvent Cleaning,"
- SSPC-SP 2, "Hand Tool Cleaning,"
- SSPC-SP 3, "Power Tool Cleaning," and
- SSPC-SP 7, "Brush-Off Blast Cleaning."

Do not use acids to remove stains or scales. Feather out touched-up areas over several feet.

3.8.3. **Machined Surfaces**. Clean and coat machine-finished surfaces that are in sliding contact, particularly pins and pinholes, using a non-drying, water-repellent, grease-type material containing rust-inhibitive compounds. Ensure the coating material contains no ingredients that might damage the steel. Protect machined surfaces from abrasive blasting.

3.9. **Handling and Storage of Materials**. Prevent damage when storing or handling girders or other materials. Remove or repair material damaged by handling devices or improper storage by acceptable means in accordance with ASTM A6 and the applicable AWS code.

Place stored materials on skids or acceptable dunnage above the ground. Keep materials clean and avoid damaging the applied coating. Shore girders and beams to keep them upright and free of standing water. Place support skids close enough to prevent excessive deflection in long members such as columns. Do not stack completed girders or beams at the jobsite.

Protect structural steel from salt water or other corrosive environments during storage and transit.

3.10. **Marking and Shipping**. Mark all structural members in conformance with the erection drawings. If a surface is painted, make the marks over the paint. Do not use impact-applied stencils to mark painted surfaces.

Mark the weight directly on all members weighing more than 3 tons.

Keep material clean and free of damage during loading, transportation, unloading, and storage. Pack bolts of each length and diameter, and loose nuts or washers of each size, separately, and ship them in boxes, crates, kegs, or barrels. Plainly mark a list and description of the contents on the outside of each package.

3.11. **Field Erection**. Do not lift and place any steel member, including girders and diaphragms, over an open highway or other open travel way unless otherwise approved. Do not allow traffic to travel under erected members until sufficiently stable as shown on approved erection drawings.

3.11.1. **Pre-Erection Conference**. Schedule and attend a pre-erection conference with the Engineer at least 7 days before commencing steel erection operations. Do not install falsework or perform any erection operations before the meeting.

3.11.2. **Methods and Equipment**. Do not tack-weld parts instead of using erection bolts. Do not tack-weld parts to hold them in place for bolting. Provide falsework, tools, machinery, and appliances, including drift pins and erection bolts. Provide enough drift pins, 1/32 in. larger than the connection bolts, to fill at least 1/4 of the bolt holes for primary connections. Use erection bolts of the same diameter as the connection bolts.

Securely tie, brace, or shore steel beams or girders immediately after erection as shown on the erection drawings. Maintain bracing or shoring until the diaphragms are in place and as specified on the erection drawings. Protect railroad, roadway, and marine traffic underneath previously erected girders or beams from falling objects associated with other construction activities.

Only welders certified or working directly under the supervision of a foreman certified in accordance with Item 448 may handle torches when applying heat to permanent structural steel members.

3.11.3. **Falsework**. Construct falsework in conformance with the erection plan. Construct foundations for shore towers as shown on erection drawings. Do not use timber mats with deteriorated timbers or soil to construct shore tower foundations. Notify the Engineer of completed falsework to obtain approval before opening roadway to traffic or starting girder erection activities. Ensure falsework is protected from potential vehicle impact. Inspect and maintain falsework daily. Use screw jacks or other approved methods to control vertical adjustment of falsework to minimize the use of shims.

3.11.4. **Handling and Assembly**. Accurately assemble all parts as shown on the plans and the approved shop drawings. Verify match-marks. Handle parts carefully to prevent bending or other damage. Do not hammer if doing so damages or distorts members. Do not weld any member for transportation or erection unless shown on the plans or approved.

3.11.4.1. **Welded Connections**. Weld flange splices to 50% of their thickness and meet the minimum erection bracing and support requirements before releasing the erection cranes, as shown on the plans and on the approved erection plans. Field-weld in accordance with Item 448.

3.11.4.2. **Bolted Connections**. Before releasing the erection cranes:

- install 50% of the bolts in the top and bottom flanges and the web with all nuts finger-tight,
- meet the minimum erection bracing and support requirements shown on the plans and on the approved erection plans, and
- install top lateral bracing across the connection for tub girders, and fully tension the bolts connecting the bracing to the top flanges.

Install high-strength bolts, including erection bolts, in accordance with Item 447. Clean bearing and faying surfaces for bolted connections in accordance with Item 447. Clean the areas of the outside ply under washers, nuts, and bolt heads before bolt installation. Ensure the required faying surface condition is present at the time of bolting.

3.11.5. **Misfits**. Correct minor misfits. Ream no more than 10% of the holes in a plate connection (flange or web), and ensure no single hole is more than 1/8 in. larger than the nominal bolt diameter. Submit proposed correction methods for members with defects that exceed these limits or prevent the proper assembly of parts. Straighten structural members in accordance with AASHTO/NSBA Steel Bridge Collaboration S2.1. Make all corrections in the presence of the Engineer at no expense to the Department. Do not remove and reweld gusset plates without approval.

3.11.6. **Bearing and Anchorage Devices**. Place all bearing devices such as elastomeric pads, castings, bearing plates, or shoes on properly finished bearing areas with full and even bearing on the concrete. Place metallic bearing devices on 1/4-in. thick preformed fabric pads manufactured in accordance with DMS-6160, "Water Stops, Nylon-Reinforced Neoprene Sheet, and Elastomeric Pads," to the dimensions shown on the plans. Provide holes in the pad that are no more than 1/4 in. larger than the bolt diameter.

Build the concrete bearing area up to the correct elevation once it has been placed below grade using mortar that meets Item 420, "Concrete Substructures," and provide adequate curing. Use only mortar for buildups between 1/8 in. and 3/8 in. thick. Use galvanized steel shims or other approved shim materials in conjunction with mortar if the bearing area must be raised more than 3/8 in.

Provide at least 75% contact of flange to shoe with no separation greater than 1/32 in. for beams and girders. Make corrections using heat or pressure in accordance with AASHTO/NSBA Steel Bridge Collaboration S2.1 or using galvanized shims. Correct small irregularities by grinding.

Provide at least 85% contact between the rocker plate and the base plate. Adjust the location of slotted holes in expansion bearings for the prevailing temperature. Adjust the nuts on the anchor bolts at the expansion ends of spans to permit free movement of the span. Provide lock nuts or burr the threads.

Remove all foreign matter from sliding or machine-finished surfaces before placing them in the structure.

Restore distorted bearing pads or expansion bearings to an equivalent 70°F position after completion of all welded or bolted splices, using an approved method of relieving the load on the bearing devices.

3.11.7. **Erecting Forms**. Do not erect forms until all welding or bolting is complete and the unit is positioned and properly set on the bearings, unless otherwise shown on the plans.

3.11.8. **Field Finish**. Paint in accordance with Item 446. Restore weathering steel that will remain unpainted to a uniform appearance by solvent cleaning, hand cleaning, power brush, or blast cleaning after all welding and slab concrete placement have been completed. Remove from all unpainted weathering steel fascia surfaces (as listed in Section 441.3.8.2., "Weathering Steel") any foreign material, including markings, that adheres to the steel and could inhibit formation of oxide film as soon as possible. Feather out touched-up areas over several feet. Do not use acids to remove stains or scales.

4. MEASUREMENT AND PAYMENT

The work performed, materials furnished, equipment, labor, tools, and incidentals will not be measured or paid for directly, but will be subsidiary to pertinent Items.

Item 442
Metal for Structures

1. DESCRIPTION

Provide structural steel, high-strength bolts, forgings, steel castings, iron castings, wrought iron, steel pipe and tubing, aluminum castings and tubing, or other metals used in structures, except reinforcing steel and metal culvert pipe.

2. MATERIALS

Furnish mill test reports (MTRs), supplemental test documentation, and certifications required by this Item and other pertinent Items.

2.1. **Structural Steel**. The Engineer may sample and test steel in accordance with ASTM A370.

2.1.1. **Bridge Structures**. Provide the grade of ASTM A709 steel shown on the plans. Grade 50W, 50S, or HPS 50W may be substituted for Grade 50 at no additional cost to the Department. Use Zone 1 if no AASHTO temperature zone is shown on the plans.

2.1.2. **Non-Bridge Structures**.

2.1.2.1. **Steel Classifications**. Provide the types and grades of steel in accordance with this Section unless otherwise shown on the plans.

2.1.2.1.1. **Carbon Steel**. Meet ASTM A36.

2.1.2.1.2. **Low-Alloy Steel**. Meet the requirements of one of the following:

- ASTM A529 Grade 50;
- ASTM A572 Grade 50 or Grade 55;
- ASTM A588;
- ASTM A709 Grade 50, 50S, 50W, or HPS 50W; or
- ASTM A992.

Specify ASTM A6 supplemental requirement S18, “Maximum Tensile Strength,” for material used for sign, signal, and luminaire supports.

2.1.2.2. **Impact Testing**. The following components, if greater than 1/2 in. thick, and other members designated on the plans must meet the Charpy V-notch (CVN) requirements of Table 1:

- base plates for roadway illumination assemblies, traffic signal pole assemblies, high mast illumination poles, ITS poles, and overhead sign supports;
- pole mounting plates, arm mounting plates, and clamp-on plates for traffic signal pole assemblies;
- arm stiffeners, pole gussets, and stiffeners for traffic signal pole long mast arm assemblies (50 ft. and greater);
- pole shafts, ground sleeves, and handhole frames for high mast illumination poles;
- W-columns, tower pipes, multiple-sided shafts, tower pipe and multiple-sided shaft connection plates, chord angles, chord splice plates or angles, and truss bearing angles for truss type overhead sign supports; and

- pipe posts, pipe arms, post and arm flange plates, and handhole frames for monotube overhead sign supports.

Table 1
CVN Requirements for Non-Bridge Steel

Material	Thickness	Minimum CVN Toughness
ASTM A36, A53, A242, A500, A501, A709, Grade 36, any other steel with minimum specified yield point below 40 ksi	up to 4"	15 foot-pounds (ft.-lb.) at 70°F
ASTM A5721, A5881, A6331, any other steel with minimum specified yield point between 40 and 65 ksi, inclusive	up to 2"	15 ft.-lb. at 70°F
	over 2" to 4", mechanically fastened	15 ft.-lb. at 70°F
	over 2" to 4", welded	20 ft.-lb. at 70°F
Any steel with minimum specified yield point over 65 ksi and under 90 ksi[2]	up to 2-1/2"	20 ft.-lb. at 50°F
	over 2-1/2" to 4", mechanically fastened	20 ft.-lb. at 50°F
	over 2-1/2" to 4", welded	25 ft.-lb. at 50°F

1. Reduce the testing temperature by 15°F for each 10-ksi increment or fraction thereof above 65 ksi if the yield point of the material given on the MTR exceeds 65 ksi.
2. Reduce the testing temperature by 15°F for each 10-ksi increment or fraction thereof above 85 ksi if the yield point of the material given on the MTR exceeds 85 ksi.

Use the (H) frequency of testing for material with minimum specified yield point up to 50 ksi. Use the (P) frequency of testing for material with minimum specified yield point greater than 50 ksi. Ensure steel is sampled and tested in accordance with ASTM A673.

2.1.3. **Other Components**.

2.1.3.1. **Miscellaneous Bridge Components**. Provide steel that meets ASTM A36, A709 Grade 36, or A500 Grade B for members such as steel bearing components not bid under other Items, steel diaphragms for use with concrete bridges, and armor and finger joints, unless otherwise shown on the plans.

2.1.3.2. **Shear Connectors and Anchors**. Provide cold-drawn bars for stud shear connectors, slab anchors, and anchors on armor and finger joints that meet the requirements of ASTM A108, Grade 1010, 1015, 1018, or 1020, either semi-killed or killed, and that have the tensile properties shown in Table 2 after drawing or finishing. Determine tensile properties in accordance with ASTM A370.

Table 2
Minimum Tensile Properties for Bar Stock

Tensile strength	60 ksi
Yield strength	50 ksi
Elongation	20% (2")
Reduction of area	50%

Provide certification from the manufacturer that the studs or anchors as delivered have the required material properties.

2.1.3.3. **Fasteners**. Provide high-strength bolts that meet ASTM F3125 Grade A325, unless otherwise shown on the plans. The Department may sample high-strength bolts, nuts, and washers for structural connections in accordance with Tex-719-I.

Follow the requirements of Item 447, “Structural Bolting,” for tests, test reports, and supplemental requirements for high-strength bolts, nuts, and washers.

2.1.3.4. **Slip-Resistant Deck Plates**. Furnish steel for deck plates that meets ASTM A786 and one of ASTM A242, A588, or A709 Grade 50W. State the type and trade name of material to be used on the shop drawings.

2.1.3.5. **Rail Posts**. Provide material for rail posts that meets ASTM A36 or ASTM A709 Grade 36 unless otherwise shown on the plans.

2.2. **Steel Forgings**. Provide steel forgings for pins, rollers, trunnions, or other forged parts that meet ASTM A668, Class C, D, F, or G, as shown on the plans. For pins 4 in. or smaller in diameter for non-railroad structures, material that meets ASTM A108 Grade 1016–Grade 1030, with a minimum yield strength of 36 ksi, may be used instead.

2.3. **Steel Castings**. Provide steel castings that meet ASTM A27, Grade 70-36.

2.4. **Iron Castings**. Provide iron castings that are true to pattern in form and dimensions; free of pouring faults, sponginess, cracks, blow holes, and other defects in positions affecting their strength and value for the service intended; and meet the standards shown in Table 3.

Table 3
Standards for Iron Castings

Casting Material	ASTM Standard	Grade or Class
Gray iron	A48	35B
Malleable iron	A47	32510
Ductile iron	A536	70-50-05

2.5. **Steel Tubing**. Provide steel tubing that meets ASTM A500 Grade B, unless otherwise shown on the plans. Tubing that meets API Standard 5L Grade X52 may be used if produced by a mill listed in the standard API specifications as authorized to produce pipe with the API monogram. Hydrostatic tests are not required for API 5L steel, and instead of an MTR, the manufacturer may furnish a certificate for each lot or shipment certifying the tubing meets the requirements of this Section.

2.6. **Aluminum**. Provide aluminum materials that meet the standards shown in Table 4 unless otherwise shown on the plans.

Table 4
Aluminum Standards

Material	ASTM Standard	Alloy-Temper
Castings	B108	A444.0-T4
Extrusions	B221	6061-T6
Sheet or plate	B209	6061-T6

When testing is required, cut test specimens from castings from the lower 14 in. of the tension flange, but not at the junction of the rib or base. Flatten the curved surfaces before machining. Provide standard test specimens in accordance with ASTM E8.

3. CONSTRUCTION

3.1. **Fabrication, Erection, and Painting**. Fabricate, weld, and erect metal structures in accordance with Item 441, “Steel Structures”; Item 447, “Structural Bolting”; and Item 448, “Structural Field Welding”; and in conformance with the applicable AWS welding code. Paint in accordance with Item 446, “Field Cleaning and Painting Steel.” Aluminum or galvanized steel members do not require painting unless otherwise shown on the plans.

3.2. **Galvanizing**. Galvanize fabricated steel items, steel castings, bolts, nuts, screws, washers, and other miscellaneous hardware, when required, in accordance with Item 445, “Galvanizing.”

4. MEASUREMENT

This Item will be measured by the pound of structural metal furnished and placed in a complete structure not including the weight of erection bolts, paint, or weld metal.

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

The maximum percent variance from the plans quantity will be as shown in Table 5.

Table 5
Percent Variance

Quantity	Variance
Over 1,000,000 lb.	1/2%
100,000–1,000,000 lb.	1%
Under 100,000 lb.	1-1/2%

If the requests for increases in sizes or weights of members are approved, measurement will be made on the sizes or weights shown on the plans.

Castings, bearing plates, anchor bolts, drains, deck plates, armor and finger joints, and other metal for which no separate measurement is specified will be included in the total quantity of structural steel.

The weights of rolled materials (e.g., structural shapes and plate) will be computed based on nominal weights and dimensions using measurements shown on the plans. Deductions will not be made for material that is removed for copes, clips, planing, or weld preparation. The weight of castings will be computed from the dimensions shown on the plans. Shoes will be measured by the weights shown on the plans.

Weight of high-strength fasteners will be based on Table 6. Weight of other metal will be based on Table 7.

Table 6
Pay Weight for High-Strength Fasteners, Pounds per Hundred Units

Diameter	Item		
	Bolt Heads	Nuts	Washers
3/4"	15	19	4.8
7/8"	23	30	7
1"	32	43	9.4
1-1/8"	45	59	11
1-1/4"	64	79	14

Table 7
Pay Weight for Metals

Material	Weight (lb./cu. in.)
Steel	0.2836
Cast iron	0.2604
Wrought iron	0.2777

Splices will be measured as follows.

- No additional weight will be allowed for weld metal in a welded splice.
- Where a bolted splice is permitted as an alternate for a welded splice, measurement will be made based on a welded splice.
- Where a bolted splice is required, the weight of the splice material, bolt heads, washers, and nuts will be measured with no deduction for holes.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Structural Steel" of the type ("Rolled Beam," "Plate Girder," "Tub Girder," "Box Girder," "Railroad Through-Girder," "Railroad Deck-Girder," "Miscellaneous Bridge," "Miscellaneous Non-Bridge," "Pedestal," "Diaphragm," and "Stiffener") specified. This price is full

compensation for materials, fabrication, transportation, erection, paint, painting, galvanizing, equipment, tools, labor, and incidentals.

Item 445
Galvanizing

1. DESCRIPTION

Galvanize or repair galvanizing on metal items.

2. MATERIALS

Provide galvanized metal items that meet the standards shown in Table 1.

Table 1
Galvanizing Standards

Item	Standard
Fabricated items; rolled, pressed, or forged steel shapes; plates; pipes; tubular items; and bars	ASTM A123
Steel or iron castings	ASTM A153, Class A
Bolts, nuts, screws, washers, and other miscellaneous hardware	ASTM F2329 or ASTM B695, Class 50
Miscellaneous fasteners	ASTM B633, Class Fe/Zn 8
Rail elements for metal beam guard fence or bridge railing	AASHTO M 180
Permanent metal deck forms, supporting angles, and incidental items	ASTM A653, Coating Designation G165

3. CONSTRUCTION

3.1. **General**. Provide for proper filling, venting, and draining during cleaning and galvanizing if fabricated members or assemblies are required to be hot-dip galvanized. Provide drain holes or slots as required, except where prohibited by the plans. Provide a surface finish on the thermal-cut drain holes or slots in accordance with AWS D1.1 requirements for base metal preparation. Drain to the small end of tapered sections that are assembled using slip-joint splices. Ensure cleaning and galvanizing do not produce hydrogen embrittlement.

Remove weld spatter on exposed surfaces, weld flux, weld slag, and any other weld residue or impurities before galvanizing. Before galvanizing material 1/4 in. or greater in thickness:

- remove all sharp burrs, and
- chamfer to approximately 1/16 in. all edges.

3.2. **Painting Galvanized Materials**. Provide a paint system if painting is specified on galvanized materials in accordance with DMS-8102, "Paint Systems for Galvanized Steel," unless otherwise shown on the plans. Follow all manufacturer instructions for surface preparation and application, including the following.

3.2.1. **Surface Preparation**. Do not water-quench or chromate-quench galvanized surfaces to be painted. Prepare the surface in accordance with ASTM D6386 or ASTM D7803, as applicable. Apply coating within 12 hr. of cleaning. Re-clean the surface if more than 12 hr. elapse before initial painting.

3.2.2. **Coating Application**. Ensure the coating is smooth, even, continuous, and free of drips, runs, sags, holidays, wrinkles, or other coating defects. Ensure the coating has a uniform appearance within all portions of the painted piece and all related pieces and components of a project. Ensure all repairs are smooth, even, and visually match the remainder of the coated piece by use of feathering and other appropriate techniques to avoid sharp transitions.

3.3. **Workmanship**.

3.3.1. **Coverage**. Bare spots no more than 1/8 in. across are acceptable unless numerous. Repair larger bare spots in accordance with Section 445.3.4., "Repairs." Local runs or drips of zinc coating are acceptable unless they interfere with the intended use of the product. Carefully remove plainly visible excessive zinc accumulations.

3.3.2. **Adhesion**. Tap the coated area using a small hammer to test coating adhesion. The coating is acceptable if it is not brittle and does not scale or flake.

3.3.3. **Appearance**.

3.3.3.1. **White Rust**. A white powdery residue indicates moisture. Remove heavy layers of white rust that have caused the coating to pit. Light coatings may remain unless the Engineer requires chemical removal. Remove white rust from articles that will be in direct contact with soil.

3.3.3.2. **Red Rust**. Red rust on galvanized items indicates uncoated areas. Refer to Section 445.3.3.1., "Coverage," for acceptance criteria.

3.3.3.3. **Alligator Cracking or Spider Webbing**. The composition of the base metal may cause dark lines resembling alligator skin. Refer to Section 445.3.3.2., "Adhesion," to determine whether the coating is acceptable.

3.3.3.4. **Dull Gray Coating**. The composition of the base metal can cause a dull gray color. Refer to Section 445.3.3.2., "Adhesion," to determine whether the coating is acceptable.

3.3.4. **Coating Thickness**. Galvanize to the thickness specified. Use Tex-728-I to determine coating thickness.

3.4. **Repairs**. Use zinc-based solders, sprayed zinc, or zinc-rich paints for repairs in accordance with this Section.

3.4.1. **Materials**.

3.4.1.1. **Zinc-Based Solders**. Solders used in rod form or as powders:

- zinc-tin-lead alloys with liquidus temperatures in the range of 446–500°F, or
- zinc-cadmium alloys with liquidus temperatures in the range of 518–527°F.

3.4.1.2. **Sprayed Zinc (Metallizing)**. Zinc coating applied by spraying with droplets of molten metal using wire, ribbon, or powder processes.

3.4.1.3. **Organic Zinc-Rich Paints**. Zinc-rich paints based on organic binders that meet the requirements of DMS-8103, "Galvanizing Repair Paints." The Department's MPL has a list of approved repair paints for galvanized coatings.

3.4.2. **Repair Processes**.

3.4.2.1. **Zinc-Based Solders**. Remove moisture, oil, grease, dirt, corrosion products, and welding slag or flux from surfaces to be repaired. Clean surface to white metal by wire-brushing, light grinding, or mild blasting extending into the surrounding undamaged galvanized coating. Preheat cleaned areas to at least 600°F, but not more than 750°F. Wire-brush while heating and evenly distribute a layer of zinc solder. Flush the repaired area with water or wipe with a damp cloth to remove flux residue when repair is completed.

3.4.2.2. **Sprayed Zinc (Metallizing)**. Remove oil, grease, corrosion products, and any welding slag or flux from surfaces to be repaired, and ensure the surfaces are dry. Clean surface to white metal by wire-brushing, light grinding, or mild blasting extending into the surrounding undamaged galvanized coating. Apply coating by metal-spraying pistols fed with either zinc wire, ribbon, or powder. Provide a coating that is uniform and free of lumps, coarse areas, or loose particles.

3.4.2.3. **Organic Zinc-Rich Paints**. Remove oil, grease, corrosion products, and welding slag or flux from surfaces to be repaired, and ensure the surfaces are clean and dry. Clean surface to near-white metal by wire-brushing, light grinding, or mild blasting extending into the surrounding undamaged coating to provide a smooth repair. Spray or brush-apply the paint to the prepared area in conformance with the paint manufacturer's instructions to attain the required dry-film thickness. Provide multiple passes when using spray application.

3.5. **Repair Coating Thickness**. Measure thickness in the repaired area in accordance with Tex-728-I after completing repair and cooling or curing. The minimum thickness required is the same as that required for the specified galvanizing. However, if the repair uses zinc-rich paints, the minimum coating thickness is 50% higher than the specified galvanizing thickness but not greater than 4.0 mils.

4. MEASUREMENT AND PAYMENT

The work performed, materials furnished, equipment, labor, tools, and incidentals will not be measured or paid for directly, but will be subsidiary to pertinent Items.

Item 446
Field Cleaning and Painting Steel

1. DESCRIPTION

Prepare steel surfaces for painting and apply paint.

2. MATERIALS

Provide the paint system (surface preparation, primer, intermediate, and appearance coats as required) shown on the plans. Provide System II if no system specified. Provide a concrete gray appearance coat (Federal Standard 595C, color 35630), unless otherwise shown on the plans. Use differing colors for each coat with enough contrast between colors to distinguish the various steps in the painting process, including differing the color of the stripe coat relative to the primer and intermediate coat.

2.1. **Paint Systems**. Standard paint systems for painting new and existing steel include the following.

2.1.1. **System I (Overcoating, One Coat)**. Provide paint in accordance with DMS-8105, "Paint, One Coat Overcoat," and the manufacturer's specifications.

2.1.2. **System II**. Provide paint in accordance with DMS-8101, "Structural Steel Paints—Performance." Provide organic zinc (OZ) prime coat and acrylic latex appearance coat meeting DMS-8101.

2.1.3. **System III-A**. Provide paint in accordance with DMS-8101. Provide organic zinc (OZ) prime coat, epoxy intermediate stripe coat, epoxy intermediate full coat, and urethane appearance coat.

2.1.4. **System III-B**. Provide paint in accordance with DMS-8101. Provide inorganic zinc (IOZ) prime coat, epoxy intermediate coat, and urethane appearance coat. Provide epoxy zinc prime coat, as recommended by the IOZ manufacturer, for touchup of IOZ.

2.1.5. **System IV**. Provide paint in accordance with DMS-8101. Provide IOZ prime coat and acrylic latex appearance coat. Provide epoxy zinc prime coat, as recommended by the IOZ manufacturer, for touchup of IOZ.

2.2. **Paint Inside Tub Girders and Closed Boxes**. In accordance with Item 441, "Steel Structures."

2.3. **Paint over Galvanizing**. In accordance with Item 445, "Galvanizing."

2.4. **Special Protection System (SPS)**. Provide the type of paint system shown on the plans or in conformance with special provisions to this Item. SPS paints must have completed AASHTO Product Evaluation & Audit Solutions Structural Steel Coatings (SSC) testing regimen as a complete system, with full data available from AASHTO unless specified otherwise.

3. EQUIPMENT

Provide spray equipment that:

- has adequate capacity and enough gauges, filters, agitators, regulators, and moisture separators to ensure delivery of clean, dry air meeting ASTM D4285 at the proper pressure and volume;
- is adequate for the type of paint being used;
- has spray heads that provide a smooth, uniform coat of paint; and
- has no dried coatings, solvents, or other foreign matter on surfaces that paint is likely to contact.

Maintain all equipment and accessories in good working order. Keep hoses serviceable, with no cracks or deterioration. Equip paint pots (or other containers from which the paint is dispensed) with agitators that operate whenever paint is in the pot.

When placing steel grit recycler and other surface preparation equipment, comply with Section 7.16.2, "Construction Equipment Operating on Structures."

4. CONSTRUCTION

4.1. **Qualification**. Certification of the cleaning and painting contractor, subcontractor, or fabricator is required as follows.

Submit to the Engineer documentation verifying AMPP QP 2 Cat A certification. If the plans specify that the existing coating system does not contain hazardous materials, provide AMPP QP 1 certification. Maintain certifications throughout the project. No work may be performed without current and active certifications unless otherwise shown on the plans. The Engineer may waive certification requirements for minor, touch-up repair work and coating steel members repaired in accordance with Item 784, "Steel Member Repair."

The Engineer may waive certification requirements, when shown on the plans, for qualification in either contractor certification program if the project has been accepted as a qualification project as part of the process for obtaining AMPP QP1 certification. Submit certification applications and proof of acceptance before beginning work or provide AMPP QP 7 certification when shown on the plans.

Inform the Engineer within 1 business day of all scheduled or unannounced inspections or audits by AMPP, OSHA, EPA, TCEQ, or other agencies or organizations. Furnish the Engineer a complete copy of all inspection and audit reports and any actions within 7 days of receipt.

4.2. **Responsibility for Hazards**. Comply with Article 6.10., "Hazardous Materials." Handle all paints and cleaning products in conformance with the information provided by the manufacturer and all applicable federal and state regulations.

4.3. **Steel to be Painted**. Clean and paint all structural steel except weathering steel that is to remain unpainted, unless otherwise shown on the plans. Structural steel includes all main members, bearing apparatus, diaphragms, floor beams, rivets, bolts, and lateral bracing, where applicable. Paint the rolling faces of rockers and base plates, all surfaces of bearing plates, and all surfaces of iron or steel castings, regardless of whether the surfaces are milled, unless otherwise shown on the plans or exempted in accordance with this Item. Perform the initial cleaning and application of required prime coating on new steel before shipment of the steel to the jobsite, unless otherwise provided in the Contract or approved in writing.

Areas deemed inaccessible by the Engineer will be cleaned and painted in conformance with the Engineer's instructions.

4.4. **SPS**. Apply paint as shown on the plans.

4.5. **Cleaning and Painting New Steel**. Clean and prime new steel in accordance with Item 441 before erection or installation of repair pieces. Clean and paint unpainted areas of newly erected steel, including bolts, nuts, washers, and areas where the shop-applied paint has been damaged or fails to meet specification requirements, in accordance with the method required under the paint system specified and Section 446.4.6.3.1., "General Preparation." Water blast exposed surfaces of all newly erected steel. Provide tool cleaning surface preparation to all repair areas. Prepare all unpainted areas by abrasive-blast cleaning. Repair prime coat and apply remaining coats after erection and maintenance work is complete. Prevent abrasive debris, paint, and overspray from contacting passing traffic, private and public property, and areas of the bridge not designated to be painted.

4.6. **Cleaning and Painting Existing Steel**.

4.6.1. **Hold Points**. No work may proceed beyond the listed hold point until the Engineer has reviewed and given provisional approval. Provide at least the following hold points:

- at containment completion,
- following any surface preparation,
- immediately before each coating application,
- after coating application,
- after each coat has cured, and
- after preparation of areas for repair.

4.6.2. **Containment**. Submit a plan that details the procedures and type and size of equipment proposed to keep public property, private property, and the environment from being adversely affected by the cleaning and painting operations. Approval of the plan is required before cleaning and painting operations begin. Containment is not required for painting new steel erected under Item 441 that is not erected or installed onto an existing steel structure other than to comply with Section 446.4.5., "Cleaning and Painting New Steel."

When shown on the plans, include with the containment plan an engineering analysis showing that the loads added to the existing structure by the containment system and waste materials do not result in overstress of the members. Have a licensed professional engineer sign, seal, and date the submittal.

Provide containment during all cleaning and painting operations of existing steel structures. Obtain approval of the constructed containment system before beginning cleaning and painting.

Construct and maintain a structure meeting the following minimum requirements:

- AMPP Guide 6, Class 1A, Level 1 emissions;
- ability to withstand winds up to 30 mph;
- enclosure of all sides of area with air-impenetrable walls;
- illumination meeting AMPP Guide 12;
- rigid and solid, watertight floor formed from minimum 20-gauge steel;
- overlapping seams and entryways; and
- exhaust air filtration system capable of creating negative pressure inside the enclosure, causing the sides of the containment to have a concave appearance and demonstrating minimum 100-ft. per minute cross-draft airflow and minimum 50-ft. per minute downdraft airflow in all areas within the containment.

In place of a full containment structure, a modified containment system may be proposed for the following situations:

- when using abrasive blasting equipment with negative pressure able to contain all blast refuse. Demonstrate, for approval, the equipment's ability to contain all blast refuse.
- when tool cleaning and water blasting for spot cleaning only, provide a system that will contain all removed paint, rust, and other debris. Place an airtight membrane below the member being cleaned to collect all falling debris and wastewater.
- when using power hand tools for spot cleaning only that are equipped with high-efficiency particulate air (HEPA) filter vacuums that will capture all removed paint, rust, and other debris. Otherwise, provide an airtight membrane below the member being cleaned to collect all falling debris.

Provide a system meeting AMPP Guide 6, Class 1W, when using water blasting. Manage wastewater from water blasting in accordance with Section 446.4.8.2., "Wastewater."

Provide safe access to all parts of the work for proper inspection. When a temporary facility is proposed for inspection access, provide a plan for review. This facility requires a licensed professional engineer in accordance with Article 5.2, "Plans and Working Drawings," Table 1. Do not place rigging or scaffolds in

contact with previously painted surfaces until the previously applied coating has fully cured. Protect previously painted and cured surfaces using an approved padding to minimize damage when rigging or scaffolds will be placed on or hung from those surfaces. Avoid and minimize coating damage to the extent possible. Repair all coating damaged by rigging or scaffolding as directed.

Remove tree limbs, bushes, grass, and other items that will interfere with the cleaning and painting operations as directed. Remove vertical clearance signs, and erect and maintain temporary ground-mounted signs matching the content and letter size on the existing sign unless otherwise directed. Re-attach permanent clearance signs as directed.

Use a skimmer when cleaning and painting over bodies of water. Remove any blast or paint material the skimmer collects the day the release occurs. Correct the containment problem that allowed the release before continuing work.

Ensure air is clear of dust and remove all blast refuse from cleaned members before the Inspector enters the containment to inspect the cleaned surfaces. Remove all blast refuse from the containment before ending work for the day.

4.6.3. **Preparation of Surfaces**. Prepare surfaces before applying paint.

4.6.3.1. **General Preparation**. Ensure all surfaces to be painted are completely free of all visible contaminants including but not limited to oil, grease, moisture, dirt, sand, overspray, and welding contamination (slag or acid residue); loose or flaking mill scale, rust, or paint; weld spatter; and any other conditions that will prevent the paint from forming a continuous, uniform, tightly adhering film.

Before other cleaning operations, remove grease-like contaminants using clean petroleum solvents or other approved methods. Contain solvents and removed material as approved. Dispose of properly or reuse solvents as approved.

Remove all hackles, splinters, weld spatter, sharp edges, fins, slag, or other irregularities that may interfere with proper paint adhesion to the steel. Remove all steel splinters (hackles) raised or evident during cleaning. Round all corners and edges to a 1/16-in. radius. Abrasive blast areas from which hackles and irregularities are removed and edges that have been rounded to achieve a minimum 1.5-mil profile. Grind all flame-cut edges when necessary to produce a minimum 1.5-mil profile over the entire flame-cut surface to achieve adequate coating adhesion.

Remove all pack rust and expansive rust between steel plates and in crevices using either abrasive blasting, ultra-high pressure waterjetting (UHP), heated water, or other approved methods.

Ensure all surfaces to be painted meet the minimum non-visible contaminant level established by the coating manufacturer or in accordance with AMPP-SP 12, NV-2, whichever is more stringent. Perform soluble salt contamination tests in accordance with AMPP Technology Guide 15, “Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates,” immediately before paint application of each coat to determine whether salt contamination has occurred. If a method other than Class A is used, then it must first be validated against the Class A method before adopting structure-wide. Test at least four random locations every 1,000 sq. ft. If soluble salt levels exceed maximum requirements, provide additional water blast cleaning to remove salt contamination (or recontamination) and retest the area. If additional water blasting does not reduce the concentration to the acceptable level, a surface treatment or water additive may be used. Use a surface treatment or water additive that is approved by the coating system supplier and the Engineer. All salt test results must be preserved and made accessible to the Engineer.

Clean coated surfaces by an approved method that does not damage applied paint to remove all dirt, grease, concrete, overspray, and any other substance that may impair adhesion before the application of the next coat.

Clean far enough into any shop-applied paint to ensure removal of all contaminants.

Feather edges of sound paint around spot-cleaned areas. Feather all sound, tightly adhered coating edges surrounding cleaned or repaired areas at least 1 in., and ensure a smooth, blended transition.

Completely remove, as directed, the protective coating on machined surfaces and pins.

Do not damage adjacent materials such as concrete during surface preparation or painting.

4.6.3.2. **Classes of Cleaning**. Water blast to remove contaminants before any mechanical or abrasive surface preparation. Water blast the steel and between coats when necessary to remove non-visible contamination. System I requires tool cleaning for defective areas of disbonded coating or rust. All other paint systems require abrasive blast cleaning unless otherwise shown on the plans.

Prepare all surfaces of painted steel members subsequently exposed from structural operations, such as deck removal or steel repair, in accordance with this Item. Prevent loose or damaged paint from entering the environment.

4.6.3.2.1. **Abrasive Blast Cleaning**. Meet the surface preparation requirements in accordance with AMPP-SP 10 unless otherwise shown on the plans. Ensure a minimum profile of 1.5 mils. Do not add depth to existing profile when the surface profile exceeds 4.0 mils. Measure surface profile in accordance with ASTM D4417, Method C. Containment mounting points and other repair areas under 1 sq. ft. may be tool-cleaned to AMPP-SP 11 with at least a minimum 1.5-mil profile when approved.

For existing steel structures, use an abrasive recycling system with an approved recyclable abrasive unless otherwise shown on the plans. New steel erected under Item 441 that is not erected or installed onto an existing steel structure is excluded from the recyclable abrasive requirement. Do not use steel shot. Abrasive will be considered recyclable if it is separated from the dust and paint debris before being reused. A non-recyclable abrasive may be used when the coating system has been identified as nonhazardous as shown on the plans. All abrasives must meet AMPP AB1, AB2, or AB3 as appropriate.

4.6.3.2.2. **Tool Cleaning**. Meet the requirements of AMPP-SP 11 unless otherwise shown on the plans. Probe the perimeter of peeled areas of paint using a putty knife to ensure remaining paint is tightly adhered.

4.6.3.2.3. **Water Blasting**. Meet the requirements of AMPP-SP WJ-4. Tight mill scale and tightly adhered rust and paint are permitted. Probe the perimeter of peeled areas of paint using a putty knife to ensure remaining paint is tightly adhered.

4.6.3.3. **Tape Test**. Perform the tape test, as necessary to determine cleanliness, on any surface before painting as follows:

- Press a strip of filament tape onto the surface by rubbing using moderate thumb pressure four times, leaving approximately 2 in. of one end of the tape free from the surface.
- Grasp the free end and remove the tape from the surface using a sharp pull.

The surface will be considered contaminated and not adequately cleaned if visible particles cling to the tape.

4.6.4. **Painting**.

4.6.4.1. **Paint Condition**. Thoroughly mix and strain paints to be applied in conformance with the manufacturer's recommendations. Mix by mechanical methods. Provide continuous mechanical agitation during painting operations to prevent settling. Ensure the paint is a completely homogeneous mixture free of lumps, skins, and agglomerates and contains all pigments, vehicle solids, and thinners required in the original formulation. Keep paint containers tightly covered and protected from weather when not in use.

4.6.4.2. **Thinning**. Adjust paint to the correct application consistency in conformance with the manufacturer's recommendations.

4.6.4.3. **Paint System Requirements**. Ensure all coatings in the paint system, including shop-applied coats, are from the same manufacturer.

4.6.4.4. **Stripe Coat**. All stripe coat will be unthinned and worked in by brush to achieve a contiguous film over all edges, corners, bolts, nuts, threads, rivets, and weld seams, extending at least 1 in. onto adjacent steel and must be of a contrasting color to the coating over which it is being applied. Ensure the paint is mixed in the appropriate proportions by weight and is agitated continuously during the striping operation.

4.6.4.5. **Paint Systems**. Apply the paint system specified in accordance with this Item and in conformance with the equipment and coating materials manufacturer's recommendations. Conflicts between this Item and the manufacturer's recommendations will be resolved by the Engineer.

4.6.4.5.1. **System I (Overcoating, One Coat)**. Apply at least 4.0 mils dry film thickness (DFT) overcoat to all surfaces to be painted.

4.6.4.5.2. **System II**.

- **Prime Coat**. Apply at least 3.5 mils DFT of epoxy zinc primer.
- **Stripe Coat**. Apply stripe coat of epoxy zinc primer to all edges, corners, bolts, nuts, threads, rivets, and weld seams, extending at least 1 in. onto adjacent steel.
- **Appearance Coat**. Apply at least 2.0 mils DFT of appearance coat.

4.6.4.5.3. **System III-A**.

- **Prime Coat**. Apply at least 3.5 mils DFT of epoxy zinc primer.
- **Stripe Coat**. Apply stripe coat of epoxy zinc primer to all edges, corners, bolts, nuts, threads, rivets, and weld seams, extending at least 1 in. onto adjacent steel.
- **Intermediate Coat**. Apply at least 2.0 mils DFT of epoxy intermediate coating.
- **Appearance Coat**. Apply at least 2.0 mils DFT of appearance coating.

4.6.4.5.4. **System III-B**.

- **Prime Coat**. Apply at least 3.5 mils DFT of IOZ primer to new steel in accordance with Item 441. Spot-clean all damaged and unpainted areas in accordance with Section 446.4.5., "Cleaning and Painting New Steel." Apply at least 3.5 mils DFT of epoxy zinc primer to the spot-cleaned areas.
- **Stripe Coat**. Apply stripe coat of epoxy zinc primer to all edges, corners, bolts, nuts, threads, rivets, and weld seams, extending at least 1 in. onto adjacent steel.
- **Intermediate Coat**. Apply at least 2.0 mils DFT of epoxy intermediate coating.
- **Appearance Coat**. Apply at least 2.0 mils DFT of appearance coat.

Apply stripe, intermediate, and appearance coat to new steel after erection and repair of all damaged areas. Extend stripe coat at least 1 in. onto flat steel in all directions.

4.6.4.5.5. **System IV**.

- **Prime Coat**. Apply at least 3.5 mils DFT of IOZ primer to new steel in accordance with Item 441. Spot-clean all damaged and unpainted areas in accordance with Section 446.4.5., "Cleaning and Painting New Steel." Apply at least 3.5 mils DFT of epoxy zinc primer to the spot-cleaned areas.
- **Appearance Coat**. Apply at least 2.0 mils DFT of appearance coat.

Apply stripe, intermediate, and appearance coat to new steel after erection and repair of all damaged areas. Extend stripe coat at least 1 in. onto flat steel in all directions.

4.6.4.6. **SPS**. Apply paint as shown on the plans.

4.6.4.7. **Application**. Do not apply paint when the steel or air temperature is below 50°F or when the steel or air temperature is expected to drop below 50°F within 2 hr. after application, unless otherwise approved. Do not

apply paint to any surface with discernible moisture. Do not apply paint to any surface when steel is within 5°F of the dewpoint. Do not apply paint when impending weather conditions might result in damage to fresh paint.

Provide environmental controls such as dehumidification, heaters, or additional containment measures as needed to control and maintain favorable atmospheric conditions in all areas of the containment. Provide environmental controls at no additional cost to the Department.

Apply each coat in two passes using a crosshatch pattern. Apply each coat of paint to clean, dry, firm surfaces in accordance with all specification requirements. Ensure each coat fully cures to form a smooth, continuous, tightly adhering film of uniform thickness and appearance and free of defects before applying the next coat. Apply all coats by spray, except brush-applied stripe coats. Obtain approval for alternative methods of application to paint inaccessible areas.

Repair all runs, sags, and other defects in each coat of paint before application of subsequent coats.

Measure the dry film thickness of coatings in accordance with AMPP PA 2, Level 3, “Procedure for Determining Conformance to Dry Coating Thickness Requirements.”

If, in the opinion of the Engineer, there is an objectionable amount of dust in the atmosphere, discontinue painting or take necessary precautions to prevent dust and dirt from contacting freshly painted surfaces or surfaces before the paint is applied.

Provide full coverage of the steel with the concrete surface when painting steel that is in contact with concrete. Do not extend paint more than 4 in. onto the concrete surfaces or as directed. Ensure when painting is completed the only visible paint on concrete surfaces is the finish coat. Remove excessive or objectionable paint on concrete surfaces in an approved manner. Intermediate and appearance coats do not have to be applied to surfaces that will be in full contact with concrete. Before applying the appearance coat onto existing steel structures, caulk gaps or crevices greater than 1/16 inch. New steel erected under Item 441 that is not erected or installed onto an existing steel structure is excluded from the caulking requirement. Use a paintable caulk meeting the requirements of DMS-8142, “Paintable Caulk for Concrete and Steel.” Use caulk that is compatible with the coatings to be applied, as determined by coating manufacturer. Apply caulking in a manner that does not trap moisture.

4.6.4.8. **Workmanship**. Perform all painting using skilled painters who can adjust equipment and application techniques as dictated by the type of paint, weather conditions, environment, and size and shape of the surface being painted. Painters who, in the opinion of the Engineer, do not adjust equipment to apply coatings in a uniform, full wet coat free of runs, sags, holidays, and overspray will not be considered skilled painters and may be removed from the project.

Brush application for touchup is acceptable if the paint is mixed in the appropriate proportions by weight and is agitated continuously during the painting operation.

4.6.5. **Handling and Shipping**. Pad the blocks, chains, slings, braces, and clamps used for handling, moving, storing, and shipping painted members so the paint will not be damaged.

4.7. **Paint Improperly Applied**. To uncover evidence of improperly applied paint, the Engineer may at any time during construction explore underneath the surface of any paint coats already applied. Repair these areas of investigation at no additional expense to the Department. Whenever unsatisfactory conditions are found, the Engineer may require remedial measures.

Repair or completely remove and replace all paint that has been applied improperly, has been applied to improperly cleaned surfaces, fails to dry and harden properly, fails to adhere tightly to underlying metal or other paint film, or does not have a normal, workmanlike appearance in accordance with this Item. When the final field coat does not have a uniform color and appearance throughout the structure, correct it using whatever additional coats or other corrective measures are required. Remove freshly applied paint that has

not yet set using suitable solvents. Remove dried paint films by blast cleaning, scraping, or flame torches, as approved.

4.8. **Waste and Wastewater**. Manage all waste and wastewater generated by cleaning and painting operations as necessary to prevent unauthorized release into the environment.

4.8.1. **Waste**. At minimum, collect all waste before leaving the jobsite each day. Handle and store the waste as if it were hazardous or Universal Waste until classification is made. Follow the requirements of 30 TAC § 335 for onsite handling of the waste. Store waste collected in containers that comply with 49 CFR Part 178. Seal containers containing waste each day before leaving the jobsite.

Test a representative sample of waste in accordance with EPA Test Method 1311, "Toxicity Characteristic Leaching Procedure" (TCLP), to determine existing metal and organic content. Handle and dispose of nonhazardous waste as a "Special Waste" as defined in 30 TAC § 330.2 or as directed. Provide documentation showing disposal of the waste was in a suitable landfill holding permits to handle this type of material. Dispose of hazardous waste in conformance with applicable waste rules and regulations. Transport hazardous waste using a permitted transporter and dispose of it in an authorized hazardous waste facility.

When the plans show the existing coating to be removed contains hazardous materials and steel grit is used as the abrasive, the waste generated is classified as hazardous or Universal Waste regardless of the results of the TCLP. For manifesting purposes, the Department is considered the waste generator for paint removal wastes generated from structures owned or controlled by the State. Dispose of this waste in conformance with applicable waste rules and regulations as specified above and in accordance with the Contract.

Provide copies of all test reports and transportation manifests to the Engineer before shipping waste. Provide signed original manifests to the Engineer verifying all steps of the handling and disposal process were correctly handled.

4.8.2. **Wastewater**. Avoid unauthorized discharge of wastewater to streams or other surface waters. Contain and dispose of all wastewater to a publicly owned treatment works (POTW), with written approval from the POTW, or at a permitted commercial disposal facility, unless authorization for reuse or discharge is obtained from TCEQ and approved. Wastewater from cleaning operations of new steel erected under Item 441 that meets the TCEQ Texas Pollutant Discharge Elimination System (TPDES) Construction General Permit (CGP) TXR150000 guidelines for non-stormwater discharge may be discharged in accordance with best management practices described in the site Stormwater Pollution Prevention Plan (SW3P*).*

4.9. **Miscellaneous**. Notify the Engineer of any condition that may require the repair or replacement of any portion of the bridge.

5. MEASUREMENT

When this Item is shown on the plans to be a pay item, this Item will be measured by the lump sum or by each structure, structure unit, or group of structures as shown on the plans.

6. PAYMENT

When this Item is specified as a pay item, the work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Cleaning and Painting Existing Structures," "Cleaning and Painting Existing Railing," or "Cleaning and Painting Existing Piling" for the system specified and, when paid by each, for the structure description by reference number. "Cleaning and Painting Existing Structures" includes painting of railing and piling unless otherwise shown on the plans. This price is full compensation for paint; cleaning, spot painting, and painting; removal of vegetative obstructions; containment systems; traffic protection and scaffolding; disposal of waste; and materials, equipment, labor, tools, and incidentals.

When the Item is not specified as a pay item, the work performed and materials furnished in accordance with this Item will not be measured or paid for directly, but will be subsidiary to pertinent Items.

Item 448
Structural Field Welding

1. DESCRIPTION

Field-weld metal members using the shielded metal arc or flux cored arc welding processes.

2. MATERIALS

Provide electrodes for shielded metal arc welding (SMAW) conforming to the requirements of ANSI/AWS A5.1 or ANSI/AWS A5.5.

Provide electrodes for flux cored arc welding (FCAW) conforming to the requirements of ANSI/AWS A5.20 or ANSI/AWS A5.29.

Use only electrodes and flux-electrode combinations conforming to AWS A5 specifications and pertinent classifications for the applicable welding processes. When requested, submit a current Certificate of Conformance (COC) containing acceptable wording indicating Buy America compliance and all tests required by the applicable AWS specifications and welding codes. Tests must be conducted on electrodes of the same class, size, and brand and manufactured by the same process and with the same materials as the electrodes to be furnished. Resubmit electrodes or flux-electrode combinations every 12 mo.

Table 1 shows the classes of electrodes required. Use electrodes with the type of current, with the polarity, and in the positions permitted by AWS A5.1 and A5.5 for SMAW. AWS A5.20 and A5.29 specifications govern for FCAW. Obtain approval for electrode use on steel not listed in Table 1.

Table 1
Classification of Electrodes Permitted

Type of Steel (ASTM Standards)	Electrode Specification	Process	Filler Metal Requirements
Steel piling Armor joints A 500 A 501	AWS A5.1 or A5.5	SMAW	E60XX E70XX or E70XX-X
	AWS A5.20 or A5.29	FCAW	E6XTX-X E7XTX-X (except -2, -3, -10, -GS)
A 36 A 572 Gr. 50 A 588 A 242 A 709 Gr. 36. 50, or 50S	AWS A5.1 or A5.5	SMAW	E7016 E7018 E7028
	AWS A5.20 or A5.29	FCAW	E7XT-1 E7XT-5 E7XT-6 E7XT-8
Weathering steel A 588 A 242 A 709 Gr. 50W	AWS A5.5	SMAW	E8018-W E8016-C3 E8018-C3 E8016-C1 E8018-C1 E8016-C2 E8018-C2
	AWS 5.29	FCAW	E8XT1-W E8XTX-Ni1 E8XTX-Ni2 E8XTX-Ni3
A 709 Gr. HPS 70W	AWS A5.5	SMAW	E9018-M-H8R
Reinforcing steel Grade 40	AWS A5.1 or A5.5	SMAW	E70XX
Reinforcing steel Grade 60	AWS A5.5	SMAW	E90XX
Permanent metal deck forms	AWS A5.1 or A5.5	SMAW	E6010 E6011 E6013 E7018

Note—Low-hydrogen electrodes applicable to the lower strength base metal may be used in joints involving base metals of different yield points or strengths.

E7010 and E8010 electrodes may be used when welding the root passes of beam and girder splices if the requirements of Section 448.4.3.5.1., “High-Cellulose Electrodes for Root Passes,” are met.

Use electrodes meeting the diffusible hydrogen requirements for fracture-critical welding in AASHTO/AWS D1.5 when welding fracture-critical applications.

Use gas or gas mixtures that are welding grade and have a dew point of -40°F or lower for gas-shielded FCAW. Furnish certification to the Engineer that the gas or gas mixture is suitable for the intended application and will meet the dew point requirements.

3. EQUIPMENT

Provide electrode drying and storing ovens that can maintain the required temperatures specified in Section 448.4.3.1., “Electrode Condition.” Each oven must have a door that is sealed and can be latched. Each oven must have a small port that may be opened briefly to insert a thermometer, or the oven must be equipped with a thermometer that allows for direct reading of temperature inside the oven without opening the oven. Provide equipment able to preheat and maintain the temperature of the base metal as required and as shown on the plans. Provide approved equipment (e.g., temperature indicator sticks or infrared thermometer) for checking preheat and interpass temperatures at all times while welding is in progress.

Provide welding equipment meeting the requirements of the approved welding procedure specifications (WPSs), if required, and capable of making consistent high-quality welds.

4. CONSTRUCTION

4.1. **Procedure Qualification**. Use the proper classification and size of electrode, arc length, voltage, and amperage for the thickness of the material, type of groove, welding positions, and other circumstances of the work.

Submit WPSs for FCAW, qualified in accordance with AASHTO/AWS D1.5 for approval before any field welding on a project.

4.2. **Welder Qualification**. Provide Department certification papers for each welder and for each welding process to be used before welding, except for miscellaneous welds described in Section 448.4.2.1.1., "Miscellaneous Welding Applications." The Department issues certification as described in Section 448.4.2.2., "Certified Steel Structures Welder."

4.2.1. **Miscellaneous Welding**. A qualified welder is an experienced welder who is capable of making welds of sound quality but does not have Department certification papers. The Engineer will check the welder's ability by conducting a jobsite test in accordance with Section 448.4.2.1.2., "Miscellaneous Weld Qualification Test," before welding begins. Furnish all materials and equipment necessary for this test.

4.2.1.1. **Miscellaneous Welding Applications**. A welder certified for structural or reinforcing steel or a qualified welder may make miscellaneous welds of the following types:

- splicing reinforcing steel to extend bars in the bottom of a drilled shaft;
- attaching chairs to the reinforcing steel cage of a drilled shaft;
- armor joints and their supports;
- screed rail and form hanger supports where permitted on steel units;
- reinforcing steel to R-bars for lateral stability between prestressed beams, spirals, or bands to reinforcing bars in drilled shaft cages;
- permanent metal deck forms;
- additional steel added in railing when slip-form construction is used; and
- other similar miscellaneous members that have no load-carrying capacity in the completed structure.

4.2.1.2. **Miscellaneous Weld Qualification Test**. A qualified welder must pass a jobsite Miscellaneous Weld Qualification Test before welding.

- Make a single-pass fillet weld of 1/4-in. maximum size in the vertical position approximately 2 in. long on 1/2-in. plate in the location shown in Figure 1. Use the same electrode proposed for the work.
- The Engineer will visually inspect the fillet weld for a reasonably uniform appearance and then rupture the weld as shown in Figure 2 using force or by striking it with a hammer.
- The fractured surface of the weld will be inspected to ensure complete penetration into the root of the joint, complete fusion to the base metal, and no inclusion or porosity larger than 3/32 in. in its greatest dimension.

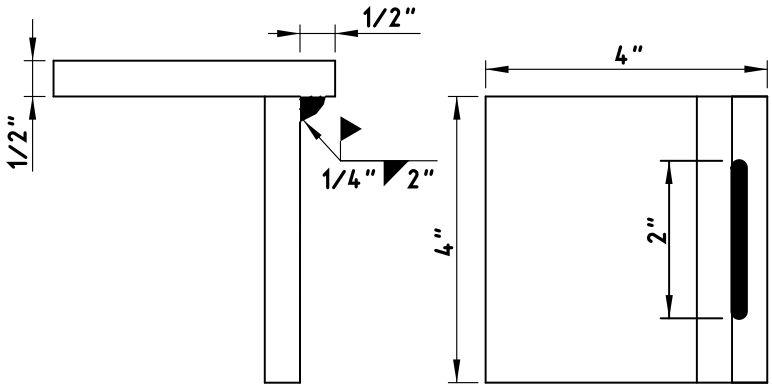

Figure 1
Miscellaneous Qualification—Fillet Weld Break Specimen

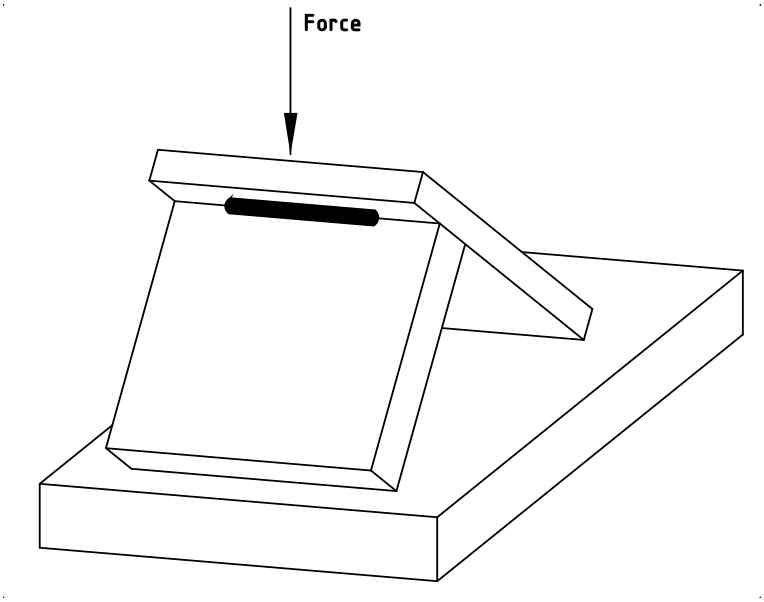

Figure 2
Miscellaneous Qualification—Method of Rupturing Specimen

A welder who fails the Miscellaneous Weld Qualification Test may retest under the following conditions.

- The retest occurs immediately and consists of two test welds as described above, with both test specimens meeting all the requirements.
- The retest occurs after 30 days if the welder provides evidence of further training or practice. In this case, the test consists of a single test weld.

Qualification by the Miscellaneous Weld Qualification Test is effective immediately upon satisfactory completion of the test and remains in effect for the duration of a project.

4.2.2. **Certified Steel Structures Welder**. Before making non-miscellaneous welds on structural steel, a welder must pass the AASHTO/AWS D1.5 qualification test for groove welds for plates of unlimited thickness in the vertical (3G) and overhead (4G) positions with the following additional requirements.

- Use metal for test plates that meets Item 442, "Metal for Structures," with a minimum yield point of 36 ksi. The minimum width of test plate must be sufficient to accommodate the radiograph inspection of 5-1/4 continuous inches of the weld, not counting the ends of the weld.
- Use approved electrodes meeting the required class in accordance with Table 1 and, in the case of FCAW, in conformance with the approved WPS.
- Have a radiographic inspection performed on the weld on each test plate. Any porosity or fusion-type discontinuity with greatest dimension larger than 1/16 in. found in the weld will result in failure of the test. Discontinuities with greatest dimension less than 1/16 in. are acceptable provided the sum of their greatest dimensions does not exceed 3/8 in. in any inch of weld.
- Have two side-bend specimens prepared, tested, and inspected for each test plate.

The test must be administered by an approved laboratory and welding observed by laboratory personnel. Submit two copies of the certification issued by the laboratory, all accompanying test papers, and the radiographic films to the Bridge Division for review. The Bridge Division issues Department certification papers if the laboratory's certification is approved. A welder must also demonstrate to the Engineer a thorough knowledge of the required welding procedures together with the ability and desire to follow them and make welds of sound quality and good appearance. The certification issued by an approved laboratory is accepted for 1 mo. from the time of certification, during which time the welder may work on Department projects if the work is satisfactory. Certification papers issued by the Department remain in effect as long as the welder performs acceptable work as determined by the Bridge Division. The certification may be cancelled at any time if the welder's work is not acceptable.

For SMAW, a welder certified using EXX18 electrodes is qualified to weld with all approved SMAW electrodes up to E90XX to join metals with a maximum specified yield strength of 65 ksi.

4.3. **Welding Steel Structures**.

4.3.1. **Electrode Condition**.

4.3.1.1. **SMAW**. For electrodes with low-hydrogen coverings in conformance with AWS A5.1, dry to the manufacturer's written drying instructions or dry for at least 2 hr. between 450°F and 500°F. For electrodes with low-hydrogen coverings conforming to AWS A5.5, dry for at least 1 hr. between 700°F and 800°F or as specified by the electrode manufacturer. If using electrodes from a newly opened, undamaged, hermetically sealed container, drying is not required. Store electrodes in ovens held at a temperature of at least 250°F immediately after drying or removal from hermetically sealed container. Elapsed time permitted between removal of an electrode from the storage oven or hermetically sealed container and use of the electrode is shown in Table 2. If the electrodes have the moisture resistance designator "R" and are being used on steel with minimum specified yield strength of 50 ksi or less, exposure time may be increased up to 9 hr.

Table 2
SMAW Electrode Exposure Limits

Electrode Type	Exposure Time (hr.)
E70	4
E80	2
E90	1

Leave electrodes in the holding oven for at least 4 hr. at 250°F before reusing if they are placed back in it before the times shown in Table 2 have lapsed. The Engineer may reduce times allowed for use without re-drying in humid atmospheres. Do not redry electrodes more than once. Do not use electrodes with flux that has been wet, cracked, or otherwise damaged.

4.3.1.2. **FCAW**. Protect or store welding wire coils removed from the original package to keep their characteristics or welding properties intact. Do not use coils or portions of coils that are rusty.

4.3.1.3. **Special Applications**. Dry electrodes for fracture-critical applications or when welding steel not shown in Table 1 in conformance with the manufacturer's specifications and in accordance with AASHTO/AWS D1.5.

4.3.2. **Environmental Conditions**. Do not weld when the air temperature is lower than 20°F; when surfaces are wet or exposed to rain, snow, or wind; or when operators are exposed to inclement conditions. Provide wind breaks to protect welding operations from winds greater than 5 mph.

4.3.3. **Assembly and Fitup**. Verify that ends of members to be welded are prepared in conformance with the welded joint detail specified. Refer to Figures 3, 4, and 5 for proper end preparation and weld details of girder splices.

Bring the parts to be joined by fillet welds into as close contact as possible, not separated more than 3/16 in. Increase the leg of the fillet weld by the amount of the separation if the separation is 1/16 in. or more. Keep the separation between faying surfaces of lap joints and of butt joints landing on backing strips to no more than 1/16 in.

Make suitable allowance for shrinkage, and never restrain the joint on both sides in any welding process.

Use the following fitup procedure for groove welds for butt joints.

- Align splices of beams and girders joined by groove welds with the center of gravity of both cross-sections coinciding or each flange vertically offset equally. Fit beams and girders with offset webs with the webs aligned and the flanges offset laterally. Make the joint with a smooth transition between offset surfaces and with a slope of no more than 1:4 when flanges are offset or abutting parts differ in thickness or width by more than 1/8 in.
- Space members to provide a 3/16-in. root opening at the nearest point. At other points of the joint when the spacing provides up to a 7/16-in. opening, correction may be made by buildup up to 1/8 in. on each bevel nose. Rebevel openings exceeding 7/16 in. and move the parts to be joined closer together to bring the joint within the maximum buildup limits. Allow buildups to cool to the maximum preheat and interpass temperatures before welding the joint.
- Bring all members into correct alignment and hold them in position using acceptable clamps while welding.

Complete all butt splices before welding diaphragms or sway bracing in a particular section of a unit. Diaphragms and sway bracing may be welded in a unit behind the splice welding to provide stability, except where such welding interferes with butt splice adjustments, such as at a drop-in segment of a continuous unit. Complete all splices before welding beams or girders to shoes.

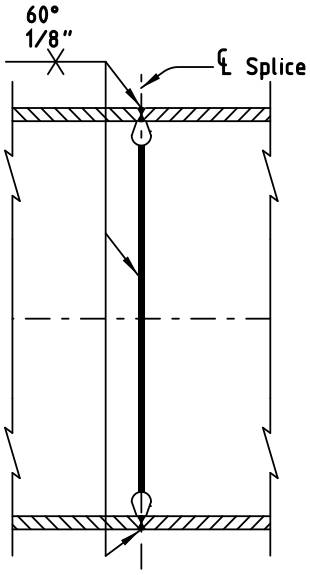

Figure 3
Girder Splice Details

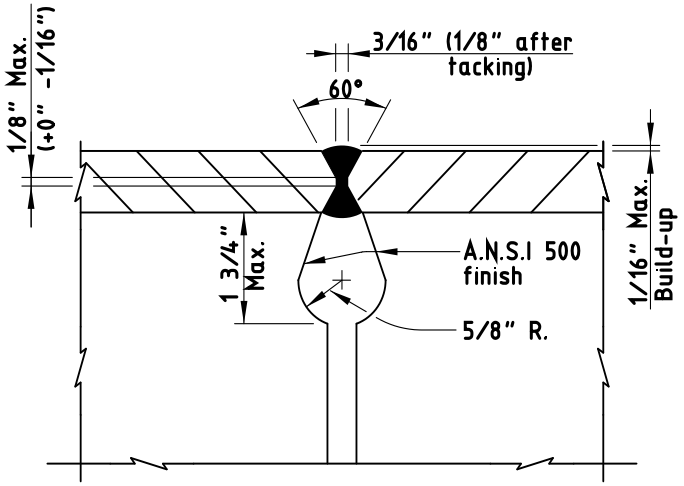

Figure 4
Girder Splice Details (Flange)

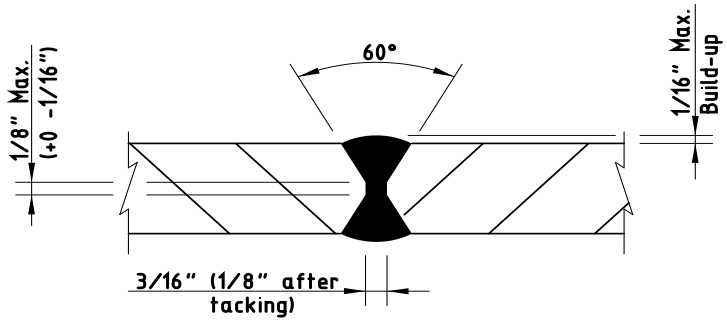

Figure 5
Girder Splice Details (Web)

4.3.4. **Preheat**. Preheat ahead of welding both groove and fillet welds (including tack welding) to the temperatures shown in Table 3. Keep preheat and interpass temperatures high enough to prevent cracks. The preheat temperatures shown in Table 3 are minimums, and higher preheats may be necessary in highly restrained welds. Preheat the base metal when it is below the required temperature so that parts being welded are not cooler than the specified temperature within 3 in. of the point of welding.

Measure preheat temperature on the side opposite to which the heat is applied at points approximately 3 in. away from the joint.

Completely weld a joint before allowing it to cool below the specified temperature. Always deposit enough weld to prevent cracking before allowing a joint to cool. Do not allow preheat and interpass temperatures to exceed 400°F for thickness up to 1-1/2 in. and 450°F for greater thicknesses.

Table 3
Minimum Preheat and Interpass Temperature for Welding with Low-Hydrogen Electrodes

Thickest Part at Point of Welding	Temperature
Up to 3/4 in., inclusive	50°F
More than 3/4 in. up to 1-1/2 in., inclusive	70°F
More than 1-1/2 in. up to 2-1/2 in., inclusive	150°F
More than 2-1/2 in.	225°F

Preheat the material in accordance with Table 4 when E7010 or E8010 electrodes are used for tacking or temporary root pass.

Table 4
Minimum Preheat Temperature for Welding with E7010 or E8010 Electrodes

Thickest Part at Point of Welding	Temperature
1/2 in. and less	150°F
9/16 in. through 3/4 in.	200°F
13/16 in. through 1-1/2 in.	300°F
More than 1-1/2 in.	400°F

Use preheat and interpass temperatures for the thicker plate thickness when joining steels of different thickness.

Preheat base metal to at least 70°F when the base metal temperature is below 32°F and maintain this minimum temperature during welding. Preheat base metal to 200°F before starting to weld if it is moist.

Preheat fracture-critical applications in accordance with AASHTO/AWS D1.5.

4.3.5. **Welding Practice**. Use an approved procedure to control shrinkage and distortion. Weld FCAW in conformance with an approved WPS. Weld as required by the Contract or erection drawings. Do not change the location or size of welds without approval. Do not make temporary welds for transportation, erection, or other purposes on main members, except as shown on the plans or approved. Use a crayon, paint, or other approved method to mark each groove weld to identify the welder who performed the work.

Use the stringer-bead technique where possible for groove welds. Progress upward in vertical welding passes using a back-step sequence, keeping the end of the low-hydrogen electrode contained within the molten metal and shield of flux unless the electrode manufacturer's specifications indicate otherwise.

Begin and terminate groove welds at the ends of a joint on extension bars. Make edge preparation and thickness of extension bars the same as that of the member being welded but extending at least 2 in. beyond the joint. Remove extension bars using a cutting torch or arc-air gouging and grind the flange edges smooth after the weld is completed and cooled. Clean any defects exposed by the grinding, fill them with weld metal, and regrind them to a uniform finish. Grind so that grind marks are parallel to the flange and avoid excess grinding of the parent metal. Clean and fuse tack welds thoroughly with the final weld. Remove defective, cracked, or broken tack welds.

Gouge, chip, or otherwise remove the root of the initial weld to sound metal for all groove welds, except those produced with the aid of backing or those on steel piling or armor joints, before welding is started on the second side. Clean the back side thoroughly before placing the backup pass. Fuse the weld metal thoroughly with the backing, and use backing that is continuous for the full length of the weld. Make a continuous length of backing by welding shorter sections together only under the following conditions.

- All splices in the backing are complete joint penetration (CJP) groove welds made with the same controls as similar CJP groove welds in the structure.
- The welds are radiographed and examined as described in Section 448.4.3.7., "Radiographic Inspection," to ensure weld soundness.
- All welding and testing of the backing are complete before the backing is used to make the structural weld.

4.3.5.1. **High-Cellulose Electrodes for Root Passes**. E7010 and E8010 electrodes may be used when welding the root passes of beam and girder splices if the work is preheated in accordance with Table 4. Remove the E7010 or E8010 electrode pass completely by arc-air gouging and replace it using a low-hydrogen electrode after the root passes are backed up.

4.3.5.2. **Welding Sequence**. Make beam and girder splices using the sequences shown in Figure 6. (Some members will require fewer or more passes than Figure 6 shows.) Alternate welds from flat to overhead to prevent heat buildup along bevel edge. Arrange the passes between the top and bottom flange to maintain balance and symmetry.

Place passes 1, 2, and 3 in the top flange, followed by passes 4, 5, and 6 in the bottom flange (Figure 6) for rolled I-beams and built-up girders. Gouge out and replace passes 1 and 4, which always are placed in the overhead position. Next, place passes 7, 8, and 9 in the top flange, followed by passes 10, 11, and 12 in the bottom flange. Continue with placing passes 13–17 in the top flange, followed by passes 18–22 in the bottom flange. Continue to alternate welding between top and bottom flange with at most five passes per flange until the flange splices are complete. Tack weld web after aligning girder webs with short tacks as required to obtain proper alignment. Place pass 23 and pass 24 on the web. Gouge out and replace pass 23. Finish web splice with pass 25.

Remove all slag for each layer, bead, and the crater area, and clean the weld and adjacent base metal before welding over previously deposited metal. Avoid arc strikes, and if they occur, grind resulting cracks and blemishes out to a smooth contour, checking them visually to ensure soundness.

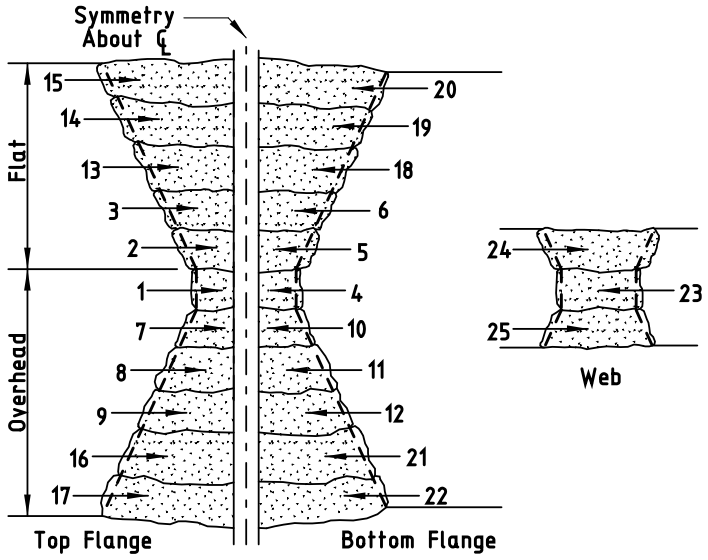

Figure 6
Welding Sequence for Splices for Material up to 50,000-psi Yield Strength

Deviation from the above sequence of weld passes requires approval. Obtain approval from the Bridge Division for welding procedures and sequences for special connections.

4.3.5.3. **Electrode Size and Weld Layer Thickness**.

4.3.5.3.1. **SMAW**.

4.3.5.3.1.1. **Electrode Size**. Use electrodes with the following maximum size:

- 1/4 in. for all welds made in the flat position except root passes,
- 1/4 in. for horizontal fillet welds,
- 1/4 in. for root passes of fillet welds made in the flat position and of groove welds made in the flat position with backing and with a root opening of 1/4 in. or more,
- 5/32 in. for welds made with low-hydrogen electrodes in the vertical and overhead positions, and
- 3/16 in. for all other welds.

4.3.5.3.1.2. **Weld Size and Layer Thickness**. Make the root pass large enough to prevent cracking. Make layers subsequent to the root pass in fillet welds and all layers in groove welds of the following maximum thickness:

- 1/4 in. for root passes of groove welds,
- 1/8 in. for subsequent layers of welds made in the flat position, and
- 3/16 in. for subsequent layers of welds made in the vertical, overhead, and horizontal positions.

Make fillet weld passes using no larger than:

- 3/8 in. in the flat position,
- 5/16 in. in the horizontal or overhead positions, and
- 1/2 in. in the vertical position.

4.3.5.3.2. **FCAW**.

4.3.5.3.2.1. **Electrode Size**. Use electrodes with the following maximum size:

- 5/32 in. for the flat and horizontal positions,
- 3/32 in. for the vertical position, and
- 5/64 in. for the overhead position.

4.3.5.3.2.2. **Weld Size and Layer Thickness**. Make weld layers, except root and surface layers, no thicker than 1/4 in. Use a multiple-pass split-layer technique when the root opening of a groove weld is 1/2 in. or wider. Use the split-layer technique to make all multiple-pass welds when the width of the layer exceeds 5/8 in.

Ensure each pass has complete fusion with adjacent base metal and weld metal and that there is no overlap, excessive porosity, or undercutting.

Do not use FCAW with external gas shielding in a draft or wind. Furnish an approved shelter of material and shape to reduce wind velocity near the welding to a maximum of 5 mph.

Make fillet weld passes using no larger than:

- 1/2 in. in the flat position,
- 3/8 in. in the horizontal or overhead positions, and
- 5/16 in. in the vertical position.

4.3.6. **Weld Quality**. Provide welds that are sound throughout, with no cracks in the weld metal or weld pass. Completely fuse the weld metal and the base metal and each subsequent pass. Keep welds free of overlap and keep the base metal free of undercut more than 1/100 in. deep when the direction of undercut is transverse to the primary stress in the part that is undercut. Fill all craters to the full cross-section of the welds.

4.3.7. **Radiographic Inspection**. Conduct radiographic testing (RT) as required in the field, at the expense of the Contractor, by an agency or individual registered and licensed to perform industrial radiography. Follow all applicable rules and regulations for radiographic operations. Testing includes furnishing all materials, equipment, tools, labor, and incidentals necessary to perform the required testing. The Department may require further tests in accordance with Article 5.10., "Inspection," and may perform additional testing, including other methods of inspection.

Perform RT in accordance with AASHTO/AWS D1.5. The Engineer will examine and interpret the resulting radiographs in accordance with AASHTO/AWS D1.5. All radiographs become the property of the Department and remain with the Engineer.

Radiographically inspect the full flange width of all flange splices and the top and bottom 1/6 of the web at each splice for field welds of splices in beams or girders. Radiographically retest repaired welds. Make necessary repairs before any further work is done. Additional RT required because of unacceptable welding or poor radiograph quality is at the Contractor's expense. RT of particular welds shown on the plans is in addition to the RT required by this Item.

Meet the requirements specified in Section 441.3.2.5.1., "Radiographic Testing (RT)," for radiograph film quality.

4.3.8. **Corrections**. When welding is unsatisfactory or indicates inferior workmanship, the Engineer will require corrective measures and approve the subsequent corrections.

Use oxygen gouging or arc-air gouging when required to remove part of the weld or base metal. Back-gouge splices in beams and girders or cut out defective welds using arc-air gouging by a welder qualified to make beam and girder splices.

Slope the sides of the area to be welded enough to permit depositing new metal where corrections require depositing additional weld metal.

Use a smaller electrode than that used for the original weld where corrections require depositing additional weld metal. Clean surfaces thoroughly before re-welding.

Remove cracked welds completely and repair. Remove the weld metal for the length of the crack if crack length is less than half the length of the weld plus 2 in. beyond each end of the crack, and repair.

Restore the original conditions where work performed after making a deficient weld has made the weld inaccessible or has caused new conditions making the correction of the deficiency dangerous or ineffectual by removing welds, members, or both before making the necessary corrections; otherwise, compensate for the deficiency by performing additional work in conformance with a revised and approved design.

Cut apart and re-weld improperly fitted or misaligned parts.

Straighten members distorted by the heat of welding using mechanical means or the carefully supervised application of a limited amount of localized heat. Do not let heated areas exceed 1,200°F as measured by temperature-indicating crayons or other approved methods for steel up to 65,000-psi yield strength. Do not let heated areas exceed 1,100°F for higher-strength steels. Keep parts to be heat-straightened substantially free of stress from external forces except when mechanical means are used with the application of heat. Before straightening, submit a straightening procedure to the Engineer for approval.

Correct defective or unsound welds either by removing and replacing the entire weld or as follows.

4.3.8.1. **Excessive Convexity**. Reduce to size by grinding off the excess weld metal, leaving a smooth profile.

4.3.8.2. **Shrinkage Cracks, Cracks in Base Metal, Craters, and Excessive Porosity**. Remove defective portions of base and weld metal down to sound metal, and replace with additional sound weld metal.

4.3.8.3. **Undercut, Undersize, and Excessive Concavity**. Clean and deposit additional weld metal.

4.3.8.4. **Overlap and Incomplete Fusion**. Remove and replace the defective portion of weld.

4.3.8.5. **Slag Inclusions**. Remove the parts of the weld containing slag, and replace them with sound weld metal.

4.3.8.6. **Removal of Base Metal During Welding**. Clean and form full size by depositing additional weld metal using stringer beads.

4.4. **Shear Stud Welding**. Weld shear studs to steel surfaces and perform preproduction and production tests as required in AASHTO/AWS D1.5.

4.5. **Welding Reinforcing Steel**. Splice reinforcing steel by welding only at locations shown on the plans. Before welding galvanized rebar, remove the zinc coating at least 1 in. from either side of the intended weld zone by grinding or equivalent means. After welding, repair the galvanized zinc coating damage in the welded area in accordance with Item 445, “Galvanizing.”

4.5.1. **Base Metal**. Provide weldable reinforcing steel in accordance with Item 440, “Reinforcement for Concrete.”

4.5.2. **Preheat and Interpass Temperature**. Minimum preheat and interpass temperatures are shown in Table 5. Preheat reinforcing steel when it is below the listed temperature for the size and carbon equivalency range of the bar being welded so that the cross-section of the bar is above the minimum temperature for at least 6 in. on each side of the joint. Allow bars to cool naturally to ambient temperature after welding is complete. Do not accelerate cooling.

Table 5
Minimum Preheat and Interpass Temperature for Reinforcing Steel

Carbon Equivalent Range (%)	Size of Reinforcing Bar (No.)	Temperature (°F)
Up to and including 0.40	Up to 11 inclusive	None
	14 and 18	50
0.41 through 0.45 inclusive	Up to 11 inclusive	None
	14 and 18	100
0.46 through 0.55 inclusive	Up to 6 inclusive	None
	7 to 11 inclusive	50
	14 and 18	200
Unknown	Up to 18 inclusive	500

Base the preheat and interpass temperatures for widening projects on the existing reinforcing steel and the requirements shown in Table 5.

4.5.3. **Joint Types**. Use butt splices for all No. 7 and larger bars. Use lap splices for No. 6 and smaller bars.

Make groove welds in lap splices at least 4 in. long and weld them on each side of the lap joint as shown in Figure 7. For No. 5 and smaller bars, weld from one side of the lap when it is impractical to weld from both sides of the joint if approved, but in this case make the weld at least 6 in. long.

Make all butt splices in the flat position. Make all welds for butt splices, except horizontal welds on vertical bars, as shown in Figures 8 and 9. The backup strip is required when access to the splice is from the top only. When bars can be rotated or access to the splice is available from two sides, the double V-groove splice may be used, and this type of weld requires gouging out the root pass similar to a flange splice on structural steel. The root pass may be made using E7010 or E8010 electrodes for all double V-groove splices. Preheat the steel to 400°F, if using E7010 or E8010 electrodes, and then completely remove the root pass before welding the opposite side. Make horizontal splices on vertical bars as shown in Figure 10. Provide alignment strips as shown in Figures 9 and 10 to hold bars during welding operation. Trim alignment strips after welding is complete.

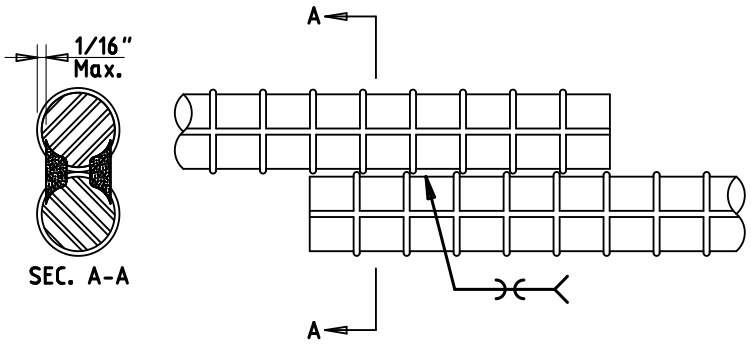

Figure 7
Direct Lap Joint with Bars in Contact

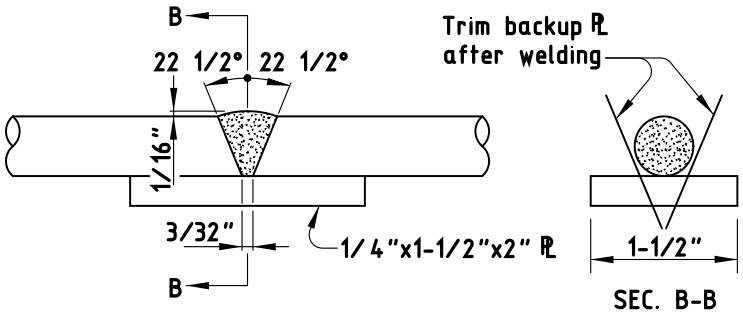

Figure 8
Single V-Groove Weld in Horizontal Position

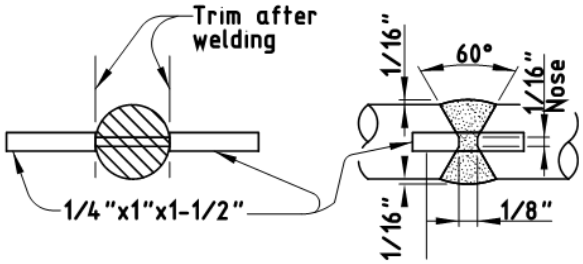

Figure 9
Double V-Groove Weld in Horizontal Position

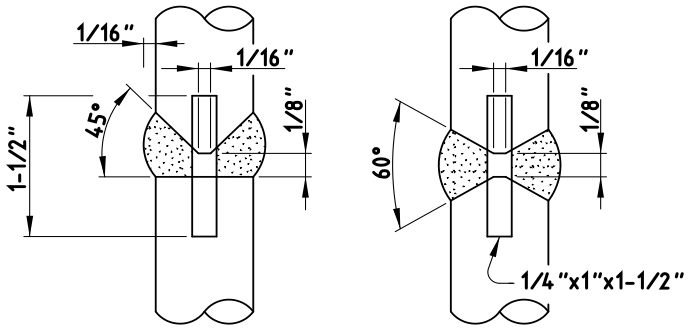

Figure 10
Double Bevel and Double V-Groove Welds in Vertical Position

4.5.4. **Radiographic Inspection**. Radiograph welded butt splices at the expense of the Contractor when designated on the plans. Follow all applicable rules and regulations for radiographic operations. Ensure welds have no cracks and that the sum of the greatest dimensions of porosity and fusion-type defects do not exceed 1/10 of the nominal bar diameter.

The Engineer will examine and interpret the resulting radiographs, which become the property of the Department and remain with the Engineer.

5. MEASUREMENT AND PAYMENT

The work performed, materials furnished, equipment, labor, tools, and incidentals will not be measured or paid for directly, but will be subsidiary to pertinent Items.

Item 449
Anchor Bolts

1. DESCRIPTION

Fabricate and install anchor bolts to be embedded in or attached to concrete. Anchor bolts are also referred to as anchor rods.

2. MATERIALS

2.1. **Bolts and Nuts**. Provide bolts and nuts that meet the standards shown in Table 1.

Table 1
Bolt and Nut Standards

Specified Anchor Bolt Category	Bolt Standards	Nut Standards
Mild steel	ASTM A307 Grade A, F1554 Grade 36, or A36	ASTM A563
Medium-strength, mild steel	ASTM F1554 Grade 55 with supplementary requirement S1	ASTM A194 Grade 2 or A563 Grade D or better
High-strength steel	ASTM F3125 Grade A325 or ASTM A449[1]	ASTM A194 or ASTM A563, heavy hex
Alloy steel	ASTM A193 Grade B7 or ASTM F1554 Grade 105	ASTM A194 Grade 2H or ASTM A563 Grade DH, heavy hex

1. If headed bolts are specified, ASTM A449 bolts must be heavy hex head.

Provide a mill test report or manufacturer's certification indicating the material conforms to these requirements. For alloy steel anchor bolts, provide a test report or certification attesting to the heat-treating process if applicable. If no specific bolt category is shown on the plans, provide mild steel anchor bolts and nuts that meet the standards shown in Table 1.

2.2. **Washers**. Use washers that meet ASTM F436.

2.3. **Threads**. Provide anchor bolts with rolled or cut threads of UNC or 8UN series in accordance with ASME B1.1. Anchor bolts 1 in. in diameter and smaller and 1-3/4 in. in diameter and larger must have UNC series threads. If bolts have rolled threads, ensure the diameter of the unthreaded portion of bolts with rolled threads is at least the minimum pitch diameter and no greater than the maximum major diameter of the threads. If bolts have cut threads, ensure the diameter of the unthreaded portion is at least the minimum major diameter of the threads. Ensure all threads for bolts and nuts have Class 2 fit tolerances in accordance with ASME B1.1.

3. CONSTRUCTION

3.1. **Fabrication**. Welded splicing of anchor bolts is not permitted.

Provide an anchorage device with each anchor bolt consisting of a standard bolt head, a threaded bolt with nuts, or, if shown on the plans, a 90° bend. Make the inside-bend diameter approximately two times the anchor bolt diameter, but at no point along the bend greater than three times the bolt diameter. Hot bending is permissible provided the temperature does not exceed 1,100°F.

When embedded templates are not specified and nuts are welded to the end of anchor bolts for anchorage, weld only on the nut face at the unstressed end of the bolt. Ensure no welding, arc, or other potential notch-producing effects occur in the stressed portion of the bolt.

Shipping of the anchor bolt cage in its assembled condition is not required.

3.2. **Finish**. Hot dip galvanize in accordance with Item 445, "Galvanizing."

3.2.1. **Anchor Bolts Embedded in Concrete**. Galvanize the exposed end of the thread length plus a minimum of 6 in. unless otherwise shown on the plans.

3.2.2. **Anchor Bolts Extending Through Concrete**. Galvanize the complete length of the bolt.

3.2.3. **Nuts**. Galvanize exposed nuts. Galvanize the untapped blanks before cutting the threads.

3.2.4. **Washers**. Galvanize exposed washers.

3.3. **Installation**. Hold the anchor bolt and template assembly rigidly in position during concrete placement. Use wood templates or other positive means to ensure correct positioning of anchor bolts not requiring steel templates. Positioning devices may be tack welded to the steel templates but not to any portion of the anchor bolts.

3.3.1. **Anchor Bolt Thread Lubricant Coating**. Coat anchor bolt threads before installing nuts using an electrically conducting lubricant compound described in Section 449.3.3.2.1., "Definitions," for traffic signal poles, roadway illumination poles, high mast illumination poles, intelligent transportation system (ITS) poles, steel electrical service supports, and overhead sign support structures. Coat anchor bolt threads for other structures with pipe joint compound or beeswax. After installing nuts, repair galvanizing damage on bolts, nuts, and washers in accordance with Section 445.3.4., "Repairs."

3.3.2. **Anchor Bolt Tightening Procedure**. Tighten anchor bolts for traffic signal poles, shoe base and concrete traffic barrier base roadway illumination poles, high mast illumination poles, ITS poles, steel electrical service supports, and overhead sign support structures in accordance with this Section. This procedure covers the tightening of nuts on a double-nut anchor bolt system using anchor bolts with 55-ksi or 105-ksi minimum yield strength and UNC or 8UN thread series to secure structures to drilled shaft foundations.

3.3.2.1. **Definitions**. The following definitions apply to the anchor bolt tightening procedure.

- **Double-Nut Anchor Bolt System**. An anchor bolt with two nuts that sandwich the structure's base plate. The bottom nut is positioned under the base plate to level, support, and provide the reaction for the force applied by tightening the top nut positioned above the base plate.
- **Electrically Conducting Lubricant**. A compound commonly used in the electrical industry to coat threads of field-cut rigid metal conduit and suitable for exposure to weather.
- **Impact Tightening**. The tightening of nuts using a box-end "slug" or "knocker" wrench and a sledgehammer. The wrench, matching the size of the nut to be tightened, is driven with the sledgehammer to rotate the nut.
- **Static Tightening**. The tightening of nuts using a "spud" wrench and a pipe or extension handle. The wrench, matching the size of the nut to be tightened, may be turned using more than one worker to rotate the nut.
- **Snug-Tight**. The condition when the nut is in full contact with the base plate. It may be assumed the full effort of a worker on a 12-in. wrench results in a snug-tight condition.
- **Turn-of-the-Nut Method**. The tightening of top nuts to snug-tight condition, then establishing reference positions by marking one flat on each nut with a corresponding reference mark on the base plate at each bolt. Each nut is then turned to the prescribed rotation from the referenced snug-tight position.

3.3.2.2. **Anchor Bolt Tightening**. Perform the following procedure.

- Coat the threads of the anchor bolts with electrically conducting lubricant.
- Install the bottom nuts on the bolts, one on each bolt.

- Level the top template (using it as a guide) by adjusting the bottom nuts so the template rests on each nut and the distance between the top of the concrete shaft and the bottom surface of the bottom nut is approximately 1/2 in.
- Remove the template.
- Coat the bearing surfaces of the bottom nuts and washers with electrically conducting lubricant.
- Install bottom washers on bolts, one on each bolt.
- Erect and plumb the structure as specified. Adjust the bottom nuts so each is bearing equally on the washer or base plate. The truss for cantilever overhead sign support structures and the mast arm for traffic signal poles must be removed during anchor bolt tightening.
- With the plumbed structure supported by a crane, coat the bearing surfaces of the top nuts and washers with electrically conducting lubricant. Install one washer and one top nut on each bolt. Turn the top nuts onto the bolts so each is hand-tight against the washer or base plate.
- Turn each bottom nut to a snug-tight condition using a wrench.
- Verify the structure is still plumb and still supported by the crane. Begin turn-of-the-nut method by turning each top nut down to the same snug-tight condition. Prevent rotation of the bottom leveling nut during all top nut tightening. Establish reference marks for turn-of-the-nut method once snug-tight condition is achieved, and then tighten the top nuts by turning each nut 1/12 turn (1/2 of a nut flat) past snug-tight using either static or impact tightening. Turn each top nut an additional 1/12 turn until each nut has been tightened 1/6 total turn past snug-tight.

4. MEASUREMENT AND PAYMENT

Top or bottom templates, washers, lock washers, nuts, lock nuts, and other devices used for installing anchor bolts are considered part of the anchor bolt assembly. All work performed, materials furnished, equipment, labor, tools, and incidentals will not be measured or paid for directly, but will be subsidiary to pertinent Items.

Item 450
Railing

1. DESCRIPTION

Construct railing of concrete, steel, aluminum, or a combination of these materials, including necessary anchorage for the railing on bridges, culverts, walls, or other structures as shown on the plans.

2. MATERIALS

Use materials that conform to requirements of the following Items.

- Item 421, “Hydraulic Cement Concrete”
- Item 440, “Reinforcement for Concrete”
- Item 441, “Steel Structures”
- Item 442, “Metal for Structures”
- Item 445, “Galvanizing”
- Item 540, “Metal Beam Guard Fence”

Provide an approved Type III, Class C epoxy or an epoxy of the type and class shown on the plans where epoxy anchors are allowed or required for installing drilled and epoxied rail anchorage reinforcement or rail anchor bolts in accordance with DMS-6100, “Epoxies and Adhesives.” Use other materials if shown on the plans. Provide only dual-cartridge epoxy systems mixed with a static mixing nozzle supplied by the epoxy adhesive manufacturer and dispensed using a tool supplied by the epoxy adhesive manufacturer. Do not use bulk epoxies. Drill and install anchorage reinforcement or anchor bolts to the embedment depth shown on the plans or the depth the manufacturer recommends, whichever is deeper. No additional payment will be made for providing embedment deeper than shown on the plans. Select an embedment depth capable of developing the yield strength of the steel anchor based on the product literature for the epoxy and steel anchor being used if no resistance or embedment depth is shown on the plans. Use 60 ksi as the yield strength for reinforcing steel.

3. CONSTRUCTION

Construct railing in compliance with details, alignment, and grade shown on the plans. Do not place railing until falsework or formwork, if any, for the span has been released unless otherwise directed. Adhere to the schedule restrictions for placing bridge rails and opening to construction traffic in accordance with Item 422, “Concrete Superstructures.” Notify the Engineer after completion of the following steps and obtain approval of work before proceeding to the next step: placing rail reinforcement and pre-pour clear cover checks.

Ensure expansion joints in the railing will function properly before placing concrete.

Furnish either steel or aluminum, but not both, for the entire Contract if the plans allow either steel or aluminum options for a particular railing type.

Install epoxy adhesive anchorages in conformance with the manufacturer’s instructions, including hole size, drilling equipment and method, hole cleaning equipment and method, mixing and dispensing epoxy, and anchor insertion. Do not alter the manufacturer’s mixing nozzle or dispenser. Anchorage bars or bolts must be clean and free of grease, oil, or any other foreign material. Demonstrate hole cleaning method to the Engineer for approval and continue the approved process for all anchorage locations. Do not weld to an anchor bar or anchor bolt that is anchored with epoxy adhesive. Do not expose rail to traffic until epoxy adhesive has obtained full cure in conformance with manufacturer’s specifications.

3.1. **Metal Railing**.

3.1.1. **General**. Furnish metal beam rail elements in accordance with Item 540.

Fabricate and erect metal railing in accordance with the pertinent provisions of Item 441 and this Item.

Prepare and submit for approval the required shop or erection drawings in accordance with Item 441 when shown on the plans. Show all splice locations and details on the shop or erection drawings. Splice members only as shown on the plans.

Field-weld when required in accordance with Item 448, "Structural Field Welding."

3.1.2. **Fabrication**. Fabrication plants that produce metal railing (steel and aluminum) must be approved in accordance with DMS-7395, "Metal Railing Fabrication Plant Qualification." This required approval does not include fabricators of chain link fence. The Department maintains an MPL of approved fabrication plants of metal railing.

Permanently mark each metal railing post base plate, at a visible location when erected, with the fabrication plant's insignia or trademark. For fabricated rail panels, provide this permanent mark on one post base plate per panel.

Fabricate metal railing and post panels in sections conforming to the details shown on the plans and field-verified lines and grades. Fabricate adjacent sections so they will accurately engage each other in the field. Match-mark each pair of sections so they can be erected in the same position in which they were fabricated.

Fabricate metal rail elements included as part of the railing system to the dimensions and cross-sections shown on the plans and within a tolerance of 1/4 in. per 10 ft. in the straightness of either edge. Connect metal rail elements to the rail posts as shown on the plans, lapping metal rail elements in the direction of traffic in the adjacent lane. Bolts and nuts for metal railing should meet requirements of ASTM A307 and be galvanized in accordance with Item 445, unless otherwise shown on the plans.

Fabricate stainless steel railing in accordance with AWS D1.3. Fabricate aluminum railing in accordance with AWS D1.2.

When required, heat aluminum materials to a temperature up to 400°F for no more than 30 min. to facilitate bending or straightening.

3.1.3. **Corrosion Protection**. Galvanize all portions of steel railing after fabrication in accordance with Item 445, unless otherwise shown on the plans. Apply appearance coat to galvanized surface in accordance with Item 445 when shown on the plans. Repair any damage to galvanized or painted surfaces after erection in accordance with Item 445 and Item 446, "Field Cleaning and Painting Steel," respectively.

Before final acceptance, clean surfaces of aluminum and galvanized steel railing not shown to be painted to remove extrusion marks, grease, dirt, and all other surface contaminants.

3.1.4. **Storage and Shipping**. Store railing materials above the ground on platforms, skids, or other supports, and keep them free of grease, dirt, and contact with dissimilar metals. Avoid scratching, marring, denting, discoloring, or otherwise damaging the railing. Properly ship railing materials in a manner to avoid damage.

3.2. **Concrete Railing**. Provide concrete portions of railing in accordance with the requirements of Item 420, "Concrete Substructures," and Item 422, "Concrete Superstructures." Construct forms so the railing line and grade can be checked after the concrete has been placed but before initial set. Do not disturb the form alignment during finish floating of the railing tops. Exercise particular care in other construction to avoid disturbing or vibrating the span with the newly placed railing.

Provide precast members conforming to Item 424, "Precast Concrete Structural Members (Fabrication)."

Slipform construction of railing is permitted unless otherwise shown on the plans. Demonstrate slipforming method showing line and grade of concrete surfaces can be consistently obtained and clear cover outside reinforcing steel be maintained at all times. Stop slipforming railing if specified concrete clear cover is not obtained or appearance of rail is off line and grade.

Do not slipform railing with cast-in-place anchor bolts unless noted otherwise.

Provide additional reinforcing as needed to prevent movement of the reinforcement cage. Clear cover and epoxy coating requirements for additional reinforcement are the same as those shown for the rail reinforcement. The rail reinforcing cage may be tack welded to the rail anchorage reinforcement provided the rail and anchorage reinforcement are not epoxy-coated and weld locations measured along the rail are no closer than 3 ft. Tie all bar intersections if epoxy-coated reinforcement is required for the railing proposed to be slipformed. Provide a wire line to maintain vertical and horizontal alignment of the slipform machine. Attach a grade line gauge or pointer to the machine so a continuous comparison can be made between the rail being placed and the established grade line. Rails or supports at the required grade are allowed instead of sensor controls. Make one or more passes with the slipform over the rail segment to ensure proper operation and maintenance of grades and clearances before placing concrete. Provide slipformed rail within a vertical and horizontal alignment tolerance of ±1/4 in. per 10 ft. Construct rail with a smooth and uniform appearance. Consolidate concrete so it is free of honeycomb. Provide concrete with a consistency that will maintain the shape of the rail without support. Minimize starting and stopping of the slipform operation by ensuring a continuous supply of concrete.

Do not exceed the manufacturer's recommended speed for the slipform machine. Stop slipforming and take remedial action if slipforming causes movement of the reinforcement such that plan clearances are not achieved. Remove and replace unsatisfactory slipformed rail at the Contractor's expense.

3.3. **Tests**. Metal beam rail elements may be sampled in accordance with Tex-713-I. The Engineer may sample bolts and nuts in accordance with Tex-708-I for galvanized coating testing.

The Engineer will select five anchor bars or bolts from the first day's production to be tested after the epoxy has cured. Test the bars or bolts in the presence of the Engineer in accordance with ASTM E1512, using a restrained test, to evaluate the epoxy adhesive's bond strength. Verify the anchor bars or bolts develop the required pullout resistance on the plans or 75% of the yield strength of the bars or bolts, whichever is less, without a bond failure of the epoxy. The Engineer may require additional tests during production. Perform corrective measures to provide adequate capacity if any of the tests do not meet the required test load. Repair damage from testing.

4. MEASUREMENT

This Item will be measured by the foot.

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Railing" of the type specified. This price is full compensation for furnishing, preparing, and placing concrete, expansion joint material, reinforcing steel, structural steel, aluminum, cast steel, pipe, anchor bolts or bars, testing of epoxy anchors, and all other materials required in the finished railing; removal and disposal of salvageable materials; and hardware, paint and painting of metal railing, galvanizing, equipment, labor, tools, and incidentals.

Item 458
Waterproofing Membranes for Structures

1. DESCRIPTION

Furnish and place waterproofing membranes on concrete and steel bridge decks of railroad and other types of structures.

2. MATERIALS

2.1. **Materials to be Furnished**. Furnish waterproofing materials listed below in accordance with DMS-6300, "Waterproofing":

- asphalt for mopping above ground,
- asphalt for mopping below ground,
- asphaltic primer,
- treated cotton fabric,
- self-adhering polyethylene,
- coal-tar modified urethane,
- rubberized asphalt with pre-formed board membrane,
- asphalt plank,
- asphalt mat,
- rubberized asphalt with plastic film,
- asphaltic panels,
- plastic cement, and
- cold asphalt base emulsion.

Furnish butyl rubber membrane and ethylene-propylene-diene terpolymer (EPDM) sheeting in accordance with ASTM D6134.

Deliver materials requiring sampling and testing to the worksite at least 3 weeks before use. Test and obtain approval for waterproofing materials before delivery to the worksite when authorized.

2.2. **Types**. Provide the following types of waterproofing as shown on the plans or as directed.

2.2.1. **Type 1**. Butyl rubber membrane applied to a surface with a proper adhesive without protective planking and as shown on the plans. Provide a minimum thickness of 1/16 in. unless otherwise shown on the plans.

2.2.2. **Type 2**. A single asphaltic primer coat and one mopping of asphalt.

2.2.3. **Type 3**. A single asphaltic primer coat and two moppings of asphalt. Supplement with two layers of treated cotton fabric with a third mopping of asphalt placed over the outer layer of fabric at construction joints of foundation structures as shown on the plans.

2.2.4. **Type 4**. Self-adhering polyethylene with a rubberized asphalt mastic material.

2.2.5. **Type 5**. Single-component, coal-tar modified urethane coating.

2.2.6. **Type 6**. Self-adhering built-up membrane of rubberized asphalt formed on a pre-formed board with cold-applied asphaltic primer.

2.2.7. **Type 10**. Any of Type 1, 4, 5, or 6 waterproofing.

2.2.8. **Type RR-1**. Butyl rubber or EPDM membrane with a protective course of asphalt plank or asphalt mat of the specified thickness, as shown on the plans.

3. CONSTRUCTION

3.1. **General**. Store waterproofing material in a manner that will prevent damage. Keep material dry, and store in a warm area before using in cold weather and out of direct sunlight in hot weather. Store asphalt planks, asphalt mats, and asphaltic panels in a manner that will prevent warping and breaking.

Provide a wood float finish to concrete decks and other unformed concrete surfaces to be waterproofed. Cure concrete surfaces to be waterproofed for at least 7 days before applying waterproofing, or as directed by the waterproofing materials manufacturers.

Ensure steel or concrete deck surfaces to be waterproofed are clean; dry; smooth; and free of fins, sharp edges, and loose material. Use grinders, if necessary, to remove protrusions that would puncture waterproofing membrane. Ensure surfaces are free of contaminants such as form-release agents, wax-base curing compounds, oil, and grease. Remove any contaminants by abrasive blast cleaning. Ensure there are no depressions or pockets in horizontal surfaces of finished waterproofing.

Fill expansion joints and other grooves with plastic cement in accordance with DMS-6300, unless otherwise shown on the plans. Ensure joints are dry and clean when filled. Overfill slightly to allow for shrinkage in drying.

Sweep, vacuum, or air-blow the area to be waterproofed thoroughly to remove dust, dirt, and loose foreign material. Maintain the deck in a clean condition until completion of waterproofing.

Do not allow vehicular or equipment traffic on the bridge after the deck waterproofing work has started or until after the work is complete, cover sheets are in place, and an adequate ballast cushion has been placed on the deck. Protect the waterproofing against damage from any source.

Use asphalt for mopping below ground in accordance with DMS-6300 when asphalt waterproofing is shown as a protection for back of abutments, retaining walls, or footings. Use asphalt for mopping above ground in accordance with DMS-6300 for waterproofing on bridge decks.

3.2. **Type 1**. Do not apply waterproofing in wet weather or when the ambient temperature is below 50°F. Ensure the rubber membrane is free of punctures, pockets, or folds.

Turn the membrane into drainage holes and castings without break. Take special care to make the waterproofing effective along the sides and ends of members to be waterproofed.

Install the butyl rubber membrane by first applying the adhesive as recommended by the membrane manufacturer. Apply the adhesive to the surface to be waterproofed and at necessary splices, in a solid area extending approximately 36 in. back from the edges. Apply the membrane by pressing it firmly and uniformly in place against the previously applied adhesive, avoiding wrinkles and buckles. Make splices, laps, and flashing in conformance with the membrane manufacturer's recommended procedures.

3.3. **Type 2**. Place the asphalt primer at least 24 hr. before the asphalt mopping. Ensure the primer is dry before the mopping. Work in the primer to give a uniform coating. Heat the asphalt for mopping in kettles equipped with armored thermometers, but do not heat above 350°F. Stir the asphalt frequently while heating. Apply the mop coating at a rate of at least 4 gal. per 100 sq. ft. of surface. Apply additional coatings, if imperfections appear, until corrected.

3.4. **Type 3**. Place the asphalt primer at least 24 hr. before the asphalt mopping. Ensure the primer is dry before the mopping. Work in the primer to give a uniform coating. Heat the asphalt for mopping in kettles equipped

with armored thermometers, but do not heat above 350°F. Stir the asphalt frequently while heating. Use a minimum coverage rate for each mop coating of 4 gal. per 100 sq. ft. of surface. Apply additional coatings, if imperfections appear, until corrected.

Mop the surfaces to be waterproofed in sections at construction joints. Lay a 15-in. wide strip of cotton fabric on the first mopping while the asphalt is still hot and press into place. Apply subsequent moppings to completely cover and seal the cotton fabric. Make the end laps of the cotton fabric at least 12 in. unless otherwise shown on the plans.

3.5. **Type 4**. Unwrap the roll of waterproofing and press the adhesive surface into contact with the concrete horizontally. Secure the free end and then unroll slowly, using hand pressure to smooth the membrane into place and help make a tight bond with the concrete. Overlap adjacent strips at least 1 in. over the previously laid strip. Backfilling may be started as soon as the initial horizontal strip has been applied.

3.6. **Type 5**. Apply waterproofing in two coats to produce a minimum cured film thickness of 1/16 in. Apply using a roller, a squeegee, a brush, or spray equipment unless otherwise shown on the plans. Apply the second coat within 16 hr. after the initial coat. Follow the manufacturer's instructions pertinent to the maximum time allowed between coats and any treatment of the initial coat required if this maximum time is exceeded. The minimum ambient temperature at the time of waterproofing application is 40°F. Do not begin backfilling until the second coat of waterproofing has cured enough to prevent damage by the backfilling operation.

3.7. **Type 6**. Apply the primer at a rate of 1 gal. per 100 sq. ft. of surface or at the rate recommended by the manufacturer if different. Allow to dry to a tacky surface before placing the waterproofing membrane. Apply the primer and waterproofing membrane board panels only when the substrate temperature is above 50°F.

Seal joints by centering 6-in. gusset tape over the joint and pressing firmly into position. Roll in the panels and jointing tape with enough pressure to assure maximum adhesion, conformance to substrate, and elimination of air bubbles. Follow the manufacturer's recommendations for installation.

Begin backfilling as soon as the application of the waterproofing is complete. Complete backfilling within 48 hr. after the waterproofing material is applied to a non-horizontal surface.

3.8. **Type RR-1**. Apply waterproofing to dry surfaces and only when the ambient temperature is above 50°F. Ensure the butyl rubber or EPDM membrane is free of punctures, pockets, or folds. Turn the membrane into drainage castings without break. Take special care to make the waterproofing effective along the sides and ends of girders and at stiffeners and gussets. Fill grooves with plastic cement.

Install the butyl rubber or EPDM membrane by first applying the adhesive as recommended by the membrane manufacturer to ballast retainers, to ends of deck, and at necessary splices in a solid area extending from the edges back approximately 36 in. or as shown on the plans. Apply the membrane and press it firmly and uniformly in place against the previously applied adhesive, avoiding wrinkles and buckles. Make splices, laps, and flashing in conformance with the membrane manufacturer's recommended procedures.

Place the protective cover as soon as practicable after placement of the membrane. Clean the membrane surface of dirt and other foreign material before placing the cover material. Apply a coating of cold asphalt emulsion over the membrane at a minimum rate of 4 gal. per 100 sq. ft. of surface. Place the asphalt plank or mat on the coating of cold asphalt emulsion.

Provide a minimum thickness of protection of 1 in., consisting of asphalt plank or asphalt mat, unless otherwise shown on the plans. Coat the edges and ends of adjacent planks already laid with cold asphalt emulsion as successive planks are laid. Lay the planks tightly against those previously laid so the emulsion will completely fill the joints and be squeezed out the top. Fill any joints not completely full after planks have been laid with emulsion. Offset the vertical joints of the second layer at least 4 in. transversely and 1 ft. longitudinally from the joints in the lower layer when two layers of planks are used to obtain the required 1-in. cover thickness.

Apply asphalt mat protection in the same manner, except stagger the longitudinal butt joints in a single layer by approximately 2 ft. Follow the same procedure with all vertical joints offset by at least 1 ft. when more than one thickness of asphalt mat is required. Place a follow-up coating of asphalt emulsion approximately 6 in. wide over all joints of the top layer.

Use asphalt for mopping above ground as defined in DMS-6300 where deck waterproofing is carried over the back wall and down the back of the abutment for only several feet to provide a proper flashing for the deck waterproofing.

4. MEASUREMENT

When waterproofing is shown on the plans to be a pay item, measurement will be by the square yard.

5. PAYMENT

Unless otherwise shown on the plans, the work performed, materials furnished, equipment, labor, tools, and incidentals will not be paid for directly, but will be subsidiary to pertinent Items.

When waterproofing is specified as a pay item, the work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Waterproofing,” of the type specified. This price is full compensation for materials furnished, equipment, labor, tools, and incidentals.

Item 464
Reinforced Concrete Pipe

1. DESCRIPTION

Furnish and install reinforced concrete pipe, materials for precast concrete pipe culverts, or precast concrete storm drain mains, laterals, stubs, and inlet leads.

2. MATERIALS

2.1. **Fabrication**. Multi-project fabrication plants, as defined in DMS-7305, "Fabrication and Qualification Procedure for Multi-Project Fabrication Plants of Precast Concrete Drainage Structures," must be approved by the Materials and Tests Division in accordance with DMS-7305 before furnishing precast reinforced concrete pipe for Department projects. The Department's MPL includes approved multi-project reinforced concrete pipe fabrication plants.

Furnish material and fabricate reinforced concrete pipe in accordance with DMS-7305.

2.2. **Design**.

2.2.1. **General**. The class and D-load equivalents are shown in Table 1. Furnish arch pipe in accordance with ASTM C506 and the dimensions shown in Table 2. Furnish horizontal elliptical pipe in accordance with ASTM C507 and the dimensions shown in Table 3. For arch pipe and horizontal elliptical pipe, the minimum height of cover required is 1 ft.

Table 1
Circular Pipe
ASTM C76 and ASTM C655

Class	D-Load
I	800
II	1,000
III	1,350
IV	2,000
V	3,000

Table 2
Arch Pipe

Design Size	Equivalent Diameter (in.)	Rise (in.)	Span (in.)
1	18	13-1/2	22
2	21	15-1/2	26
3	24	18	28-1/2
4	30	22-1/2	36-1/4
5	36	26-5/8	43-3/4
6	42	31-5/16	51-1/8
7	48	36	58-1/2
8	54	40	65
9	60	45	73
10	72	54	88

Table 3
Horizontal Elliptical Pipe

Design Size	Equivalent Diameter (in.)	Rise (in.)	Span (in.)
0	15	12	19
1	18	14	23
2	24	19	30
3	27	22	34
4	30	24	38
5	33	27	42
6	36	29	45
7	39	32	49
8	42	34	53
9	48	38	60
10	54	43	68

2.2.2. **Jacking, Boring, or Tunneling**. Design pipe for jacking, boring, or tunneling considering the specific installation conditions such as the soil conditions, installation methods, anticipated deflection angles, and jacking stresses. Provide design notes and drawings signed and sealed by a Texas licensed professional engineer when requested. Provide steel reinforcement in bell and spigot.

2.3. **Marking**. Furnish each section of reinforced concrete pipe marked with the following information in accordance with DMS-7305:

- class or D-load of pipe,
- ASTM designation,
- date of manufacture,
- pipe size,
- name or trademark of fabricator and plant location,
- designation “TX” for precast units fabricated in accordance with DMS-7305,
- designated fabricator’s approval stamp for each approved unit,
- pipe to be used for jacking and boring (when applicable), and
- designation “SR” for pipe meeting sulfate-resistant concrete plan requirements (when applicable).

Clearly mark one end of each section during the process of manufacture or immediately thereafter for pipe with elliptical reinforcement. Mark the pipe on the inside and outside of opposite walls to show the location of the top or bottom of the pipe as it should be installed unless the external shape of the pipe is such that the correct position of the top and bottom is obvious. Mark the pipe section by indenting or painting with waterproof paint.

2.4. **Inspection**. Provide access for inspection of the finished pipe at the project site before and during installation.

2.5. **Causes for Rejection**. Individual sections of pipe may be rejected for any of the conditions stated in the DMS-7305 Annex.

2.6. **Repairs**. Make repairs, if necessary, in accordance with the DMS-7305 Annex.

2.7. **Jointing Materials**. Use any of the following materials for the making of joints unless otherwise shown on the plans. Furnish a manufacturer’s certificate of compliance for all jointing materials except mortar.

2.7.1. **Mortar**. Provide mortar for joints that meets the requirements of Section 464.3.3., “Jointing.”

2.7.2. **Cold-Applied, Plastic Asphalt Sewer Joint Compound**. Provide a material that consists of natural or processed asphalt base, suitable volatile solvents, and inert filler. Ensure the consistency is such that the ends of the pipe can be coated with a layer of the compound up to 1/2 in. thick by trowel. Provide a joint

compound that cures to a firm, stiff plastic condition after application. Provide a material of a uniform mixture. Stir any small separation found in the container into a uniform mix before using.

Provide a material that meets the requirements shown in Table 4 when tested in accordance with Tex-526-C.

Table 4
Cold-Applied, Plastic Asphalt Sewer Joint Compound Material Requirements

Composition	Analysis
Asphalt base, 100%–% volatiles–% ash, % by weight	28–45
Volatiles, 212°F evaporation, 24 hr., % by weight	10–26
Mineral matter, determined as ash, % by weight	30–55
Consistency, cone penetration, 150 q, 5 sec., 77°F	150–275

2.7.3. **Rubber Gaskets**. Provide gaskets that conform to ASTM C1619 Class A or Class C. Meet the requirements of ASTM C443 for design of the pipe joints and permissible variations in dimensions.

2.7.4. **Pre-Formed Flexible Joint Sealants**. Pre-formed flexible joint sealants may be used for sealing joints of tongue-and-groove concrete pipe. Provide flexible joint sealants that meet the requirements of ASTM C990. Use flexible joint sealants that do not depend on oxidizing, evaporating, or chemical action for its adhesive or cohesive strength. Supply in extruded rope form of suitable cross-section. Provide a size of the pre-formed flexible joint sealant in conformance with the manufacturer's recommendations and large enough to properly seal the joint. Protect flexible joint sealants with a suitable wrapper able to maintain the integrity of the jointing material when the wrapper is removed.

3. CONSTRUCTION

3.1. **Excavation, Shaping, Bedding, and Backfill**. Excavate, shape, bed, and backfill in accordance with Item 400, "Excavation and Backfill for Structures," except where jacking, boring, or tunneling methods are permitted. Jack, bore, or tunnel the pipe in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box." Immediate backfilling is permitted if joints consist of materials other than mortar. Take special precautions in placing and compacting the backfill to avoid any movement of the pipe or damage to the joints. Do not use heavy earth-moving equipment to haul over the structure until at least 4 ft. of permanent or temporary compacted fill has been placed over the structure, unless otherwise shown on the plans or permitted in writing. Remove and replace pipe damaged by the Contractor at no expense to the Department.

3.2. **Laying Pipe**. Start the laying of pipe on the bedding at the outlet end with the spigot or tongue end pointing downstream and proceed toward the inlet end with the abutting sections properly matched, true to the established lines and grades unless otherwise authorized. Fit, match, and lay the pipe to form a smooth, uniform conduit. Cut cross trenches in the foundation to allow the barrel of the pipe to rest firmly on the bedding where bell-and-spigot pipe is used. Cut cross trenches no more than 2 in. larger than the bell ends of the pipe. Lower sections of pipe into the trench without damaging the pipe or disturbing the bedding and the sides of the trench. Carefully clean the ends of the pipe before the pipe is placed. Prevent earthen or bedding material from entering the pipe as it is laid. Lay the pipe in the trench, when elliptical pipe with circular reinforcing or circular pipe with elliptical reinforcing is used, so the markings for the top or bottom are not more than 5° from the vertical plane through the longitudinal axis of the pipe. Remove and re-lay, without extra compensation, pipe that is not in alignment or shows excessive settlement after laying.

Lay multiple lines of reinforced concrete pipe with the centerlines of the individual barrels parallel. Use the clear distances between outer surfaces of adjacent pipes shown in Table 5 unless otherwise shown on the plans. Use the equivalent diameter from Table 2 or Table 3 for arch pipe or horizontal elliptical pipe to determine the clear distance requirement shown in Table 5.

Table 5
Minimum Clear Distance Between Pipes

Equivalent Diameter	Min Clear Distance
18 in.	9 in.
24 in.	11 in.
30 in.	1 ft. 1 in.
36 in.	1 ft. 3 in.
42 in.	1 ft. 5 in.
48 in.	1 ft. 7 in.
54 in.	1 ft. 11 in.
60–84 in.	2 ft.

3.3. **Jointing**. Make available an appropriate rolling device similar to an automobile mechanic's "creeper" for conveyance through small-size pipe structures.

3.3.1. **Joints Sealed with Hydraulic Cement Mortar**. Use Type S mortar meeting the requirements of ASTM C270. Clean and wet the pipe ends before making the joint. Plaster the lower half of the bell or groove and the upper half of the tongue or spigot with mortar. Pack mortar into the joint from both inside and outside the pipe after the pipes are tightly jointed. Finish the inside smooth and flush with adjacent joints of pipe. Form a bead of semicircular cross-section over tongue-and-groove joints outside the pipe, extending at least 1 in. on each side of the joint. Form the mortar for bell-and-spigot joints to a 45° fillet between the outer edge of the bell and the spigot. Cure mortar joints by keeping the joints wet for at least 48 hr. or until the backfill has been completed, whichever is first. Place fill or backfill once the mortar jointing material has cured for at least 6 hr. Conduct jointing only when the atmospheric temperature is above 40°F. Protect mortared joints against freezing by backfilling or other approved methods for at least 24 hr.

Driveway culverts do not require mortar banding on the outside of the pipe.

Furnish pipes, with approval, that are large enough for a person to enter with the groove between 1/2 in. and 3/4 in. longer than the tongue. Such pipe may be laid and backfilled without mortar joints. Clean the space on the interior of the pipe between the end of the tongue and the groove of all foreign material, thoroughly wet and fill with mortar around the entire circumference of the pipe, and finish flush after the backfilling has been completed.

3.3.2. **Joints Using Cold-Applied, Plastic Asphalt Sewer Joint Compound**. Ensure both ends of the pipes are clean and dry. Trowel or otherwise place a 1/2-in. thick layer of the compound in the groove end of the pipe covering at least 2/3 of the joint face around the entire circumference. Shove home the tongue end of the next pipe with enough pressure to make a tight joint. Remove any excess mastic projecting into the pipe after the joint is made. Backfill after the joint has been inspected and approved.

3.3.3. **Joints Using Rubber Gaskets**. Make the joint assembly in conformance with the recommendations of the gasket manufacturer. Make joints watertight when using rubber gaskets. Backfill after the joint has been inspected and approved.

3.3.4. **Joints Using Pre-Formed Flexible Joint Sealants**. Install pre-formed flexible joint sealants in conformance with the manufacturer's recommendations. Place the joint sealer so no dirt or other deleterious materials contact the joint sealing material. Pull or push home the pipe with enough force to properly seal the joint. Remove any joint material pushed out into the interior of the pipe that would tend to obstruct the flow. Store pre-formed flexible joint sealants in an area warmed naturally or artificially to above 70°F in an approved manner when the atmospheric temperature is below 60°F. Apply flexible joint sealants to pipe joints immediately before placing pipe in trench, and connect pipe to previously laid pipe. Backfill after the joint has been inspected and approved.

3.4. **Connections and Stub Ends**. Make connections of concrete pipe to existing pipes, pipe storm drains, or storm drain appurtenances as shown on the plans.

Mortar or concrete the bottom of existing structures if necessary to eliminate any drainage pockets created by the connections. Repair any damage to the existing structure resulting from making the connections.

Make connections between concrete pipe and corrugated metal pipe with a suitable concrete collar and a minimum thickness of 4 in. unless otherwise shown on the plans.

Finish stub ends for connections to future work not shown on the plans by installing watertight plugs into the free end of the pipe.

Fill lift holes with concrete, mortar, or precast concrete plugs after the pipe is in place.

4. MEASUREMENT

This Item will be measured by the foot. Measurement will be made between the ends of the pipe barrel along the flow line, not including safety end treatments. Safety end treatments will be measured in accordance with Item 467, “Safety End Treatment.” Pipe that will be jacked, bored, or tunneled will be measured in accordance with Item 476. Measurement of spurs, branches, or new connecting pipe will be made from the intersection of the flow line with the outside surface of the pipe into which it connects. Where inlets, headwalls, catch basins, manholes, junction chambers, or other structures are included in lines of pipe, the length of pipe tying into the structure wall will be included for measurement, but no other portion of the structure length or width will be included.

For multiple pipes, the measured length will be the sum of the lengths of the barrels.

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., “Plans Quantity Measurement.” Additional measurements or calculations will be made if adjustments of quantities are required.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Reinforced Concrete Pipe,” “Reinforced Concrete Pipe (Arch),” or “Reinforced Concrete Pipe (Elliptical)” of the size and D-load specified or of the size and class specified. This price is full compensation for constructing, furnishing, transporting, placing, and joining pipes; shaping the bed; cutting pipes on skew or slope; connecting to new or existing structures; breaking back, removing, and disposing of portions of the existing structure; replacing portions of the existing structure; cutting pipe ends on skew or slope; and equipment, labor, tools, and incidentals.

Protection methods for excavations greater than 5 ft. deep will be measured and paid for as required under Item 402, “Trench Excavation Protection,” or Item 403, “Temporary Special Shoring.” Excavation, shaping, bedding, and backfill will be paid for in accordance with Item 400. When jacking, boring, or tunneling is used at the Contractor’s option, payment will be made under this Item. When jacking, boring, or tunneling is required, payment will be made under Item 476.

Item 465
Junction Boxes, Manholes, and Inlets

1. DESCRIPTION

Construct junction boxes, manholes, and inlets, complete in place or to the stage detailed, including furnishing and installing frames, grates, rings, and covers.

2. MATERIALS

Furnish materials in accordance with the following.

- Item 420, "Concrete Substructures"
- Item 421, "Hydraulic Cement Concrete"
- Item 440, "Reinforcement for Concrete"
- Item 471, "Frames, Grates, Rings, and Covers"

Cast-in-place junction boxes, manholes, inlets, risers, and appurtenances are acceptable unless otherwise shown on the plans. Alternate designs for cast-in-place items must be acceptable to the Engineer and must conform to functional dimensions and design loading. Alternate designs must be designed and sealed by a licensed professional engineer.

2.1. **Concrete**. Furnish concrete in accordance with DMS-7305, "Fabrication and Qualification Procedure for Multi-Project Fabrication Plants of Precast Concrete Drainage Structures," for formed and machine-made precast junction boxes, manholes, and inlets. Furnish Class C concrete for cast-in-place junction boxes, manholes, and inlets unless otherwise shown on the plans.

2.2. **Mortar**. Furnish mortar conforming to DMS-4675, "Cementitious Grouts and Mortars for Miscellaneous Applications."

2.3. **Timber**. Provide sound timber that is at least 3-in. nominal thickness and reasonably free of knots and warps for temporary covers when used with Stage I construction. (Refer to Article 465.3., "Construction.")

2.4. **Other Materials**. Use commercial-type hardware as approved.

3. CONSTRUCTION

Construct all types of junction boxes, manholes, and inlets either complete or in two stages, described as Stage I and Stage II.

Construct the Stage I portion of junction boxes, manholes, and inlets as shown on the plans or as specified in this Item. Furnish and install a temporary cover as approved.

Furnish and install the storm drain pipe and a temporary plug for the exposed end of the storm drain pipe from the storm drain to a point below the top of curb indicated on the plans for Stage I construction of cast iron or steel inlet units.

Construct Stage II after the pavement structure is substantially complete, unless otherwise approved.

Construct the remaining wall height and top of junction box, manhole, or inlet for Stage II, and furnish and install any frames, grates, rings and covers, curb beams, or collecting basins required.

Construct cast-in-place junction boxes, manholes, and inlets in accordance with Item 420. Forms are required for all concrete walls. Outside wall forms for cast-in-place concrete may be omitted with approval if the surrounding material can be trimmed to a smooth vertical face.

3.1. **Precast Junction Boxes, Manholes, and Inlets**. Construct formed and machine-made precast junction boxes, manholes, and inlets in accordance with DMS-7305 and as shown on the plans, except as otherwise specified in this Item.

Multi-project fabrication plants as defined in DMS-7305 that produce junction boxes, manholes, and inlets will be approved by the Materials and Tests Division in accordance with DMS-7305. The Department's MPL has a list of approved multi-project junction box, manhole, and inlet fabrication plants.

3.1.1. **Marking**. Clearly mark each precast junction box, manhole, and inlet unit with the following information:

- name or trademark of fabricator and plant location,
- product designation,
- ASTM designation (if applicable),
- date of manufacture,
- designation "TX" for precast units fabricated in accordance with DMS-7305,
- designated fabricator's approval stamp for each approved unit, and
- designation "SR" for product meeting sulfate-resistant concrete plan requirements (when applicable).

3.1.2. **Defects and Repair**. Repair precast junction boxes, inlets, and manholes, if necessary, in accordance with the Annex of DMS-7305. Precast junction boxes, inlets, and manholes may be rejected for any of the conditions stated in this Annex.

3.1.3. **Storage and Shipment**. Store precast units on a level surface. Do not ship units until design strength requirements have been met.

3.2. **Excavation, Shaping, Bedding, and Backfill**. Excavate, shape, bed, and backfill in accordance with Item 400, "Excavation and Backfill for Structures." Immediate backfilling is permitted for all junction box, manhole, and inlet structures where joints consist of rubber boots, rubber gaskets, or bulk or preformed joint sealant. Take precautions in placing and compacting the backfill to avoid any movement of junction boxes, manholes, and inlets. Remove and replace junction boxes, manholes, and inlets damaged by the Contractor at no expense to the Department.

3.3. **Junction Boxes, Manholes, and Inlets for Precast Concrete Pipe Storm Drains**. Construct junction boxes, manholes, and inlets for precast concrete pipe storm drains before completion of storm drain lines into or through the junction box, manhole, or inlet. Neatly cut all storm drains at the inside face of the walls of the junction box, manhole, or inlet.

3.4. **Junction Boxes, Manholes, and Inlets for Box Storm Drains**. Place bases or risers of junction boxes, manholes, and inlets for box storm drains before or in conjunction with placement of the storm drain. Backfill the junction box, manhole, or inlet and storm drain as a whole.

3.5. **Inverts**. Shape and route floor inverts passing out or through the junction box, manhole, or inlet as shown on the plans. Shape by adding and shaping mortar or concrete after the base is placed or by placing the required additional material with the base.

3.6. **Finishing Complete Junction Boxes, Manholes, and Inlets**. Complete junction boxes, manholes, and inlets as shown on the plans. Backfill to original ground elevation in accordance with Item 400.

3.7. **Finishing Stage I Construction**. Complete Stage I construction by constructing the walls to the elevations shown on the plans and backfilling to required elevations in accordance with Item 400.

3.8. **Stage II Construction**. Construct subgrade and base course or concrete pavement over Stage I junction box, manhole, or inlet unless otherwise approved. Excavate to expose the top of Stage I construction and complete the junction box, manhole, or inlet as shown on the plans and in accordance with these specifications, including backfill and cleaning of all debris from the bottom of the junction box, manhole, or inlet.

3.9. **Inlet Units**. Install cast iron or steel inlet units in conjunction with the construction of concrete curb and gutter. Set the inlet units securely in position before placing concrete for curb and gutter. Form openings for the inlets and recesses in curb and gutter as shown on the plans. Place and thoroughly consolidate concrete for curb and gutter adjacent to inlets and around the inlet castings and formed openings and recesses without displacing the inlet units.

4. MEASUREMENT

All junction boxes, manholes, and inlets satisfactorily completed as shown on the plans and in conformance with specifications will be measured by each junction box, manhole, or inlet complete, or by each junction box, manhole, or inlet completed to the stage of construction required by the plans.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for as follows.

5.1. **Complete Manholes**. Payment for complete manholes will be made at the unit price bid for "Manhole (Complete)" of the type specified.

5.2. **Complete Inlets**. Payment for inlets will be made at the unit price bid for "Inlet (Complete)" of the type specified.

5.3. **Complete Junction Boxes**. Payment for junction boxes will be made at the unit price bid for "Junction Box (Complete)" of the type specified.

5.4. **Manholes Stage I**. Payment for manholes, Stage I, will be made at the unit price bid for each "Manhole (Stage I)" of the type specified.

5.5. **Manholes Stage II**. Payment for manholes, Stage II, will be made at the unit price bid for each "Manhole (Stage II)" of the type specified.

5.6. **Inlets Stage I**. Payment for inlets, Stage I, will be made at the unit price bid for each "Inlet (Stage I)" of the type specified.

5.7. **Inlets Stage II**. Payment for inlets, Stage II, will be made at the unit price bid for each "Inlet (Stage II)" of the type specified.

5.8. **Junction Boxes Stage I**. Payment for junction boxes, Stage I, will be made at the unit price bid for each "Junction Box (Stage I)" of the type specified.

5.9. **Junction Boxes Stage II**. Payment for junction boxes, Stage II, will be made at the unit price bid for each "Junction Box (Stage II)" of the type specified.

These prices are full compensation for concrete, reinforcing steel, mortar, frames, grates, rings and covers, excavation, and backfill, and for all other materials, tools, equipment, labor, and incidentals.

Item 496
Removing Structures

1. DESCRIPTION

Remove and either dispose of or salvage structures.

2. CONSTRUCTION

2.1. **Demolition Plans**. Follow the demolition sequence shown on the plans for bridge structures to be removed or submit a demolition plan if shown on the plans. Include in the required demolition plan the type and location of equipment to be used, the method and sequence of removal of the structural elements, and a narrative indicating the stability of the partially demolished structure is maintained throughout the demolition process. Have these plans signed and sealed by a licensed professional engineer when demolished structure intersects active roadways and as otherwise shown on the plans. Submit required demolition plans at least 14 days before starting work unless otherwise directed. Department approval of these plans is not required, but the Department reserves the right to request modifications to the plans when work could affect the safety of the traveling public and when around other transportation facilities to remain in place. Notify the Department 30 days before starting any bridge demolition work to allow for required notifications to other agencies.

2.2. **Removal**.

2.2.1. **Pipes**. Avoid damaging appurtenances determined by the Engineer to be salvageable.

2.2.2. **Concrete, Brick, or Stone Structures**. Portions of structures that will not interfere with the proposed construction may remain in place 2 ft. or more below the permanent ground line. Square off remaining structures and cut reinforcement flush with the surface of the concrete.

2.2.3. **Steel Structures**. Dismantle steel to be retained by the Department or re-erected by cold-cutting fastener heads and punching or drilling the remaining portion of the fastener, air-arc gouging welded connections, and flame-cutting beams along a straight line. The Engineer may approve other methods of cutting. Cut beams at the locations shown on the plans. Match-mark steel to be re-erected with paint in conformance with the erection drawings. Remove steel piles or cut off 2 ft. or more below the permanent ground line.

2.2.4. **Timber Structures**. Remove all fasteners from timber determined by the Engineer to be salvageable. Remove timber piles or cut off 2 ft. or more below the permanent ground line.

2.3. **Salvage**. Avoid damage to materials shown on the plans to be salvaged. Deliver materials to be retained by the Department to the location shown on the plans. Block up salvaged steel materials off the ground.

2.4. **Disposal**. Material removed that is not deemed to be salvageable is the property of the Contractor. Dispose of removed material off the right of way in conformance with federal, state, and local regulations.

2.5. **Backfill**. Backfill excavation and voids to the original ground line if resulting from the removal of structures. Place backfill that will support any portion of the roadbed or embankment to the same requirements for placing embankment. Backfill other areas in 10-in. layers, loose measurement, and compact to the density of adjacent undisturbed material.

3. MEASUREMENT

This Item will be measured by each structure or by the foot.

4. PAYMENT

The work performed in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Removing Structures” of the type of structure specified. This price is full compensation for demolition plan preparation, loading, hauling, disposal, stockpiling, removal of appurtenances, excavation and backfill, equipment, labor, tools, and incidentals.

Item 502
Barricades, Signs, and Traffic Handling

1. DESCRIPTION

Provide, install, move, replace, maintain, clean, and remove all traffic control devices shown on the plans and as directed.

Temporary work zone (TWZ) traffic control devices manufactured after December 31, 2019, must have been successfully tested to the crashworthiness requirements of the 2016 edition of the AASHTO *Manual for Assessing Safety Hardware* (MASH). An exception to the manufacture date applies when, based on the project's date of letting, a category of MASH-2016 compliant TWZ traffic control devices was not approved, or was not self-certified. In such case, devices that meet NCHRP-350 or MASH-2009 may be used.

Temporary work zone (TWZ) traffic control devices manufactured on or before December 31, 2019, must at a minimum have been successfully tested to the crashworthiness requirements of NCHRP-350 or MASH-2009. These devices may continue to be used throughout their normal service lives.

Such TWZ traffic control devices include:

- portable sign supports,
- barricades,
- portable traffic barriers designated exclusively for use in TWZs,
- crash cushions designated exclusively for use in TWZs,
- longitudinal channelizers, and
- truck-mounted attenuators (TMAs) and trailer attenuators (TAs).

Category I devices (i.e., lightweight devices), such as cones, tubular markers, and drums without lights or signs attached, may be self-certified by the vendor or provider, with documentation provided to the Department, or as shown on Department's Compliant Work Zone Traffic Control Device List.

2. CONSTRUCTION

Comply with the requirements of Article 7.2., "Safety."

Implement the traffic control plan (TCP) shown on the plans.

Install traffic control devices straight and plumb. Make changes to the TCP only as approved. Minor adjustments to meet field conditions are allowed.

Submit Contractor-proposed TCP changes, signed and sealed by a licensed professional engineer, for approval. The Engineer may develop, sign, and seal Contractor-proposed changes. Changes must conform to guidelines established in the TMUTCD using approved products from the Department's Compliant Work Zone Traffic Control Device List.

Maintain traffic control devices by taking corrective action when notified. Corrective actions include, but are not limited to, cleaning, replacing, straightening, covering, and removing devices. Maintain the devices such that they are properly positioned and spaced, are legible, and have retroreflective characteristics that meet requirements day or night and in all weather conditions.

The Engineer may authorize or direct in writing the removal or relocation of project limit advance warning signs. When project limit advance warning signs are removed before final acceptance, provide traffic control in accordance with the TMUTCD for minor operations as approved.

Remove all traffic control devices upon completion of the work as shown on the plans or as directed.

3. MEASUREMENT

"Barricades, Signs, and Traffic Handling" will be measured by the month. Law enforcement personnel with patrol vehicles will be measured by the hour for each person.

4. PAYMENT

4.1. **Barricades, Signs, and Traffic Handling**. Except for Contracts with callout work and work orders, the work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Barricades, Signs, and Traffic Handling." This price is full compensation for installation, maintenance, adjustments, replacements, removal, materials, equipment, labor, tools, and incidentals.

When the plans establish pay items for particular work in the TCP, that work will be measured and paid for under pertinent Items.

TMAs and TAs will be paid for under Item 505, "Truck-Mounted Attenuator (TMA) and Trailer Attenuator (TA)." Portable changeable message signs will be paid for under Item 503, "Portable Changeable Message Sign." Portable traffic signals will be paid for under Item 510, "One-Way Traffic Control," unless otherwise shown on the plans.

In accordance with Section 7.2.3., "Safety Contingency," funds have been included in the project budget to improve the effectiveness of traffic handling and enhance safety during the course of this project.

4.1.1. **Initiation of Payment**. Payment for this Item will begin on the first estimate after barricades, signs, and traffic handling devices have been installed in accordance with the TCP.

4.1.2. **Paid Months**. Monthly payment will be made each succeeding month for this Item provided the barricades, signs, and traffic handling devices have been installed and maintained in accordance with the TCP until the Contract amount has been paid.

If, within the timeframe established by the Engineer, the Contractor fails to provide or properly maintain signs and barricades in compliance with the Contract requirements, as determined by the Engineer, the Contractor will be considered in noncompliance with this Item. No payment will be made for the months in question, and the total final payment quantity will be reduced by the number of months the Contractor was in noncompliance.

4.1.3. **Maximum Total Payment Before Acceptance**. The total payment for this Item will not exceed 10% of the total Contract amount before final acceptance in accordance with Article 5.12., "Final Acceptance." The remaining balance will be paid in accordance with Section 502.4.1.5., "Balance Due."

4.1.4. **Total Payment Quantity**. The quantity paid under this Item will not exceed the total quantity shown on the plans, except as modified by change order and as adjusted in accordance with Section 502.4.1.2., "Paid Months." An overrun of the plans quantity for this Item will not be allowed for approving designs; testing; material shortages; closed construction seasons; curing periods; establishment, performance, test, and maintenance periods; failure to complete the work in the number of months allotted; or delays caused directly or indirectly by Contract requirements.

4.1.5. **Balance Due**. The remaining unpaid months of barricades less non-compliance months will be paid on final acceptance of the project, if all work is complete and accepted in accordance with Article 5.12., "Final Acceptance."

4.1.6. **Contracts with Callout Work and Work Orders**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be subsidiary to pertinent Items, except for federally funded Contracts.

4.2. **Law Enforcement Personnel**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid by Contractor force account for "Law Enforcement Personnel." This price is full compensation for furnishing all labor, materials, supplies, equipment, patrol vehicles, fees, and incidentals necessary to complete the work as directed.

Item 506

Temporary Erosion, Sedimentation, and Environmental Controls

1. DESCRIPTION

Install, maintain, and remove erosion, sedimentation, and environmental control measures to prevent or reduce the discharge of pollutants and protect environmental resources in accordance with the Stormwater Pollution Prevention Plan (SWP3) and environmental layout shown on the plans. Comply with Texas Pollutant Discharge Elimination System (TPDES) Construction General Permit (CGP) TXR150000 requirements. Control measures are defined as Best Management Practices (BMPs) used to prevent or reduce the discharge of pollutants and measures to protect environmental resources. Control measures include, but are not limited to, rock filter dams, temporary pipe slope drains, temporary paved flumes, construction exits, earthwork for erosion control, pipe, construction perimeter fence, sandbags, temporary sediment control fence, biodegradable erosion control logs, vertical tracking, temporary or permanent seeding, and other measures. Erosion and sediment control devices must be selected from the Erosion Control Approved Products List. Perform work in a manner to prevent degradation of receiving waters, protect environmental resources, facilitate project construction, and comply with applicable federal, state, and local regulations. Ensure the installation and maintenance of control measures are performed in conformance with the manufacturer's or designer's specifications.

2. MATERIALS

Furnish materials in accordance with the following.

- Item 161, "Compost"
- Item 432, "Riprap"
- Item 556, "Pipe Underdrains"

2.1. **Rock Filter Dams**.

2.1.1. **Aggregate**. Furnish aggregate with approved hardness, durability, cleanliness, and resistance to crumbling, flaking, and eroding. Provide the following.

- **Types 1, 2, and 4 Rock Filter Dams**. Use 3–6-in. aggregate.
- **Type 3 Rock Filter Dams**. Use 4–8-in. aggregate.

2.1.2. **Wire**. Provide minimum 20-gauge galvanized wire for the steel wire mesh and tie wires for Types 2 and 3 rock filter dams. Type 4 dams require:

- a double-twisted, hexagonal weave with a nominal mesh opening of 2-1/2 × 3-1/4 in.,
- minimum 0.0866-in. steel wire for netting,
- minimum 0.1063-in. steel wire for selvages and corners, and
- minimum 0.0866 in. for binding or tie wire.

2.1.3. **Sandbag Material**. Furnish sandbags meeting Section 506.2.8., "Sandbags," except that any gradation of aggregate may be used to fill the sandbags.

2.2. **Temporary Pipe Slope Drains**. Provide corrugated metal pipe, polyvinyl chloride (PVC) pipe, flexible tubing, watertight connection bands, grommet materials, prefabricated fittings, and flared entrance sections as shown on the plans. Recycled and other materials meeting these requirements are allowed if approved.

Furnish concrete in accordance with Item 432.

2.3. **Temporary Paved Flumes**. Furnish asphalt concrete, hydraulic cement concrete, or other comparable non-erodible material as shown on the plans. Provide rock or rubble with a minimum diameter of 6 in. and a maximum volume of 1/2 cu. ft. for the construction of energy dissipaters.

2.4. **Construction Exits**. Provide materials as shown on the plans and in accordance with this Section.

2.4.1. **Rock Construction Exit**. Provide crushed aggregate for long- and short-term construction exits. Furnish aggregates that are clean, hard, durable, and free of adherent coatings such as salt, alkali, dirt, clay, loam, shale, soft or flaky materials, and organic and injurious matter. Use 4–8-in. aggregate for Type 1. Use 2–4-in. aggregate for Type 3.

2.4.2. **Timber Construction Exit**. Furnish No. 2 quality or better railroad ties and timbers for long-term construction exits, free of large and loose knots and treated to control rot. Fasten timbers using nuts and bolts or lag bolts, of at least 1/2 in. diameter, unless otherwise shown on the plans or allowed. Provide plywood or pressed wafer board at least 1/2 in. thick for short-term exits.

2.4.3. **Foundation Course**. Provide a foundation course consisting of flexible base, bituminous concrete, hydraulic cement concrete, or other materials as shown on the plans or directed.

2.5. **Embankment for Erosion Control**. Provide rock, loam, clay, topsoil, or other earth materials that will form a stable embankment to meet the intended use.

2.6. **Pipe**. Provide pipe outlet material in accordance with Item 556 and as shown on the plans.

2.7. **Construction Perimeter Fence**.

2.7.1. **Posts**. Provide essentially straight wood or steel posts that are at least 60 in. long. Furnish soft wood posts with a minimum diameter of 3 in. or use nominal 2 × 4-in. boards. Furnish hardwood posts with a minimum cross-section of 1-1/2 × 1-1/5 in. Furnish T- or L-shaped steel posts with a minimum weight of 1.25 lb. per foot.

2.7.2. **Fence**. Provide orange construction fencing as approved.

2.7.3. **Fence Wire**. Provide 14-gauge or larger galvanized smooth or twisted wire. Provide 16-gauge or larger tie wire.

2.7.4. **Flagging**. Provide brightly colored flagging that is fade-resistant and at least 3/4 in. wide to provide maximum visibility both day and night.

2.7.5. **Staples**. Provide staples with a crown at least 1/2 in. wide and legs at least 1/2 in. long.

2.7.6. **Used Materials**. Previously used materials meeting the applicable requirements may be used if approved.

2.8. **Sandbags**. Provide sandbag material of polypropylene, polyethylene, or polyamide woven fabric with a minimum unit weight of 4 oz. per square yard, a Mullen burst-strength exceeding 300 psi, and an ultraviolet (UV) stability exceeding 70%.

Use natural coarse sand or manufactured sand meeting the gradation shown in Table 1 to fill sandbags. Filled sandbags must be 24–30 in. long, 16–18 in. wide, and 6–8 in. thick.

Table 1
Sand Gradation

Sieve Size	Retained (% by Weight)
#4	Maximum 3%
#100	Minimum 80%
#200	Minimum 95%

Aggregate may be used instead of sand for situations where sandbags are not adjacent to traffic. The aggregate size must not exceed 3/8 in.

2.9. **Temporary Sediment Control Fence**. Provide a net-reinforced fence using woven geotextile fabric. Logos visible to the traveling public will not be allowed.

2.9.1. **Fabric**. Provide fabric materials in accordance with DMS-6230, "Temporary Sediment Control Fence Fabric."

2.9.2. **Posts**. Provide essentially straight wood or steel posts with a minimum length of 48 in., unless otherwise shown on the plans. Furnish soft wood posts at least 3 in. in diameter or use nominal 2 × 4-in. boards. Furnish hardwood posts with a minimum cross-section of 1-1/2 × 1-1/2 in. Furnish T- or L-shaped steel posts with a minimum weight of 1.25 lb. per foot.

2.9.3. **Net Reinforcement**. Provide net reinforcement of at least 12.5-gauge (Standard Wire Gauge) galvanized welded wire mesh, with a maximum opening size of 2 × 4 in., at least 24 in. wide, unless otherwise shown on the plans.

2.9.4. **Staples**. Provide staples with a crown at least 3/4 in. wide and legs 1/2 in. long.

2.9.5. **Used Materials**. Use recycled material meeting the applicable requirements if approved.

2.10. **Biodegradable Erosion Control Logs**.

2.10.1. **Core Material**. Furnish core material that is biodegradable or recyclable. Use compost, mulch, aspen excelsior wood fibers, chipped site vegetation, agricultural rice or wheat straw, coconut fiber, 100% recyclable fibers, or any other acceptable material unless specifically shown on the plans. Permit no more than 5% of the material to escape from the containment mesh. Furnish compost in accordance with Item 161.

2.10.2. **Containment Mesh**. Furnish containment mesh that is 100% biodegradable, photodegradable, or recyclable, such as burlap, twine, UV photodegradable plastic, polyester, or any other acceptable material.

Furnish biodegradable or photodegradable containment mesh when log will remain in place as part of a vegetative system.

Furnish recyclable containment mesh for temporary installations.

2.10.3. **Size**. Furnish biodegradable erosion control logs with diameters as shown on the plans or as directed. Stuff containment mesh densely so logs do not deform.

3. QUALIFICATIONS, TRAINING, AND EMPLOYEE REQUIREMENTS

3.1. **Contractor Responsible Person Environmental (CRPE) Qualifications and Responsibilities**. Provide and designate in writing at the preconstruction conference a CRPE and alternate CRPE who have overall responsibility for managing environmental compliance. The CRPE will implement stormwater and erosion control practices, oversee and observe stormwater control measure monitoring and management, oversee environmental compliance requirements, and monitor the project site daily and produce daily monitoring reports as long as there are BMPs in place or soil disturbing activities are evident to ensure compliance with the SWP3 and TPDES CGP TXR150000. Take required training in accordance with Section 7.7.4.4, "Training."

Maintain daily monitor reports and make them available within 24 hr. upon request. During time suspensions when work is not occurring or on Contract non-work days, daily inspections are not required unless a rain event has occurred. The CRPE will provide recommendations on how to improve the effectiveness of control measures. Attend the Department's preconstruction conference for the project.

Ensure training is completed in accordance with Section 7.7.4.4., "Training," by all applicable personnel before employees work on the project. Document, maintain, and make available within 24 hr. of a request, a list, signed by the CRPE, of all applicable Contractor and subcontractor employees who have completed the training. Include the employee's name, the training course name, and the date the employee completed the training.

3.2. **Contractor Superintendent Qualifications and Responsibilities**. Provide a superintendent who is competent, has experience with and knowledge of stormwater management, and is knowledgeable of the requirements and the conditions of the TPDES CGP TXR150000. The superintendent will manage and oversee the day-to-day operations and activities at the project site, work with the CRPE to provide effective stormwater management at the project site, represent and act on behalf of the Contractor, and attend the Department's preconstruction conference for the project. Take training as required in Section 7.7.4.4., "Training."

4. CONSTRUCTION

4.1. **Contractor Responsibilities**. Implement the SWP3 for the project site in accordance with the plans and specifications, TPDES CGP TXR150000, and as directed. Coordinate stormwater management with all other work on the project. Develop and implement an SWP3 for project-specific material supply plants within and outside the Department's right of way in conformance with the specific or general stormwater permit requirements. Prevent water pollution from stormwater associated with construction activity from entering any surface water or private property on or adjacent to the project site.

4.2. **Implementation**. The CRPE, or alternate CRPE, must be accessible by telephone and able to respond to project-related stormwater management or other environmental emergencies 24 hr. per day.

4.2.1. **Commencement**. Implement the SWP3 as shown on the plans and as directed. Contractor-proposed recommendations for changes will be allowed as approved. Conform to the established guidelines in the TPDES CGP TXR150000 to make changes. Do not implement changes until approval has been received and changes have been incorporated into the plans. Minor adjustments to meet field conditions are allowed and will be recorded in the SWP3.

4.2.2. **Phasing**. Implement control measures before the commencement of activities that result in soil disturbance. Phase and minimize the soil disturbance to the areas shown on the plans. Coordinate temporary control measures with permanent control measures and all other work activities on the project to assure economical, effective, safe, and continuous water pollution prevention. Provide control measures that are appropriate to the construction means, methods, and sequencing allowed by the Contract. Exercise precaution throughout the life of the project to prevent pollution of ground waters and surface waters. Schedule and perform clearing and grubbing operations so that stabilization measures will follow immediately thereafter if project conditions permit. Bring all grading sections to final grade as soon as possible and implement temporary and permanent control measures at the earliest time possible. Implement temporary control measures when required by TPDES CGP TXR150000 or otherwise necessitated by project conditions.

Do not prolong final grading and shaping. Preserve vegetation where possible throughout the project, and minimize clearing, grubbing, and excavation within stream banks, bed, and approach sections.

4.3. **General**.

4.3.1. **Temporary Alterations or Control Measure Removal**. Altering or removal of control measures is allowed when control measures are restored within the same working day.

4.3.2. **Stabilization**. Initiate stabilization for disturbed areas no more than 14 days after the construction activities in that portion of the site have temporarily or permanently ceased. Establish a uniform vegetative cover or use another stabilization practice in accordance with TPDES CGP TXR150000.

4.3.3. **Finished Work**. Remove and dispose of all temporary control measures upon acceptance of vegetative cover or other stabilization practice unless otherwise directed. Complete soil disturbing activities and establish a uniform perennial vegetative cover. A project will not be considered for acceptance until a vegetative cover of 70% density of existing adjacent undisturbed areas is obtained or equivalent permanent stabilization is obtained in accordance with TPDES CGP TXR150000. The Engineer may accept the work before vegetative cover of 70% density of existing adjacent undisturbed areas. An exception will be allowed in arid areas as defined in TPDES CGP TXR150000.

4.3.4. **Restricted Activities and Required Precautions**. Do not discharge onto the ground or into surface waters any pollutants such as chemicals, raw sewage, fuels, lubricants, coolants, hydraulic fluids, bitumens, or any other petroleum product. Operate and maintain equipment onsite to prevent actual or potential water pollution. Manage, control, and dispose of litter onsite such that no adverse impacts to water quality occur. Prevent dust from creating a potential or actual unsafe condition, public nuisance, or condition endangering the value, utility, or appearance of any property. Wash out concrete trucks only as described in TPDES CGP TXR150000. Use appropriate controls to minimize the offsite transport of suspended sediments and other pollutants if it is necessary to pump or channel standing water (i.e., dewatering). Immediately address chemical and hydrocarbon spills caused by the Contractor. Keep a spill kit onsite. Prevent discharges that would contribute to a violation of Edwards Aquifer Rules, water quality standards, the impairment of a listed water body, or other state or federal law.

4.4. **Installation, Maintenance, and Removal Work**. Perform work in accordance with the SWP3, in conformance with manufacturers' guidelines, and in accordance with TPDES CGP TXR150000. Install and maintain the integrity of temporary erosion and sedimentation control devices to accumulate silt and debris until soil disturbing activities are completed and permanent erosion control features are in place, or the disturbed area has been adequately stabilized as approved.

The Department will inspect and document the condition of the control measures at the frequency shown on the plans and will provide the Construction SWP3 Field Inspection and Maintenance Reports to the Contractor. Make corrections as soon as possible before the next anticipated rain event or within 7 calendar days after being able to enter the worksite for each control measure. The only acceptable reason for not accomplishing the corrections within the timeframe specified is when site conditions are considered "too wet to work." Take immediate action if a correction is deemed critical as directed. When corrections are not made within the established timeframe, all work will cease on the project and time charges will continue while the control measures are brought into compliance. Commence work once the Engineer reviews and documents the project is in compliance. Commencing work does not release the Contractor of the liability for noncompliance with the SWP3, the plans, or TPDES CGP TXR150000.

The Engineer may limit the disturbed area if the Contractor cannot control soil erosion and sedimentation resulting from the Contractor's operations. Implement additional controls as directed.

Remove devices upon approval or as directed. Finish-grade and dress the area upon removal. Stabilize disturbed areas in accordance with TPDES CGP TXR150000, and as shown on the plans or directed. Materials removed are considered consumed by the project. Retain ownership of stockpiled material and remove it from the project when new installations or replacements are no longer required.

4.4.1. **Rock Filter Dams for Erosion Control**. Remove trees, brush, stumps, and other objectionable material that may interfere with the construction of rock filter dams. Place sandbags as a foundation when required or at the Contractor's option.

Place the aggregate to the lines, height, and slopes specified, without undue voids for Types 1, 2, 3, and 5. Place the aggregate on the mesh and then fold the mesh at the upstream side over the aggregate and secure it to itself on the downstream side using wire ties, or hog rings for Type 2 and Type 3, or as directed.

Place rock filter dams perpendicular to the flow of the stream or channel unless otherwise directed. Construct filter dams in accordance with the following criteria unless otherwise shown on the plans.

4.4.1.1. **Type 1 (Non-Reinforced)**.

- **Height**. At least 18 in. measured vertically from existing ground to top of filter dam.
- **Top Width**. At least 2 ft.
- **Slopes**. No steeper than 2:1.

4.4.1.2. **Type 2 (Reinforced)**.

- **Height**. At least 18 in. measured vertically from existing ground to top of filter dam.
- **Top Width**. At least 2 ft.
- **Slopes**. No steeper than 2:1.

4.4.1.3. **Type 3 (Reinforced)**.

- **Height**. At least 36 in. measured vertically from existing ground to top of filter dam.
- **Top Width**. At least 2 ft.
- **Slopes**. No steeper than 2:1.

4.4.1.4. **Type 4 (Sack Gabions)**. Unfold sack gabions and smooth out kinks and bends. Connect the sides by lacing in a single-loop-double-loop pattern on 4–5-in. spacing for vertical filling. Pull the end lacing rod at one end until tight, wrap around the end, and twist four times. Fill with stone at the filling end, pull the rod tight, cut the wire with approximately 6 in. remaining, and twist wires four times.

Place the sack flat in a filling trough, fill with stone, connect sides, and secure ends as described above for horizontal filling.

Lift and place without damaging the gabion. Shape sack gabions to existing contours.

4.4.1.5. **Type 5**. Provide rock filter dams as shown on the plans.

4.4.2. **Temporary Pipe Slope Drains**. Install pipe with a slope as shown on the plans or as directed. Construct embankment for the drainage system in 8-in. lifts to the required elevations. Hand-tamp the soil around and under the entrance section to the top of the embankment as shown on the plans or as directed. Form the top of the embankment or earth dike over the pipe slope drain at least 1 ft. higher than the top of the inlet pipe at all points. Secure the pipe with hold-downs or hold-down grommets spaced at most 10 ft. on center. Construct the energy dissipaters or sediment traps as shown on the plans or as directed. Construct the sediment trap using concrete or rubble riprap in accordance with Item 432, when shown on the plans.

4.4.3. **Temporary Paved Flumes**. Construct paved flumes as shown on the plans or as directed. Provide excavation and embankment (including compaction of the subgrade) of material to the dimensions shown on the plans unless otherwise indicated. Install a rock or rubble riprap energy dissipater, constructed from the materials specified above, to a minimum depth of 9 in. at the flume outlet to the limits shown on the plans or as directed.

4.4.4. **Construction Exits**. Prevent traffic from crossing or exiting the construction site or moving directly onto a public roadway, alley, sidewalk, parking area, or other right of way areas other than at the location of construction exits when tracking conditions exist. Construct exits for either long- or short-term use.

4.4.4.1. **Long-Term**. Place the exit over a foundation course as required. Grade the foundation course or compacted subgrade to direct runoff from the construction exits to a sediment trap as shown on the plans or as directed. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed.

4.4.4.1.1. **Type 1**. Construct to a depth of at least 8 in. using crushed aggregate as shown on the plans or as directed.

4.4.4.1.2. **Type 2**. Construct using railroad ties and timbers as shown on the plans or as directed.

4.4.4.2. **Short-Term**.

4.4.4.2.1. **Type 3**. Construct using crushed aggregate, plywood, or wafer board. This type of exit may be used for daily operations where long-term exits are not practical.

4.4.4.2.2. **Type 4**. Construct as shown on the plans or as directed.

4.4.5. **Earthwork for Erosion Control**. Perform excavation and embankment operations to minimize erosion and to remove collected sediments from other erosion control devices.

4.4.5.1. **Excavation and Embankment for Erosion Control Features**. Place earth dikes, swales, or combinations of both along the low crown of daily lift placement, or as directed, to prevent runoff spillover. Place swales and dikes at other locations as shown on the plans or as directed to prevent runoff spillover or to divert runoff. Construct cuts with the low end blocked with undisturbed earth to prevent erosion of hillsides. Construct sediment traps at drainage structures in conjunction with other erosion control measures as shown on the plans or as directed.

Create a sediment basin, where required, providing 3,600 cu. ft. of storage per acre drained, or equivalent control measures for drainage locations that serve an area with 10 or more disturbed acres at one time, not including offsite areas.

4.4.5.2. **Excavation of Sediment and Debris**. Remove sediment and debris when accumulation affects the performance of the devices, after a rain, and when directed.

4.4.6. **Construction Perimeter Fence**. Construct, align, and locate fencing as shown on the plans or as directed.

4.4.6.1. **Installation of Posts**. Embed posts 18 in. deep or adequately anchor in rock, with a spacing of 8–10 ft.

4.4.6.2. **Wire Attachment**. Attach the top wire to the posts at least 3 ft. from the ground. Attach the lower wire midway between the ground and the top wire.

4.4.6.3. **Flag Attachment**. Attach flagging to both wire strands midway between each post. Use flagging at least 18 in. long. Tie flagging to the wire using a square knot.

4.4.7. **Sandbags for Erosion Control**. Construct a berm or dam of sandbags that will intercept sediment-laden stormwater runoff from disturbed areas, create a retention pond, detain sediment, and release water in sheet flow. Fill each bag with sand so that at least the top 6 in. of the bag is unfilled to allow for proper tying of the open end. Place the sandbags with their tied ends in the same direction. Offset subsequent rows of sandbags 1/2 the length of the preceding row. Place a single layer of sandbags downstream as a secondary debris trap. Place additional sandbags as necessary or as directed for supplementary support to berms or dams of sandbags or earth.

4.4.8. **Temporary Sediment Control Fence**. Provide temporary sediment control fence near the downstream perimeter of a disturbed area to intercept sediment from sheet flow. Incorporate the fence into erosion control measures used to control sediment in areas of higher flow. Install the fence as shown on the plans, in accordance with this Section, or as directed.

4.4.8.1. **Installation of Posts**. Embed posts at least 18 in. deep or adequately anchor, if in rock, with a spacing of 6--8 ft., and install on a slight angle toward the runoff source.

4.4.8.2. **Fabric Anchoring**. Dig trenches along the uphill side of the fence to anchor 6–8 in. of fabric. Provide a minimum trench cross-section of 6 × 6 in. Place the fabric against the side of the trench and align approximately 2 in. of fabric along the bottom in the upstream direction. Backfill the trench, then hand-tamp.

4.4.8.3. **Fabric and Net Reinforcement Attachment**. Attach the reinforcement to wooden posts using staples, or to steel posts using T-clips, in at least four places equally spaced unless otherwise shown on the plans. Sewn vertical pockets may be used to attach reinforcement to end posts. Fasten the fabric to the top strand of reinforcement using hog rings or cord every 15 in. or less.

4.4.8.4. **Fabric and Net Splices**. Locate splices at a fence post with a minimum lap of 6 in. attached in at least six places equally spaced unless otherwise shown on the plans. Do not locate splices in concentrated flow areas.

Requirements for installation of used temporary sediment control fence include the following:

- fabric with minimal or no visible signs of biodegradation (weak fibers),
- fabric without excessive patching (more than one patch every 15–20 ft.),
- posts without bends, and
- backing without holes.

4.4.9. **Biodegradable Erosion Control Logs**. Install biodegradable erosion control logs near the downstream perimeter of a disturbed area to intercept sediment from sheet flow. Incorporate the biodegradable erosion control logs into the erosion measures used to control sediment in areas of higher flow. Install, align, and locate the biodegradable erosion control logs as specified below, as shown on the plans, or as directed.

Secure biodegradable erosion control logs in a method adequate to prevent displacement resulting from normal rain events, to prevent damage to the logs, and as approved, such that flow is not allowed under the logs. Temporarily removing and replacing biodegradable erosion logs to facilitate daily work is allowed at the Contractor's expense.

4.4.10. **Vertical Tracking**. Perform vertical tracking on slopes to temporarily stabilize soil. Provide equipment with a track undercarriage capable of producing a linear soil impression measuring at least 12 in. long × 2–4 in. wide × 1/2–2 in. deep. Do not exceed 12 in. between track impressions. Install continuous linear track impressions where the 12-in. length impressions are perpendicular to the slope. Vertical tracking is required on projects where soil disturbing activities have occurred, unless otherwise approved.

4.5. **Monitoring and Documentation**. Monitor the control measures daily as long as there are BMPs in place or soil disturbing activities are evident to ensure compliance with the SWP3 and TPDES CGP TXR150000. During time suspensions when work is not occurring or contract non-work days, daily inspections are not required unless a rain event has occurred. Monitoring will consist of, but is not limited to, observing, inspecting, and documenting site locations with control measures and discharge points to provide maintenance and inspection of controls in accordance with the SWP3. Keep written records of daily monitoring. Document in the daily monitoring report the control measure condition, the date of inspection, required corrective actions, the responsible person for making the corrections, and the date corrective actions were completed. Maintain records of all monitoring reports at the project site or at an approved place. Provide copies within 7 days. Together, the CRPE and an Engineer's representative will complete the Construction Stage Gate Checklist periodically as directed.

5. MEASUREMENT

5.1. **Rock Filter Dams**. Installation or removal of rock filter dams will be measured by the foot or by the cubic yard. The measured volume will include sandbags, when used.

5.1.1. **Linear Measurement**. When rock filter dams are measured by the foot, measurement will be along the centerline of the top of the dam.

5.1.2. **Volume Measurement**. When rock filter dams are measured by the cubic yard, measurement will be based on the volume of rock computed by the method of average end areas.

5.1.2.1. **Installation**. Measurement will be made in final position.

5.1.2.2. **Removal**. Measurement will be made at the point of removal.

5.2. **Temporary Pipe Slope Drains**. Temporary pipe slope drains will be measured by the foot.

5.3. **Temporary Paved Flumes**. Temporary paved flumes will be measured by the square yard of surface area. The measured area will include the energy dissipater at the flume outlet.

5.4. **Construction Exits**. Construction exits will be measured by the square yard of surface area.

5.5. **Earthwork for Erosion and Sediment Control**.

5.5.1. **Equipment and Labor Measurement**. Equipment and labor used will be measured by the actual number of hours the equipment is operated and the labor is engaged in the work.

5.5.2. **Volume Measurement**.

5.5.2.1. **In Place**.

5.5.2.1.1. **Excavation**. Excavation will be measured by the cubic yard in its original position and the volume computed by the method of average end areas.

5.5.2.1.2. **Embankment**. Embankment will be measured by the cubic yard in its final position by the method of average end areas. The volume of embankment will be determined between:

- the original ground surfaces or the surface upon which the embankment is to be constructed for the feature and
- the lines, grades, and slopes of the accepted embankment for the feature.

5.5.2.2. **In Vehicles**. Excavation and embankment quantities will be combined and paid for under "Earthwork (Erosion and Sediment Control, In Vehicle)." Excavation will be measured by the cubic yard in vehicles at the point of removal. Embankment will be measured by the cubic yard in vehicles measured at the point of delivery. Shrinkage or swelling factors will not be considered in determining the calculated quantities.

5.6. **Construction Perimeter Fence**. Construction perimeter fence will be measured by the foot.

5.7. **Sandbags for Erosion Control**. Sandbags will be measured as each sandbag or by the foot along the top of sandbag berms or dams.

5.8. **Temporary Sediment Control Fence**. Installation or removal of temporary sediment control fence will be measured by the foot.

5.9. **Biodegradable Erosion Control Logs**. Installation or removal of biodegradable erosion control logs will be measured by the foot along the centerline of the top of the control logs.

5.10. **Vertical Tracking**. Vertical tracking will not be measured or paid for directly, but will be subsidiary to this Item.

6. PAYMENT

The following will not be paid for directly, but will be subsidiary to pertinent Items:

- erosion control measures for Contractor project-specific locations (PSLs) inside and outside the right of way (e.g., construction and haul roads, field offices, equipment and supply areas, plants, and material sources);
- removal of litter, unless a separate pay item is shown on the plans;
- repair to devices and features damaged by Contractor operations;

- added measures and maintenance needed due to negligence, carelessness, lack of maintenance, and failure to install permanent controls;
- removal and reinstallation of devices and features needed for the convenience of the Contractor;
- finish grading and dressing upon removal of the device; and
- minor adjustments including but not limited to plumbing posts, reattaching fabric, minor grading to maintain slopes on an erosion embankment feature, or moving small numbers of sandbags.

Stabilization of disturbed areas will be paid for under pertinent Items except vertical tacking, which will be subsidiary.

Furnishing and installing pipe for outfalls associated with sediment traps and ponds will not be paid for directly, but will be subsidiary to the excavation and embankment under this Item.

6.1. **Rock Filter Dams**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid as follows.

6.1.1. **Installation**. Installation will be paid for as "Rock Filter Dams (Install)" of the type and slope as specified. This price is full compensation for furnishing and operating equipment, finish backfill and grading, lacing, proper disposal, labor, materials, tools, and incidentals.

6.1.2. **Removal**. Removal will be paid for as "Rock Filter Dams (Remove)." This price is full compensation for furnishing and operating equipment, proper disposal, labor, materials, tools, and incidentals.

When the Engineer directs that the rock filter dam installation or portions thereof be replaced, payment will be made at the unit price bid for "Rock Filter Dams (Remove)" and for "Rock Filter Dams (Install)" of the type specified. This price is full compensation for furnishing and operating equipment, finish backfill and grading, lacing, proper disposal, labor, materials, tools, and incidentals.

6.2. **Temporary Pipe Slope Drains**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Temporary Pipe Slope Drains" of the size specified. This price is full compensation for furnishing materials, removal and disposal, furnishing and operating equipment, labor, tools, and incidentals.

Removal of temporary pipe slope drains will not be paid for directly, but will be subsidiary to the installation Item. When the Engineer directs that the pipe slope drain installation or portions thereof be replaced, payment will be made at the unit price bid for "Temporary Pipe Slope Drains" of the size specified, which is full compensation for the removal and reinstallation of the pipe drain.

Earthwork required for the pipe slope drain installation, including construction of the sediment trap, will be measured and paid for under "Earthwork for Erosion and Sediment Control."

Riprap concrete or stone, when used as an energy dissipater or as a stabilized sediment trap, will be measured and paid for in accordance with Item 432.

6.3. **Temporary Paved Flumes**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Temporary Paved Flume (Install)" or "Temporary Paved Flume (Remove)." This price is full compensation for furnishing and placing materials, removal and disposal, equipment, labor, tools, and incidentals.

When the Engineer directs that the paved flume installation or portions thereof be replaced, payment will be made at the unit prices bid for "Temporary Paved Flume (Remove)" and "Temporary Paved Flume (Install)." These prices are full compensation for the removal and replacement of the paved flume and for equipment, labor, tools, and incidentals.

Earthwork required for the paved flume installation, including construction of a sediment trap, will be measured and paid for under "Earthwork for Erosion and Sediment Control."

6.4. **Construction Exits**. Contractor-required construction exits from off right of way locations or on right of way PSLs will not be paid for directly, but will be subsidiary to pertinent Items.

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" for construction exits needed on right of way access to work areas required by the Department will be paid for at the unit price bid for "Construction Exits (Install)" of the type specified or "Construction Exits (Remove)." This price is full compensation for furnishing and placing materials, excavating, removal and disposal, cleaning vehicles, labor, tools, and incidentals.

When the Engineer directs that a construction exit or portion thereof be removed and replaced, payment will be made at the unit prices bid for "Construction Exit (Remove)" and "Construction Exit (Install)" of the type specified. These prices are full compensation for the removal and replacement of the construction exit and for equipment, labor, tools, and incidentals.

Construction of sediment traps used in conjunction with the construction exit will be measured and paid for under "Earthwork for Erosion and Sediment Control."

6.5. **Earthwork for Erosion and Sediment Control**.

6.5.1. **Initial Earthwork for Erosion and Sediment Control**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Excavation (Erosion and Sediment Control, In Place)," "Embankment (Erosion and Sediment Control, In Place)," "Excavation (Erosion and Sediment Control, In Vehicle)," "Embankment (Erosion and Sediment Control, (In Vehicle)," or "Earthwork (Erosion and Sediment Control, In Vehicle)."

This price is full compensation for excavation and embankment, including hauling; disposal of material not used elsewhere on the project; embankments including furnishing material from approved sources and construction of erosion control features; and equipment, labor, tools, and incidentals.

Sprinkling and rolling required by this Item will not be paid for directly, but will be subsidiary to this Item.

6.5.2. **Maintenance Earthwork for Erosion and Sediment Control for Cleaning and Restoring Control Measures**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid under a Contractor Force Account Item from invoice provided to the Engineer.

This price is full compensation for excavation, embankment, and re-grading, including dewatering for removal of accumulated sediment, and the removal of accumulated sediment in various erosion control installations as directed, hauling, and disposal of material not used elsewhere on the project; excavation for construction of erosion control features; embankments, including furnishing material from approved sources and construction of erosion control features; and equipment, labor, tools, and incidentals.

Earthwork needed to remove and obliterate erosion control features will not be paid for directly, but will be subsidiary to pertinent Items unless otherwise shown on the plans.

Sprinkling and rolling required by this Item will not be paid for directly, but will be subsidiary to this Item.

6.6. **Construction Perimeter Fence**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Construction Perimeter Fence." This price is full compensation for furnishing and placing the fence; digging, fence posts, wire, and flagging; removal and disposal; and materials, equipment, labor, tools, and incidentals.

Removal of construction perimeter fence will not be paid for directly, but will be subsidiary to the installation Item. When the Engineer directs that the perimeter fence installation or portions thereof be removed and replaced, payment will be made at the unit price bid for "Construction Perimeter Fence," which is full compensation for the removal and reinstallation of the construction perimeter fence.

6.7. **Sandbags for Erosion Control**. Sandbags will be paid for at the unit price bid for "Sandbags for Erosion Control" (of the height specified when measurement is by the foot). This price is full compensation for materials, placing sandbags, removal and disposal, equipment, labor, tools, and incidentals.

Removal of sandbags will not be paid for directly, but will be subsidiary to the installation Item. When the Engineer directs that the sandbag installation or portions thereof be replaced, payment will be made at the unit price bid for "Sandbags for Erosion Control," which is full compensation for the reinstallation of the sandbags.

6.8. **Temporary Sediment Control Fence**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid as follows.

6.8.1. **Installation**. Installation will be paid for as "Temporary Sediment-Control Fence (Install)." This price is full compensation for furnishing and operating equipment, finish backfill and grading, lacing, proper disposal, labor, materials, tools, and incidentals.

6.8.2. **Removal**. Removal will be paid for as "Temporary Sediment-Control Fence (Remove)." This price is full compensation for furnishing and operating equipment, proper disposal, labor, materials, tools, and incidentals.

6.9. **Biodegradable Erosion Control Logs**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid as follows.

6.9.1. **Installation**. Installation will be paid for as "Biodegradable Erosion Control Logs (Install)" of the size specified. This price is full compensation for furnishing and operating equipment, finish backfill and grading, staking, proper disposal, labor, materials, tools, and incidentals.

6.9.2. **Removal**. Removal will be paid for as "Biodegradable Erosion Control Logs (Remove)." This price is full compensation for furnishing and operating equipment, proper disposal, labor, materials, tools, and incidentals.

6.10. **Vertical Tracking**. Vertical tracking will not be measured or paid for directly, but will be subsidiary to this Item.

Item 510
One-Way Traffic Control

1. DESCRIPTION

Provide one-way traffic control using one of the methods shown on the plans.

2. WORK METHODS

2.1. **Flagger Control Method**. Furnish flaggers in accordance with Article 7.2., "Safety," on each approach to the activity area to control traffic. Furnish additional flaggers at all intersections, public driveways, and commercial driveways as determined by the Engineer. Furnish a STOP/SLOW paddle in conformance with the TMUTCD for each flagger. If desired, use automated flagger assistance devices if approved.

2.2. **Pilot Car Method**. Furnish a licensed driver and pilot vehicle with required signs attached. Furnish flaggers in accordance with Article 7.2. on each approach to the activity area to control traffic. Furnish additional flaggers at all intersections, public driveways, and commercial driveways as determined by the Engineer. Furnish STOP/SLOW paddles and signs in conformance with the TMUTCD. Instruct drivers to follow the pilot vehicle and to not pass the cars ahead.

2.3. **Portable Traffic Signal Method**. Furnish, operate, and maintain new or used portable traffic signal units. Assure used units are in good working condition and are approved before use. Approved units are on the Department's *Compliant Work Zone Traffic Control Device List*. Units will remain the property of the Contractor.

3. MEASUREMENT

When shown on the plans as a bid item, this Item will be measured as follows.

3.1. **Flagger Control Method**. By the actual number of hours flaggers are engaged in flagging activities. Each flagger will be measured separately.

3.2. **Pilot Car Method**. By the actual number of hours of use for the combination of two flaggers and pilot vehicle. Additional flaggers, when directed by the Engineer, will be measured by the flagger control method.

3.3. **Portable Traffic Signal Method**. By the month, including two units operated by a single controller set up and operational on the worksite.

4. PAYMENT

Unless otherwise shown on the plans, the work performed and materials furnished in accordance with this Item will not be paid for directly but will be subsidiary to pertinent Items.

When shown on the plans as a bid item, the work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for the method specified. This price is full compensation for furnishing and operating equipment, pilot car, pilot vehicle driver, flaggers, signs, labor, tools, and incidentals. Payment for "Portable Traffic Signal Units" and "Portable Traffic Signals" is full compensation for the units, setup, relocating, removing, replacing parts, batteries, fuel, oil, and incidentals.

Item 529

Concrete Curb, Gutter, and Combined Curb and Gutter

1. DESCRIPTION

Construct hydraulic cement concrete curb, gutter, and combined curb and gutter.

2. MATERIALS

Furnish materials in accordance with the following.

- Item 360, "Concrete Pavement"
- Item 420, "Concrete Substructures"
- Item 421, "Hydraulic Cement Concrete"
- Item 440, "Reinforcement for Concrete"

Use Class A concrete or material specified on the plans. Use Grade 8 coarse aggregate for extruded Class A concrete. Use other grades if approved. When curbs are monolithically placed with the concrete pavements, use the same class of concrete as the concrete pavement.

Use of fibers in accordance with DMS-4550, "Fibers for Concrete," to replace reinforcing steel in Class A concrete is allowed unless otherwise shown on the plans. Dose fibers in accordance with the Department's MPL of pre-qualified fibers for concrete.

3. CONSTRUCTION

Provide finished work with a well-compacted mass and a surface free of voids and honeycomb, in the required shape, line, and grade. Round exposed edges using an edging tool of the radius shown on the plans. Mix, place, and cure concrete in accordance with Item 420. Construct joints at locations shown on the plans. Cure for at least 72 hr.

Furnish and place reinforcing steel in accordance with Item 440 unless fiber reinforced concrete is used.

Set and maintain a guideline that conforms to alignment data shown on the plans, with an outline that conforms to the details shown on the plans. Ensure that changes in curb grade and alignment do not exceed 1/4 in. between any two contacts on a 10-ft. straightedge.

3.1. **Conventionally Formed Concrete**. Shape and compact subgrade, foundation, or pavement surface to the line, grade, and cross-section shown on the plans. Lightly sprinkle subgrade or foundation material immediately before concrete placement.

Pour concrete into forms, and strike off with a template 1/4–3/8 in. less than the dimensions of the finished curb unless otherwise approved. After initial set, plaster surface with mortar consisting of one part hydraulic cement and two parts fine aggregate. Brush exposed surfaces to a uniform texture.

Place curbs, gutters, and combined curb and gutters in 50-ft. maximum sections unless otherwise approved.

3.2. **Extruded or Slipformed Concrete**. Shape and compact subgrade, foundation, or pavement surface to the line, grade, and cross-section shown on the plans. Lightly sprinkle subgrade or foundation material immediately before concrete placement. Provide clean surfaces for concrete placement. Coat cleaned

surfaces, if required, with approved adhesive or coating at the rate of application shown on the plans or as directed. Place concrete using approved self-propelled equipment.

The forming tube of the extrusion machine or the form of the slipform machine must be easily adjustable vertically during the forward motion of the machine to provide variable heights necessary to conform to the established gradeline.

Attach a pointer or gauge to the machine so that a continual comparison can be made between the extruded or slipform work and the grade guideline. Other methods may be used when approved.

Finish surfaces immediately after extrusion or slipforming.

3.3. **Curb Joints for Concrete Pavements**. Provide transverse expansion and contraction joints in the curb of the same type and location as the adjacent or underlying pavement. Use expansion joint material of the same thickness and type required for the pavement. Extend expansion joints through the curb. Place reinforcing steel for non-monolithic curb construction joints as shown on the plans, unless otherwise approved. Form or saw the contraction joint through the full depth of the monolithic curb.

4. MEASUREMENT

This Item will be measured by the foot.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Concrete Curb," "Concrete Curb (Mono)," or "Concrete Curb and Gutter" of the type specified. This price is full compensation for surface preparation of curb foundation, equipment, labor, materials, tools, and incidentals.

Item 530
Intersections, Driveways, and Turnouts

1. DESCRIPTION

Construct and pave intersections, driveways, and turnouts. Pave existing intersections, driveways, and turnouts.

Intersections are considered areas off the travel lanes and shoulders of the Contract highway on the intersecting highway on the state system. The intersecting on-system highway work will be paid for under this Item only when shown on the plans.

Driveways are defined as private (residential or commercial) and public (county road and city street) access areas off the travel lanes and shoulders.

Turnouts include, but are not limited to, mailbox and litter barrel widenings.

2. MATERIALS

Furnish materials in accordance with the following.

- Item 247, “Flexible Base”
- Item 260, “Lime Treatment (Road-Mixed)”
- Item 275, “Cement Treatment (Road-Mixed)”
- Item 276, “Cement Treatment (Plant-Mixed)”
- Item 292, “Asphalt Treatment (Plant-Mixed)”
- Item 316, “Seal Coat”
- Item 330, “Limestone Rock Asphalt Pavement”
- Item 334, “Hot-Mix Cold-Laid Asphalt Concrete Pavement”
- Item 360, “Concrete Pavement”
- Item 421, “Hydraulic Cement Concrete”
- Item 440, “Reinforcement for Concrete”

3. CONSTRUCTION

Construct and pave intersections, driveways, and turnouts, and pave existing intersections, driveways, and turnouts as shown on the plans or as directed. Place materials in conformance with construction Articles of pertinent Items. Provide uninterrupted access to adjacent property unless otherwise directed. Ensure that abrupt elevation changes in driveway or turnout areas that serve as sidewalks do not exceed 1/4 in. and that the sidewalk area cross slope does not exceed 2%. Ready-mix concrete and hand finishing will be permitted when concrete pavement is specified unless otherwise shown on the plans for intersections.

4. MEASUREMENT

This Item will be measured by the square yard of the final pavement surface, as placed in the field, including radii and turnout.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Intersections," "Driveways," "Turnouts," "Intersections, Driveways, and Turnouts," or "Driveways and Turnouts" of the surface specified.

This price is full compensation for furnishing and operating equipment; excavation and embankment; base and pavement materials; and labor, materials, tools, and incidentals. Drainage structures will be measured and paid for in conformance with the pertinent bid Items.

Item 531
Sidewalks

1. DESCRIPTION

Construct hydraulic cement concrete sidewalks, Americans with Disabilities Act ramps, and steps.

2. MATERIALS

Furnish materials in accordance with the following.

- Item 360, “Concrete Pavement”
- Item 420, “Concrete Substructures”
- Item 421, “Hydraulic Cement Concrete”
- Item 440, “Reinforcement for Concrete”

Use Class A concrete unless otherwise shown on the plans. Use Grade 8 coarse aggregate for extruded Class A concrete. Use other grades if approved.

Use of fibers meeting the requirements of DMS-4550, “Fibers for Concrete,” to replace reinforcing steel in Class A concrete is allowed unless otherwise shown on the plans. Dose fibers in accordance with the Department’s MPL of prequalified fibers for concrete.

Furnish detectable warning material in accordance with DMS-4350, “Detectable Warning Material.”

3. CONSTRUCTION

Shape and compact subgrade, foundation, or pavement surface to the line, grade, and cross-section shown on the plans. Lightly sprinkle subgrade or foundation material immediately before concrete placement. Hand-tamp and sprinkle foundation when placement is directly on subgrade or foundation materials. Remove and dispose of existing concrete in accordance with Item 104, “Removing Concrete.” Provide a clean surface for concrete placement directly on the surface material or pavement.

Furnish and place reinforcing steel in accordance with Item 440 unless fiber reinforced concrete is used.

Mix and place concrete in conformance with the pertinent Items. Hand-finishing is allowed for any method of construction. Finish exposed surfaces to a uniform transverse broom finish surface. Curb ramps must include a detectable warning surface and conform to details shown on the plans. Install joints as shown on the plans. Ensure that abrupt changes in sidewalk elevation do not exceed 1/4 in., sidewalk cross slope does not exceed 2%, curb ramp grade does not exceed 8.3%, and flares adjacent to the ramp do not exceed 10% slope measured parallel to the curb line. Ensure that the sidewalk depth and reinforcement are not less than the driveway cross-sectional details shown on the plans where a sidewalk crosses and is part of the concrete driveway.

Use construction methods in conformance with manufacturers’ recommendations when installing detectable warning surface. Install detectable warning surface as shown on the plans.

Provide finished work with a well-compacted mass, a surface free of voids and honeycomb, and the required true-to-line shape and grade. Cure for at least 72 hr. in accordance with Item 420.

3.1. **Conventionally Formed Concrete**. Provide pre-molded or board expansion joints of the thickness shown on the plans for sidewalk section lengths greater than 8 ft. but less than 40 ft., unless otherwise directed. Terminate workday production at an expansion joint.

3.2. **Extruded or Slipformed Concrete**. Provide any additional surface finishing immediately after extrusion or slipforming as shown on the plans. Construct joints at locations as shown on the plans or as directed.

4. MEASUREMENT

Sidewalks will be measured by the square yard of surface area. Curb ramps will be measured by the square yard of surface area or by each. A curb ramp consists of the ramp, landing or turning space, adjacent flares or side curb, and detectable warning surface as shown on the plans. Steps will be measured by the square yard of horizontal surface area.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Concrete Sidewalks" of the depth specified, "Concrete Sidewalk (Steps)," and "Curb Ramps" of the type specified. This price is full compensation for surface preparation of sidewalk foundation; materials; removal and disposal of existing concrete; excavation, hauling, and disposal of excavated material; drilling and doweling into existing concrete curb, sidewalk, and pavement; repair of adjacent street or pavement structure damaged by these operations; and equipment, labor, materials, tools, and incidentals.

Sidewalks that cross and are part of the concrete driveways or turnouts will be measured and paid for in accordance with Item 530, "Intersections, Driveways, and Turnouts."

Item 536
Concrete Medians and Directional Islands

1. DESCRIPTION

Construct cast-in-place concrete medians and directional islands.

2. MATERIALS

Furnish materials in accordance with the following.

- Item 420, “Concrete Substructures”
- Item 421, “Hydraulic Cement Concrete”
- Item 440, “Reinforcement for Concrete”
- Item 529, “Concrete Curb, Gutter, and Combined Curb and Gutter”

Use Class A concrete unless otherwise shown on the plans.

Use of fibers meeting the requirements of DMS-4550, “Fibers for Concrete,” to replace reinforcing steel in Class A concrete is allowed unless otherwise shown on the plans. Dose fibers in accordance with the Department’s MPL of pre-qualified fibers for concrete.

3. CONSTRUCTION

Provide wood or metal forms securely held in place. Properly position and secure reinforcing steel and dowels. Place concrete for each section on the prepared foundation to line, grade, and cross-section in accordance with Item 420. Separate sections from adjacent curbs or adjoining sections using expansion or contraction joints of the type and size specified on the plans. A curb section may be used for the perimeter of the median or island when shown. Construct curbs in accordance with Item 529.

Furnish and place reinforcing steel in accordance with Item 440 unless fiber reinforced concrete is used.

Finish exposed surfaces with a wood or metal float after sufficient concrete set. Round exposed edges as shown on the plans.

Remove forms after concrete has set. Point up exposed surfaces. Provide an ordinary surface finish in accordance with Item 427, “Surface Finishes for Concrete.” Use mortar consisting of one part hydraulic cement and two parts fine aggregate to plaster exposed formed surfaces when required. Apply the mortar using a template made to conform to the cross-section shown on the plans.

Cure at least 72 hr. using a method specified in Item 420, “Concrete Substructures.”.

4. MEASUREMENT

This Item will be measured by the foot or by the square yard to the face of the curb.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Concrete Median” or “Concrete Directional Island.” This price is full compensation for preparing foundation surfaces; furnishing and operating equipment; curbs

and gutters used as part of the concrete median or directional island; and labor, materials, tools, and incidentals.

Item 540
Metal Beam Guard Fence

1. DESCRIPTION

Furnish, install, replace, or adjust metal beam guard fence consisting of metal beam rail elements, hardware, blocks, and support posts.

2. MATERIALS

Provide samples of metal beam rail elements, terminal sections, bolts, and nuts for compliance testing in accordance with Tex-708-I and Tex-713-I to verify physical and chemical properties meet AASHTO M 180 when directed.

Obtain materials at the locations shown on the plans when the plans designate that the Department will furnish materials.

2.1. **Metal Beam Rail Elements**. Furnish new metal beam rail elements, transitions, anchor sections, and terminals that meet the requirements of Table 1 and from a manufacturer on the Department's MPL of rail element manufacturers.

Type I or Type II is required, unless otherwise shown on the plans. Base metal for metal beam rail elements must not contain more than 0.04% phosphorus or more than 0.05% sulfur.

Warped or deformed rail elements will be rejected.

Table 1
Rail Element Requirements

Specification	AASHTO M 180
Class	A— Base metal nominal thickness 0.105 in. B— Base metal nominal thickness 0.135 in.
Type	I— Zinc-coated 1.80 oz. per square foot minimum single-spot. II— Zinc-coated 3.60 oz. per square foot minimum single-spot. IV— Weathering steel (required when shown on the plans).
Shape	W-Beam Thrie Beam W-Beam to Thrie Beam Transition
Markings	Permanently mark each metal beam rail element (including curved sections) with the information required in AASHTO M 180.

2.2. **Posts**. Furnish new round timber, rectangular timber, or rolled steel section posts as shown on the plans and in conformance with the following requirements.

2.2.1. **Timber Posts**. Meet requirements DMS-7200, "Timber Posts and Blocks for Metal Beam Guard Fence." Purchase from a manufacturer or supplier on the Department's MPL of timber treating plants and suppliers.

2.2.2. **Steel Posts**. Provide rolled sections conforming to the material requirements of ASTM A36. Drill or punch posts for standard rail attachment as shown on the plans. Galvanize in accordance with Item 445, "Galvanizing." Low-fill culvert posts may be fabricated as galvanized "blanks" with the rail hole and the final height field fabricated. Treat all exposed post surfaces caused by the field fabrication in accordance with Section 445.3.4., "Repairs."

2.3. **Blocks**. Furnish new rectangular timber or composite blocks as shown on the plans and in conformance with the following requirements.

2.3.1. **Timber**. Meet the requirements of DMS-7200. Purchase from a manufacturer or supplier on the Department's MPL of timber treating plants and suppliers.

2.3.2. **Composite**. Meet the requirements of DMS-7210, "Composite Material Posts and Blocks for Metal Beam Guard Fence." Purchase from a manufacturer on the Department's MPL of composite material blocks and posts.

2.4. **Fittings**. Furnish new fittings (e.g., bolts, nuts, and washers) as shown on the plans and galvanized in accordance with Item 445.

2.5. **Terminal Connectors**. Furnish new terminal connectors, where required, meeting the material and galvanizing requirements specified for metal beam rail elements.

2.6. **Concrete**. Furnish concrete for terminal anchor posts meeting the requirements for Class A concrete in accordance with Item 421, "Hydraulic Cement Concrete."

2.7. **Curb**. If indicated in the details, furnish the curb shown with metal beam guard fence transition in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."

2.8. **Driveway Terminal Anchor Posts**. Furnish new terminal anchor posts from steel conforming to the material requirements of ASTM A36. Fabricate posts in accordance with Item 441, "Steel Structures." Galvanize terminal anchor posts after fabrication in accordance with Item 445.

2.9. **Downstream Anchor Posts**. Furnish new terminal anchor posts consisting of new rectangular timber and new steel foundation tubes as shown on the plans.

2.10. **Downstream Anchor Hardware**. Furnish new hardware (e.g., brackets, plates, struts, and cable) as shown on the plans and galvanized in accordance with Item 445.

2.11. **Controlled Released Terminal (CRT) Posts**. Furnish new CRT posts as shown on the plans and conforming to the requirements of DMS-7200. Purchase from a manufacturer or supplier on the Department's MPL of timber treating plants and suppliers.

3. CONSTRUCTION

Install posts and rail elements as shown on the plans.

3.1. **Posts**. Install posts by either drilling or driving.

3.1.1. **Drilling**. Drill holes and set posts plumb and firm to the line and grade shown. Backfill posts by thoroughly compacting material to the density of adjacent undisturbed material.

3.1.2. **Driving**. Drive posts plumb using approved power hammers (e.g., steam, compressed air, vibratory, or diesel) or gravity hammers to the line and grade shown while preventing damage to the post. Use pilot holes when required and approved. Determine the size and depth of pilot holes based on results of the first few posts driven. Thoroughly tamp loosened soil around the post, fill voids with suitable material, and thoroughly compact to the density of adjacent undisturbed material.

3.2. **Rail Elements**. Erect metal beam rail elements to produce a smooth, continuous rail paralleling the line and grade of the roadway surface or as shown on the plans. Bolt rail elements end-to-end and lap splices in the direction of traffic. Field-drill or punch holes in rail elements for special details, only when approved.

3.3. **Short Radius**. Special rail fabrication with a required radius must be as shown on the plans.

3.4. **Galvanizing Repair**. Repair all parts of galvanized steel posts, washers, bolts, and rail elements after erection where galvanizing has become scratched, chipped, or otherwise damaged. Repair in accordance with Section 445.3.4., "Repairs."

3.5. **Guardrail Adjustment**. Work includes vertical adjustment, horizontal shift, and overlap of the rail element as shown on the plans.

3.6. **Curb**. If indicated in the details, construct the curb shown with metal beam guard fence transition in accordance with Item 529.

3.7. **Driveway Terminal Anchor Posts**. Embed terminal anchor posts in concrete, unless otherwise shown on the plans.

4. MEASUREMENT

4.1. **Guard Fence**. Measurement will be by the foot of fence. Fence will be measured on the face of the rail in place, from center-to-center of end splice locations.

4.2. **Transitions**. Transitions for rail connection will be measured by each transition.

4.3. **Short Radius**. Measurement will be by the foot to the nearest whole foot along the face of the rail in place, from beginning of radius (first CRT post) to the end of radius.

4.4. **Driveway Terminal Anchor Section**. Measurement will be by each section, complete in place, consisting of a driveway terminal anchor post and one 6-ft. section of rail element.

4.5. **Downstream Anchor Terminal**. Measurement will be by each section, complete in place, consisting of one W-Beam end section, two downstream anchor posts, and one rail section.

4.6. **Long Span System**. Measurement will be by each long span system, complete in place. Each long span system will be from the first CRT to the last CRT in the system.

5. PAYMENT

The work performed and material furnished in accordance with this Item and measured as provided under "Measurement" will be paid at the unit price bid for "Metal W-Beam Guard Fence" of the post type specified; "Metal Thrie Beam Guard Fence" of the post type specified, "Metal Beam Guard Fence Transition" of the type specified, "Metal W-Beam Guard Fence Adjustment," "Metal Thrie Beam Guard Fence Adjustment," "Transition Adjustment," "Short Radius," "Driveway Terminal Anchor Section," "Downstream Anchor Terminal," or "Metal Beam Guard Fence (Long Span System)." When weathering steel is required, Type IV will be specified.

Samples furnished to the Department for testing purposes, special backfill materials, and concrete curbs will not be paid for directly, but will be subsidiary to this Item.

5.1. **Guard Fence**. The unit price bid for "Metal W-Beam Guard Fence" or "Metal Thrie Beam Guard Fence" is full compensation for materials, hauling, erection, setting posts in concrete, blocks, driving posts, excavating, backfilling, equipment, labor, tools, and incidentals.

5.2. **Transition**. The unit price bid for "Metal Beam Guard Fence Transition" is full compensation for furnishing nested sections of Thrie Beam; nested sections of W-Beam; Thrie Beam to W-Beam transitional rail piece, posts, concrete, curb, and connections to W-Beam guard fence and bridge rails; Thrie Beam terminal connectors; excavation and backfilling; and equipment, labor, tools, and incidentals.

5.3. **Guardrail Adjustment**. The unit price bid for "Metal W-Beam Guard Fence Adjustment," "Metal Thrie Beam Guard Fence Adjustment," "Terminal Anchor Section Adjustment," and "Transition Adjustment" is full

compensation for furnishing materials not supplied by the Department, drilling holes in posts, hauling, erection, blocks, excavation, backfill, cleaning, salvaging materials, setting rail element anchor assembly and terminal anchor post, removal of rail element, concrete, curb, equipment, labor, tools, and incidentals.

5.4. **Short Radius**. The unit price bid for "Short Radius" is full compensation for furnishing special rail fabricated metal beam guard fence, CRT posts, steel posts, sand barrels, end terminal, cable anchor, materials, hauling, erection, blocks, driving posts, excavating, backfilling, equipment, labor, tools, and incidentals.

5.5. **Driveway Terminal Anchor Section**. The unit price bid for "Driveway Terminal Anchor Section" is full compensation for furnishing the rail element, driveway anchor assembly, driveway terminal anchor post, and foundations; installing the rail element anchor assembly and the driveway terminal anchor post and foundations; excavation and backfilling; and equipment, labor, tools, and incidentals.

5.6. **Downstream Anchor Terminal**. The unit price bid for "Downstream Anchor Terminal" is full compensation for furnishing the rail element, W-Beam end section, guardrail anchor bracket, shelf angle bracket, channel strut, downstream anchor posts, breakaway cable terminal (BCT) cable anchor assembly, and foundations; installing the BCT cable anchor assembly and the downstream anchor post and foundations; excavation and backfilling; and equipment, labor, tools, and incidentals.

5.7. **Long Span System**. The unit price bid for "Metal Beam Guard Fence (Long Span System)" is full compensation for furnishing the rail element, CRT posts, materials, hauling, erection, blocks, driving posts, excavating, backfilling, equipment, labor, tools, and incidentals.

Item 542
Removing Metal Beam Guard Fence

1. DESCRIPTION

Remove existing metal beam guard fence and store at locations shown on the plans or as directed.

2. CONSTRUCTION

Remove rail elements in original lengths. Remove fittings from the posts and the metal rail and then pull the posts. Do not mar or damage salvageable materials during removal.

Completely remove posts and any concrete or grout backfill surrounding the posts. Furnish backfill material and backfill the hole with material equal in composition and density to the surrounding soil unless otherwise directed.

Cut off or bend down deadman eyebolts to an elevation at least 1 ft. below the new subgrade elevation and leave in place along with the deadman.

Neatly stack salvaged materials to be retained by the Department at designated sites shown on the plans. Properly dispose of unsalvageable materials in conformance with federal, state, and local regulations. Repair or replace Contractor-damaged salvageable material at the Contractor's expense.

3. MEASUREMENT

This Item will be measured by the foot for "Remove Metal Beam Guard Fence" in its original position. Measurement will be made along the face of the rail, in place, including metal beam guard fence transitions, from center-to-center of end posts and from terminal points shown on the plans.

When "Remove Terminal Anchor Section" is specified as a separate bid item, measurement will be made for each removed section. A terminal anchor section consists of one post, one 25-ft. rail element, and associated hardware.

When "Remove Downstream Anchor Terminal" is specified as a separate bid item, measurement will be made for each removed section. Downstream anchor terminal consists of two posts, one section, and associated hardware.

4. PAYMENT

The work performed and measured as provided under "Measurement" will be paid for at the unit price bid for "Remove Metal Beam Guard Fence," "Remove Terminal Anchor Section," and "Remove Downstream Anchor Terminal." This price is full compensation for removing materials; loading, hauling, unloading, and storing or disposal; furnishing backfill material; backfilling postholes; and equipment, labor, tools, and incidentals.

Removal of mow strips or riprap will be paid for separately under the pertinent Items.

Removal of curb associated with the metal beam guard fence transitions will not be paid for directly, but will be subsidiary to this Item.

Item 544
Guardrail End Treatments

1. DESCRIPTION

Furnish and install, move, or remove guardrail end treatments.

2. MATERIALS

Furnish new materials from the MPL of rail element manufacturers. Obtain materials at the location shown on the plans when furnished by the Department.

3. CONSTRUCTION

Install guardrail end treatments in conformance with manufacturer's assembly and installation requirements and the details shown on the plans. Provide the Engineer with manufacturer's installation and repair manuals specific to the guardrail end treatment.

Move or remove guardrail end treatments as shown on the plans and as directed. Deliver salvageable materials as shown on the plans or as directed. Dispose of unsalvageable materials in conformance with federal, state, and local regulations.

4. MEASUREMENT

This Item will be measured by each guardrail end treatment.

5. PAYMENT

The work performed and the materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Guardrail End Treatment (Install)" of the post and type specified where applicable, "Guardrail End Treatment (Move and Reset)," or "Guardrail End Treatment (Remove)." This price is full compensation for foundations, materials, stockpiling, disposal of unsalvageable materials, equipment, labor, tools, and incidentals.

Payment for "Guardrail End Treatment (Move and Reset)" will include each guardrail end treatment removed from a stockpile or from an existing location and reset in a new location as shown on the plans or as directed.

Payment for "Guardrail End Treatment (Remove)" will include each guardrail end treatment removed from an existing location and stockpiled at the location shown on the plans, or disposed of, or as otherwise directed

Item 550
Chain Link Fence

1. DESCRIPTION

Furnish, install, remove, repair, or replace chain link fence and gates.

2. MATERIALS

Furnish certification from the chain link fence materials manufacturer stating that all fencing materials comply with the requirements of this Item before installation of the fence. Use only new materials.

2.1. **General**. Furnish materials in accordance with the following.

- Item 421, "Hydraulic Cement Concrete," Class B
- Item 445, "Galvanizing"

2.2. **Wire Fabric**. Provide wire fabric with:

- 9-gauge (0.148-in. diameter) steel wire with a minimum breaking strength of 1,290 lb. meeting ASTM A392 Class I or ASTM A491;
- mesh size of 2 in. ± 1/8 in. between parallel wires with at least seven meshes in a vertical dimension of 23 in. along the diagonals of the openings; and
- knuckled selvages at the top and bottom edge of the fabric, unless otherwise shown on the plans.

2.3. **Posts**. Provide posts of the size and weight shown on the plans. Do not provide rerolled or open-seam posts. Use material for all posts meeting ASTM F1043 Group 1A Regular Grade or Group 1C High Strength.

2.4. **Post Caps**. Provide malleable iron post caps designed to exclude all moisture. Furnish barbed wire support arms integral with the post caps if barbed wire is shown on the plans. Furnish post caps with an opening for the top rail if top rail is shown on the plans. Post caps must have a 2-in. skirt.

2.5. **Gates**. Provide gates fabricated from round sections of pipe of the size and weight shown on the plans. Use material for all gate pipes meeting ASTM F1043 Group 1A Regular Grade or Group 1C High Strength. For each gate, include:

- corner and tee fittings of malleable iron or pressed steel with means for attaching diagonal bracing members;
- hinges of malleable iron allowing a full 180° swing, easily operated by one person;
- ball-and-socket type bottom hinges that do not twist or turn from the action of the gate and prevent the closed gate from being lifted off the hinges;
- a positive stop that prevents any portion of the gate from swinging over an adjacent traffic lane;
- malleable iron pulley systems for roll-type gate (only when required);
- diagonal braces consisting of 3/8-in. diameter cable with turnbuckles, two to each gate frame, and, for vehicle gates, a vertical pipe brace of the size and weight shown on the plans at the center of each gate leaf;
- latches of malleable iron or steel for single gates with a single-fork latch and padlock eye that will keep the gate closed;
- two fork latches mounted on a center plunger rod with a padlock eye for double-leaf gates;
- holdbacks for each leaf of vehicular gates, with a semi-automatic holdback catch anchored at least 12 in. into a 12-in. diameter × 24-in. deep concrete footing; and

- a malleable iron center rest, designed to receive the plunger rod anchored as shown on the plans for all double-leaf gates.

2.6. **Top Rail**. Use material meeting ASTM F1043 Group 1A or Group 1C for all top rail pipes. Provide 1.660-in. outside diameter (OD) top rail manufactured from Group 1A standard weight (Schedule 40) steel pipe weighing 2.27 lb. per foot, or from Group 1C high-strength pipe weighing 1.84 lb. per foot when shown on the plans. Provide pipe in sections at least 18 ft. long joined with outside steel sleeve couplings at least 6 in. long with a minimum wall thickness of 0.70 in. Use couplings designed to allow for expansion of the top rail.

2.7. **Tension Wire**. Use 7-gauge (0.177-in.) carbon steel wire with a minimum breaking strength of 1,950 lb. for the bottom edge of all fence fabric, and for the top edge of fence fabric when a top rail is not specified.

2.8. **Truss Bracing**. Provide truss bracing as shown on the plans.

2.9. **Cables**. Provide seven-wire strand cables manufactured of galvanized annealed steel at least 3/8 in. in diameter.

2.10. **Barbed Wire**. Provide three strands of twisted 12.5-gauge barbed wire with two-point, 14-gauge barbs spaced approximately 5 in. apart conforming to ASTM A121 or ASTM A585 when shown on the plans.

2.11. **Barbed Wire Support Arms**. Provide support arms at an angle of 45° from vertical, with clips for attaching three strands of barbed wire to each support arm and sufficient strength to support a 200-lb. weight applied at the outer strand when barbed wire is shown on the plans.

2.12. **Stretcher Bars**. Provide stretcher bars made of flat steel at least 3/16 × 3/4 in. and not more than 2 in. shorter than the fabric height. Provide one stretcher bar for each gate and end post and two stretcher bars for each corner and pull post.

2.13. **Grounds**. Provide copper-clad steel rods 8 ft. long with a minimum diameter of 5/8 in., or other UL-listed ground rods.

2.14. **Miscellaneous Fittings and Fasteners**. Furnish enough fittings and fasteners to erect all fencing materials in a proper manner. Furnish fittings for posts from pressed or rolled steel, forged steel, malleable iron, or wrought iron of good commercial quality spaced as shown on the plans.

2.15. **Coatings**. Hot-dip galvanize all materials unless specified otherwise in this Item or as shown on the plans. Fabric, tension wire, and barbed wire may be aluminum-coated or alloy-coated if approved. Additionally, coat all material except bolts, nuts, washers, and pipe material with thermally fused polyvinyl chloride (PVC) in accordance with ASTM F668, Class 2b, meeting the specified color when shown on the plans.

2.15.1. **Fabric**.

2.15.1.1. **Galvanizing**. Hot-dip galvanize in accordance with ASTM A392, Class I.

2.15.1.2. **Aluminum Coating**. Aluminum-coat in accordance with ASTM A491.

2.15.1.3. **Alloy Coating**. Coat with zinc-5% aluminum-mischmetal alloy (Zn-5A1-MM) in accordance with ASTM F1345, Class I.

2.15.2. **Posts, Braces, and Gates**.

2.15.2.1. **Standard Weight (Schedule 40) Pipe**. Hot-dip galvanize inside and outside in accordance with ASTM F1043 (1.8 oz. per square foot galvanized zinc weight).

2.15.2.2. **High Strength Pipe**. Hot-dip galvanize before or after forming pipe in accordance with ASTM F1043 Group 1C and as follows.

- **Outside**. Minimum 0.9 oz. per square foot galvanized zinc weight with a verifiable polymer overcoat.
- **Inside**. Minimum 0.9 oz. per square foot galvanized zinc weight before forming, or minimum 0.3 mils zinc-based coating after forming containing a minimum 90% zinc dust, by weight.

2.15.2.3. **Optional Additional Coating**. Additionally, coat all pipe material with 10 mils minimum thermally fused PVC in accordance with ASTM F1043, meeting the specified color when shown on the plans.

2.15.3. **Fittings, Bolts, and Other Miscellaneous Hardware**. Galvanize all fittings, bolts, and miscellaneous hardware in accordance with Item 445.

2.15.4. **Tension Wire**. Zinc-coat tension wire with a minimum coating of 0.80 oz. per square foot, or aluminum-coat with a minimum coating of 0.30 oz. per square foot.

2.15.5. **Barbed Wire**. Zinc-coat barbed wire in accordance with ASTM A121 (0.80 oz. per square foot), or aluminum-coat in accordance with ASTM A585 (0.30 oz. per square foot).

2.15.6. **Pull Cable**. Zinc-coat pull cable with a minimum coating of 0.80 oz. per square foot of individual-wire surface when tested in accordance with ASTM A116.

3. CONSTRUCTION

Erect the chain link fence to the lines and grades established on the plans. Overall height of the fence when erected is the height above the grade shown.

Repair or replace damaged fence or gates. Remove and replace the post and foundation if posts cannot be repaired by straightening. Return all salvageable material to the location shown on the plans when a fence installation is to be removed in its entirety and not replaced. Backfill all postholes with suitable material. Return the salvaged fence fabric in secured rolls not more than 50 ft. long. Dispose of unsalvageable material.

3.1. **Clearing and Grading**. Clear all brush, rocks, and debris necessary for the installation of this fencing.

Stake the locations for corner posts and terminal posts unless otherwise shown on the plans. Follow the finished ground elevations for fencing panels between corner and terminal posts. Level off minor irregularities in the path of the fencing.

3.2. **Erection of Posts**. Install posts as shown on the plans. Plumb and permanently position posts with anchorages firmly set before fabric is placed. Brace corner and pull posts as shown on the plans.

3.2.1. **Post Spacing**. Space posts as shown in Table 1.

Table 1
Post Spacing and Placement

Post Type	Required Spacing or Placement
Line posts	No more than 10 ft. apart
Pull posts	No more than 500 ft. apart and at each change in direction exceeding 20° vertically
Corner posts	At each horizontal angle point

Install cables on all terminal posts and extend to adjacent posts. Install cables on each side of corner and pull posts using a 3/8-in. drop-forged eye-and-eye or eye-and-clevis turnbuckle unless otherwise shown on the plans.

3.2.2. **Postholes**. Drill holes for concrete footings for all posts to provide footings of the dimensions shown on the plans.

Penetrate solid rock by at least 12 in. (18 in. for end, corner, gate, and pull posts) or to plan depth where the rock is encountered before reaching plan depth. Drill holes in the solid rock with a diameter at least 1 in. greater than the OD of the post.

Fill the hole in the solid rock with grout consisting of one part hydraulic cement and three parts clean, well-graded sand after the posts are set and plumbed. If desired, other grouting materials may be used only if approved. Thoroughly work the grout into the hole, leaving no voids. Construct concrete footings from the solid rock to the top of the ground.

3.2.3. **Gate Posts**. Align the tops of all gate frames with the fencing top tension wire or top rail. Provide vehicular gates that are greater in overall height than the adjacent fencing by the height necessary to extend to within 2 in. of the pavement between the curbs if curbs are shown on the plans.

3.2.4. **Concrete Footings**. Center posts in their footings. Place concrete and compact by tamping or other approved methods. Machine mix all batches of concrete more than 1/2 cu. yd. Hand mixing concrete is allowed on batches less than 1/2 cu. yd.

Use forms for footings where the ground cannot be satisfactorily excavated to neat lines. Crown the concrete or grout (for solid rock) to carry water from the post. Keep the forms in place for at least 24 hr. Backfill the footing with moistened material as soon as each form is removed, and thoroughly tamp. Cover concrete with at least 4 in. of loose moist material, free of clods and gravel, immediately after placing concrete. No other curing is required.

Spread all excess excavated and loose material used for curing neatly and uniformly. Remove excess concrete and other construction debris from the site.

3.3. **Erection of Fabric**. Place the fabric with the cables drawn taut with the turnbuckles after all posts have been permanently positioned and anchorages firmly set. Secure one end and apply enough tension to the other end to remove all slack before making attachments. Cut the fabric, independently attach each span at all corner posts, and pull posts unless otherwise shown on the plans.

Follow the finished contour of the site with the bottom edge of fabric located approximately 2 in. above the grade. Grade uneven areas so the maximum distance between the bottom of fabric and ground is 6 in. or less.

Fasten fabric at 12-in. intervals to the top and bottom tension wires between posts. Fasten the fabric in the same manner when top rail is shown on the plans. Fasten the fabric on gate frames to the top and bottom of the frame at 12-in. intervals. Use steel wire fabric ties of 9-gauge steel or larger. Fasten fabric to terminal posts using steel stretcher bars and stretcher bar bands fitted with carriage bolts and nuts of the size and spacing shown on the plans. Use stretcher bars to fasten end posts, pull posts, corner posts, and gateposts with stretcher bar bands at intervals of no more than 15 in. Attach stretcher bars to terminal posts using 1 × 1/8-in. flat steel bands with 3/8-in. carriage bolts at intervals up to 15 in.

3.4. **Electrical Grounds**. Provide at least one electrical ground for each 1,000 ft. of fence, located near the center of the run. Provide additional grounds directly under the point where power lines pass over the fence. For fence placed on bridge structures, install grounds as shown on the plans.

Vertically drive or drill in the grounding rod until the top of the rod is approximately 6 in. below the top of the ground. Connect a No. 6 solid copper conductor to the rod and to the fence by a UL-listed method so that each element of the fence is grounded.

3.5. **Repair of Coatings**. Repair damaged zinc coating in accordance with Section 445.3.4., “Repairs.”

4. MEASUREMENT

Chain link fence will be measured by the foot of fence installed, repaired, replaced, or removed, measured at the bottom of the fabric along the centerline of the fence from center to center of posts, excluding gates.

Gates will be measured as each gate installed, repaired, replaced, or removed.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Chain Link Fence (Install)" or "Chain Link Fence (Repair)" of the height specified, or "Chain Link Fence (Remove)" and "Gate (Install)" or "Gate (Repair)" of the type, height, and width of opening specified, or "Gate (Remove)." Clearing and grading for fencing and gates will not be paid for directly, but will be subsidiary to this Item.

5.1. **Chain Link Fence (Install)**. This price is full compensation for furnishing and installing fencing, except gates; cleaning, grading, and backfilling; removing and disposing of surplus material; and equipment, labor, tools, and incidentals.

5.2. **Chain Link Fence (Repair)**. This price is full compensation for furnishing materials; repairing or replacing fencing, except gates; cleaning, grading, and backfilling; removing and disposing of surplus or damaged material; and equipment, labor, tools, and incidentals.

5.3. **Chain Link Fence (Remove)**. This price is full compensation for removing all fencing, except gates; cleaning, grading, and backfilling; removing and disposing of surplus material; and equipment, labor, tools, and incidentals.

5.4. **Gate (Install)**. This price is full compensation for installing gate and for providing materials, center anchorages, equipment, labor, tools, and incidentals.

5.5. **Gate (Repair)**. This price is full compensation for repairing or replacing gate and for furnishing materials; removing and disposing of damaged materials; and equipment, labor, tools, and incidentals.

5.6. **Gate (Remove)**. This price is full compensation for removing gate and for materials, equipment, labor, tools, and incidentals.

Item 552
Wire Fence

1. DESCRIPTION

Furnish and construct fence of barbed wire or a combination of woven fence fabric and barbed wire, supported on metal or wood posts.

2. MATERIALS

Furnish materials as shown on the plans and in accordance with this Article.

2.1. **Metal Posts and Braces**. Furnish steel pipe in accordance with ASTM A53 if used for posts and braces. Use steel in accordance with ASTM A702 for T-posts. Use only new steel. Do not use rerolled or open-seam material. Furnish galvanized steel sections in accordance with Item 445, "Galvanizing." Use an approved anticorrosive coating when painting is specified. Spot-coat damaged areas with the same paint color after installation of painted posts and braces. Use paint with at least the same anticorrosive properties as the original paint. Use the size, weight, and area of posts, braces, and anchor plates shown on the plans.

2.2. **Wood Posts and Braces**.

2.2.1. **Untreated Wood**. Provide cedar or juniper timber.

2.2.2. **Treated Wood**. Provide pine timber treated in accordance with Item 492, "Timber Preservative and Treatment." Remove outer bark and all inner cambium bark on treated posts; occasional strips of bark may remain if not more than 1/2 in. wide or more than 3 in. long.

Use sound timber that is free of decay, shakes, splits, or other defects that would weaken the posts or braces or otherwise make them structurally unsuitable for the purposes intended. Knots that are sound, tight, trimmed flush, and not in clusters are allowed, provided they do not exceed 1/3 of the small diameter or the least dimension of the posts and braces. Remove spurs and splinters, cutting the ends square.

2.3. **Gates and Gateposts**. Furnish materials to the dimensions shown on the plans or as directed.

2.4. **Barbed Wire**. Furnish barbed wire in accordance with ASTM A121 and as shown on the plans.

2.5. **Wire Mesh**. Furnish wire mesh fabric in accordance with ASTM A116 and as shown on the plans.

2.6. **Miscellaneous**. Furnish galvanized bolts, nuts, washers, braces, straps, and suitable devices for holding barbed wire and wire mesh firmly to metal posts. Use material of good commercial quality and design. Provide galvanized staples at least 1-1/2 in. long.

3. CONSTRUCTION

Space fence posts as shown on the plans. Set fence posts plumb and firm at the intervals, depth, and grade shown on the plans. Brace corner and pull posts in two directions. Brace end posts and gateposts in one direction. Install a corner post where the alignment changes 30° or more. Brace the angle post to the adjacent line posts with diagonal tension wires at alignment angles between 15° and 30°.

Snub or guy fencing at the critical point of grade depressions and fence sags, where stresses tend to pull posts out of the ground, with a double 9-gauge galvanized wire. Connect the wire to the top horizontal line of

the barbed wire or to the top and bottom wire or wire mesh fabric, and to a deadman weighing at least 100 lb. Stretch the fence before guying and snubbing.

Install corner, end, pull, or angle post assembly before stretching the wire between posts. Connect existing cross fences to the new fences and corner posts at junctions with existing fences. Fasten to posts using galvanized ties or staples while drawing barbed wire and wire fabric taut, or as shown on the plans. Install pull post assemblies at 500-ft. intervals for steel posts and at 1,000-ft. intervals for wood posts. Metal line posts may be driven provided driving does not damage the posts. Metal corners, ends, pull posts, and braces must be set in concrete footings crowned at the top to shed water. Thoroughly tamp backfill in 4-in. layers. Notch timber posts as shown on the plans.

Unless otherwise directed, T-posts, steel pipe brace posts, steel pipe gate posts, steel pipe post assemblies, and water gap posts must remain in place.

Posts removed for the convenience of the Contractor due to brush removal or other issues will be replaced at the Contractor's expense.

Remove brush and trees from fence areas where work is performed. Dispose of debris off the right of way, in conformance with federal, state, and local regulations unless otherwise approved. When approved, chip debris and spread in a thin layer on the right of way.

Install water gaps at locations as shown on the plans.

4. MEASUREMENT

Fencing will be measured by the foot of wire fence, excluding gates and water gaps. Gates will be measured as each gate. Water gaps will be measured by the foot as the distance between fence ends.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Wire Fence," "Water Gap," or "Gate." This price is full compensation for furnishing, preparing, hauling, and installing fence, water gap, and gate materials; excavation, backfilling, and disposal of surplus material; removing and trimming of brush and tree limbs; and equipment, labor, tools, and incidentals.

Unless otherwise shown on the plans, removal of existing fence will not be paid for directly but will be subsidiary to pertinent Items.

Item 556
Pipe Underdrains

1. DESCRIPTION

Install pipe underdrains.

2. MATERIALS

2.1. **Pipe**. Furnish the types and sizes of pipe shown on the plans. Use only one type of pipe for any underdrain system on the project. Use perforated pipe in areas to be drained and use non-perforated pipe between the perforated pipe and the outfall.

2.1.1. **Type 1**. Corrugated steel pipe (CSP) conforming to any type specified in AASHTO M 36, fabricated from corrugated galvanized sheet.

2.1.2. **Type 2**. Corrugated aluminum pipe conforming to AASHTO M 196, Type I or Type IA, fabricated from corrugated sheet.

2.1.3. **Type 3**. Bituminous-coated CSP conforming to the requirements of Type 1 and uniformly coated inside and out with a minimum thickness of 0.05 in. of bituminous material meeting the requirements shown in Table 1 when tested in accordance with ASTM A849 Material Class A or Material Class PA.

Table 1
Requirements of Bituminous Material

Test	Requirements
Solubility, % by wt., in trichloroethylene	99.5 Min
Brittleness	Pass
Flow, in.	0.25 Max

2.1.4. **Type 4**. Bituminous-coated corrugated aluminum pipe conforming to the requirements of Type 2 and uniformly coated inside and out with a minimum thickness of 0.05 in. of bituminous material meeting the requirements shown in Table 1 when tested in accordance with ASTM A849 Material Class A or Material Class PA.

2.1.5. **Type 6**. Corrugated polyethylene plastic tubing conforming to AASHTO M 252.

2.1.6. **Type 7**. Corrugated polyvinyl chloride (PVC) pipe conforming to ASTM F949.

2.1.7. **Type 8**. Smooth-wall PVC pipe conforming to AASHTO M 278 Class PS 46.

2.1.8. **Type 9**. As shown on the plans.

2.2. **Filter Material**. Furnish hard, durable, and clean sand, gravel, crushed stone, or crushed shell meeting the gradation by percent weight shown in Table 2 unless otherwise shown on the plans. Filter material must be free of clay balls or other organic or deleterious matter as determined by in accordance with Tex-413-A. Use of crushed limestone is allowed unless otherwise shown on the plans. Use only one type of filter material for any underdrain system on a project.

Table 2
Acceptable Gradations for Filter Material

Sieve Size	Type B	Type C	Type E	Type F	Type G
	% Retained on Sieve (Tex-401-A)				
1-1/2"	–	0–10	Grade 2 Coarse Aggregate[2]	Grade 3 Coarse Aggregate[2]	Grade 4 (57) Coarse Aggregate[2]
3/4"	0–10	20–40			
3/8"	15–35	–			
#4	35–55	40–60			
#20	35–65[1]	35–65[1]			
#50	75–100[1]	75–100[1]			

1. Of the portion finer than No. 4 sieve.
2. Refer to Table 4 in Item 421, "Hydraulic Cement Concrete."

Loss by decantation as determined by in accordance with Tex-406-A must not exceed 1% of the material retained on a No. 4 sieve or 4% of the material passing a No. 4 sieve. Use Type G filter material around the underdrains unless otherwise shown on the plans.

2.3. **Filter Fabric**. Meet DMS-6200, "Filter Fabric," Type 1.

2.4. **Riprap**. Provide concrete riprap in accordance with Item 432, "Riprap," when required.

3. CONSTRUCTION

Begin excavation of the trench at the outfall and proceed toward its upper end, following the lines and grades shown on the plans or as directed. Hold the minimum horizontal limits of excavation for filter material to the dimensions shown in Table 3 or as shown on the plans.

Table 3
Minimum Horizontal Limits of Excavation for Filler Material

Depth of Trench (ft.)	Distance Outside Neat Lines of Pipe Underdrains (ft.)
0–6	1.00
>6–10	1.50
>10–15	2.00
>15	2.50

Place filter fabric in the bottom and sides of the trench in areas to be drained before placing pipe or filter material, as shown in Figure 1. Provide enough width of fabric to overlap on top of the filter material. Center perforated pipe in the excavated ditch with the perforations below the horizontal axis. Join the pipe with appropriate couplers if required. Join plastic pipe in conformance with the manufacturer's recommendations. Do not use tarpaper strips. Obtain approval for pipe placement before placing filter material.

Place filter material at least 12 in. above the bottom of the pipe or as shown on the plans. Do not allow filter material to displace the pipe.

Lap filter fabric over the top of the filter material after placing pipe and filter material in conformance with the manufacturer's recommendation or as shown on the plans.

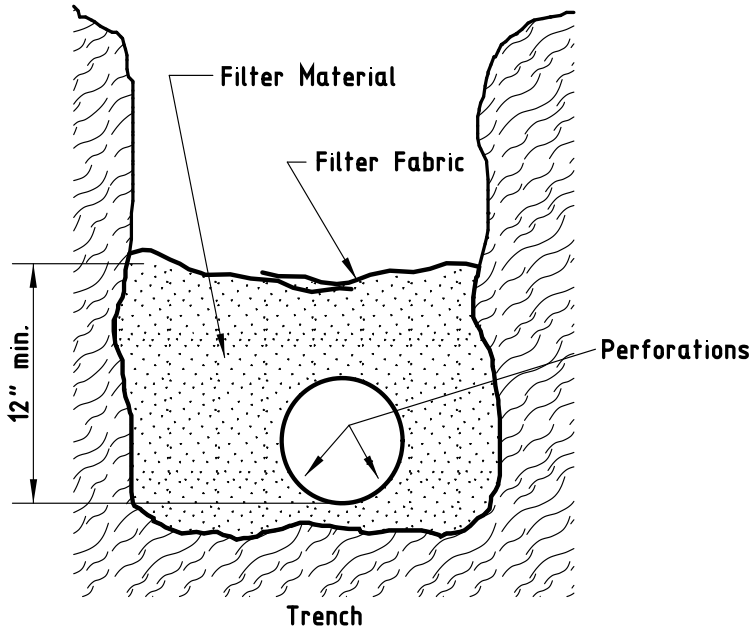

Figure 1
Installation Process

Install non-perforated pipe sections between the perforated pipe and the outfall. The sections of non-perforated pipe do not require filter fabric or filter material.

Place approved plugs in the upper ends of all pipe. Cover exposed outfall ends with 1/2-in. galvanized hardware cloth as directed. Provide Class B concrete riprap, when required, in accordance with Item 432 and as shown on the plans. Place the riprap to the contour and grade of the embankment slope. Cut the pipe to the slope of the riprap.

Backfill the remainder of the trench with suitable material in layers not to exceed 6 in.

4. MEASUREMENT

This Item will be measured by the foot along the top of the pipe and will include the length of elbows, wyes, tees, and other branches.

5. PAYMENT

The work performed and material furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Pipe Underdrains" of the pipe type and size specified. This price is full compensation for pipe, couplers, plugs, screens, filter material, filter fabric, riprap, excavation, backfill, equipment, labor, materials, tools, and incidentals.

Protection methods for excavations deeper than 5 ft. will be measured and paid for in accordance with Item 402, "Trench Excavation Protection."

Item 618
Conduit

1. DESCRIPTION

Furnish and install conduit; prepare existing conduit.

2. MATERIALS

Provide new materials that comply with the details shown on the plans, the requirements of this Item, and the pertinent requirements of the following Items.

- Item 400, "Excavation and Backfill for Structures"
- Item 476, "Jacking, Boring, or Tunneling Pipe or Box"

When specified on the plans, provide:

- rigid metal conduit (RMC),
- polyvinyl chloride (PVC) conduit,
- high density polyethylene (HDPE) conduit,
- liquid-tight flexible metal conduit (LFMC), or
- liquid-tight flexible nonmetallic conduit (LFNC).

Furnish conduit from new materials in accordance with DMS-11030, "Conduit."

Provide prequalified conduit from the Department's MPL. When required by the Engineer, notify the Department in writing of selected materials from the MPL intended for use on each project.

Provide other types of conduit not on the MPL that comply with the details shown on the plans and the NEC. Fabricate fittings such as junction boxes and expansion joints from a material like the connecting conduit, unless otherwise shown on the plans. Use watertight fittings. Do not use set screw fittings. Steel compression fittings are permissible. When using HDPE conduit, provide fittings that are UL-listed as electrical conduit connectors, or connect conduit by thermal fusing with an electrically heated welding method.

Use red 3-in. 4-mil polyethylene underground warning tape that continuously states, "Caution Buried Electrical Line Below."

3. CONSTRUCTION

Perform work as shown on the plans and in accordance with this Item.

Use established industry and utility safety practices when installing conduit located near underground utilities. Consult with the appropriate utility company before beginning work.

3.1. **Installation of Conduit**. Install conduit at least 18 in. deep below finished grade to top of conduit unless otherwise shown on the plans. Meet the requirements of the NEC when installing conduit. Secure and support conduit placed for concrete encasement such that the alignment will not be disturbed during placement of the concrete. Cap ends of conduit and close box openings before concrete is placed.

Ream conduit to remove burrs and sharp edges. Use a standard conduit cutting die with a 3/4-in. taper per foot when conduit is threaded in the field. Galvanize or paint threads in accordance with Item 445, "Galvanizing." Fasten conduit placed on structures with conduit straps or hangers as shown on the plans or

as directed. Fasten conduit within 3 ft. of each box or fitting and at other locations shown on the plans or as directed. Use two-hole type clamps for 2-in. diameter or larger conduit.

Fit PVC and HDPE conduit terminations with bushings or bell ends. Fit metal conduit terminations with a grounding type bushing, except conduit used for duct cable casing that does not terminate in a ground box and is not exposed at any point. Conduit terminating in threaded bossed fittings does not need a bushing. Before installation of conductors or final acceptance, pull a properly sized mandrel or piston through the conduit to ensure that it is free of obstruction. Cap or plug empty conduit placed for future use.

Perform trench excavation and backfilling as shown on the plans or as directed, and in accordance with Item 400. Excavation and backfilling will be subsidiary to the installation of the conduit.

Jack and bore as shown on the plans or as directed, and in accordance with Item 476.

Place warning tape approximately 10 in. above trenched conduit. Where existing surfacing is removed for placing conduit, repair by backfilling with material equal in composition and density to the surrounding areas and by replacing any removed surfacing, such as asphalt pavement or concrete riprap, with like material to equivalent condition. Mark conduit locations as directed.

3.2. **Preparation of Conduit**. Pull a mandrel through empty conduits. Use a mandrel with a diameter greater than 70% of the inside diameter of the conduit and 2-in. length. Repair or replace conduit runs that will not allow passage of the mandrel. Replace conduit deemed impractical to repair or that remains unsuitable in accordance with Item 618, “Conduit.” Clean the conduit by pulling a rubber swab slightly larger in diameter than the conduit.

Blow compressed air through conduits that contain wires. Remove debris from the conduit by pushing a fish tape through the conduit. Do not use water to clear debris. Retest the conduit by blowing compressed air.

Install one pull cord in each conduit for use in installing the conductors, cables, or innerduct.

4. MEASUREMENT

This Item will be measured by the foot of conduit installed, or by the foot of conduit cleared, tested, replaced, and repaired.

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., “Plans Quantity Measurement.” Additional measurements or calculations will be made if adjustments of quantities are required.

5. PAYMENT

5.1. **Installation of Conduit**. The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Conduit” of the type and size specified and the installation method specified as applicable, or for “Conduit (Prepare).” This price is full compensation for furnishing and installing conduit; cleaning and testing conduit; hanging, strapping, jacking, boring, tunneling, trenching, and furnishing and placing backfill; encasing in steel or concrete; replacing pavement structure, sod, riprap, curbs, or other surface; marking location of conduit (when required); furnishing and installing fittings, junction boxes, and expansion joints; and materials, equipment, labor, tools, and incidentals.

Flexible conduit will not be paid for directly, but will be subsidiary to pertinent Items. Unless otherwise shown on the plans, no payment will be allowed under this Item for conduit used on electrical services or in foundations.

Repair of existing conduit will be paid for by the Department in accordance with Article 9.7., “Payment for Extra Work and Force Account Method.”

Item 620
Electrical Conductors

1. DESCRIPTION

Furnish and install electrical conductors, except conductors specifically covered by other Items.

2. MATERIALS

Provide new materials that comply with the details shown on the plans and the requirements of this Item. Use stranded insulated conductors that are rated for 600V, approved for wet locations, and marked in conformance with UL, NEC, and Canadian Standards Association (CSA) requirements. Furnish electrical conductors in accordance with DMS-11040, "Electrical Conductors."

Provide pre-qualified electrical conductors from the Department's MPL. When required by the Engineer, notify the Department in writing of selected materials from the MPL intended for use on each project.

Ensure all grounding conductors Size 8 AWG and larger are stranded, except for the grounding electrode conductor at the electrical service, which will be a 6-AWG solid conductor.

Use white insulation for grounded (neutral) conductors, except grounded conductors Size 4 AWG and larger may be black with white tape marking at every accessible location. Do not use white insulation or marking for any other conductor except control wiring specifically shown on the plans.

Ensure insulated grounding conductors are green, except insulated grounding conductors Size 4 AWG and larger may be black with green tape marking at every accessible location. Do not use green insulation or marking for any other conductor except control wiring specifically shown on the plans.

3. CONSTRUCTION

Perform work as shown on the plans and in accordance with this Item.

Splice conductors only in junction boxes, ground boxes, and transformer bases, and in poles and structures at the handholes. Splice as shown on the plans. Do not exceed the manufacturer's recommended pulling tension. Use lubricant as recommended by the manufacturer. Install conductors in accordance with the NEC.

Test insulation resistance on the conductors before making final connections and ensure each continuous run of insulated conductor has a minimum direct-current (DC) resistance of 5 megohms (MΩ) when tested at 1,000V DC. The Engineer may require verification testing of all or part of the conductor system. The Engineer will witness these verification tests. Replace conductors exhibiting an insulation resistance of less than 5 MΩ at no additional cost to the Department.

4. MEASUREMENT

This Item will be measured by the foot of each single conductor.

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Electrical Conductors" of the types and sizes specified. This price is full compensation for furnishing, installing, and testing electrical conductors; furnishing and installing breakaway connectors; and materials, equipment, labor, tools, and incidentals, with the following exceptions:

- conductors used in connecting the components of electrical services will be paid for under Item 628, "Electrical Services";
- conductors inside roadway illumination assemblies will be paid for under Item 610, "Roadway Illumination Assemblies";
- conductors inside traffic signal pole assemblies will be paid for under this Item; and
- conductors used for internal wiring of equipment will not be paid for directly, but will be subsidiary to pertinent Items.

Item 624
Ground Boxes

1. DESCRIPTION

1.1. **Installation**. Construct, furnish, and install ground boxes complete with lids.

1.2. **Removal**. Remove existing ground boxes.

2. MATERIALS

Provide new materials that comply with the details shown on the plans, the requirements of this Item, and the pertinent requirements of the following Items.

- Item 420, "Concrete Substructures"
- Item 421, "Hydraulic Cement Concrete"
- Item 432, "Riprap"
- Item 440, "Reinforcement for Concrete"
- Item 618, "Conduit"
- Item 620, "Electrical Conductors"

Provide fabricated precast polymer concrete ground boxes in accordance with DMS-11070, "Ground Boxes." Provide pre-qualified ground boxes from the Department's MPL. When required by the Engineer, notify the Department in writing of selected materials from the MPL intended for use on each project.

Provide other precast or cast-in-place ground boxes that comply with the details shown on the plans.

3. CONSTRUCTION

Perform work as shown on the plans and in accordance with this Item.

Use established industry and utility safety practices when installing or removing ground boxes located near underground utilities. Consult with the appropriate utility company before beginning work.

3.1. **Installation**. Fabricate and install ground boxes as shown on the plans. Install ground box to approved line and grade.

Construct precast and cast-in-place concrete ground boxes in accordance with Item 420 and Item 440.

Construct concrete aprons as shown on the plans and in accordance with Item 432 and Item 440.

3.2. **Removal**. Remove existing ground boxes and concrete aprons to at least 6 in. below the conduit level. Uncover conduit to a sufficient distance so that 90° bends can be removed and conduit reconnected. Clean the conduit in accordance with Item 618. Replace conduit within 5 ft. of the ground box. Remove old conductors and install new conductors as shown on the plans. Backfill area with material equal in composition and density to the surrounding area. Replace surfacing material with similar material to an equivalent condition.

4. MEASUREMENT

This Item will be measured by each ground box installed complete in place or each ground box removed.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Ground Box" of the types and sizes specified and for "Remove Ground Box."

5.1. **Installation**. This price is full compensation for excavating, backfilling, and aggregate; constructing, furnishing, and installing ground boxes and concrete aprons; and material, equipment, labor, tools, and incidentals. All wiring connections required inside the ground box will be subsidiary to this Item. Conduit will be paid for under Item 618. Electrical conductors will be paid for under Item 620.

5.2. **Removal**. This price is full compensation for removing and disassembling ground boxes and concrete aprons; excavating, backfilling, and surface placement; removing old conductors; disposal of unsalvageable materials; and materials, equipment, labor, tools, and incidentals. Cleaning of conduit will be subsidiary to this Item. Conduit replaced within 5 ft. of the ground box will be subsidiary to this Item. Additional conduit will be paid for under Item 618. Installation of conductors will be paid for under Item 620.

Item 628
Electrical Services

1. DESCRIPTION

- **Installation**. Furnish and install electrical services.
- **Relocation**. Relocate existing electrical services.
- **Removal**. Remove existing electrical services.

2. MATERIALS

Provide materials that comply with the details shown on the plans, the requirements of this Item, and the pertinent requirements of the following Items.

- Item 441, "Steel Structures"
- Item 445, "Galvanizing"
- Item 449, "Anchor Bolts"
- Item 618, "Conduit"
- Item 620, "Electrical Conductors"
- Item 627, "Treated Timber Poles"
- Item 656, "Foundations for Traffic Control Devices"

For the installation of electrical services, use new materials that meet the requirements of the NEC, UL, the Canadian Standards Association (CSA), and NEMA, and are in accordance with DMS-11080, "Electrical Services."

Provide pre-qualified electrical services from the Department's MPL. When required, notify the Department in writing of selected materials from the MPL intended for use on each project.

3. CONSTRUCTION

Perform work as shown on the plans and in accordance with this Item. Use established industry and utility safety practices when installing, relocating, or removing electrical services located near overhead or underground utilities. Consult with the appropriate utility company before beginning work.

3.1. **Installation**. Furnish and install electrical service equipment. Ensure components of the electrical service meet the requirements of the Electrical Detail Standards. Install the electrical equipment in accordance with the NEC and in conformance with local utility company requirements. Coordinate the utility companies' work for providing service.

3.2. **Relocation**. Coordinate relocation with the appropriate utility company before beginning work. Remove existing electrical service in accordance with Section 628.3.3., "Removal." Reinstall existing electrical service in accordance with Section 628.3.1., "Installation." Replace or add circuit breakers as shown on the plans.

3.3. **Removal**. Coordinate removal with the appropriate utility company before beginning work. Before the removal of the electrical service, disconnect and isolate any existing electrical service equipment in conformance with the utility company's requirements.

Remove existing electrical service support at least 2 ft. below finished grade unless otherwise shown on the plans. Repair the remaining hole by backfilling with material equal in composition and density to the surrounding area. Replace any surfacing, such as asphalt pavement or concrete riprap, with like material to equivalent condition.

Disconnect and remove conductors from the conduit. Cut off and cap all protruding conduit 6 in. below finished grade. Abandoned conduit need not be removed unless otherwise shown on the plans.

Reconnect conductors and conduit to be reused when shown on the plans. Make all splices in ground boxes unless otherwise shown on the plans.

Accept ownership and dispose of unsalvageable materials in conformance with federal, state, and local regulations.

4. MEASUREMENT

This Item will be measured by each electrical service installed, relocated, or removed.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Electrical Services" of the types specified, "Relocate Electrical Services," or "Remove Electrical Services."

Costs for utility-owned power line extensions, connection charges, meter charges, consumption charges, and other charges will be paid for by the Department. The Department will reimburse the Contractor the amount billed by the utility, plus an additional 5% of the invoice cost will be paid for labor, equipment, administrative costs, superintendence, and profit.

Applications for a permanent utility service will designate the Department as the service owner unless otherwise shown in the plans.

5.1. **Installation**. This price is full compensation for paying all fees, testing, permits, utility company inspections, connection or meter charges, and other costs; making arrangements with the utility company for all work and materials provided by the utility company; furnishing, installing, and connecting all components, including poles, service supports, foundations, anchor bolts, riprap, enclosures, switches, breakers, service conduit (from the service equipment, including the elbow below ground), fittings, service conductors (from the service equipment, including the elbow below ground), brackets, bolts, hangers, and hardware; and materials, equipment, labor, tools, and incidentals.

5.2. **Relocation**. This price is full compensation for disconnecting and isolating the existing electrical service; relocating the service supports; new service support foundation; backfilling holes; paying all fees, testing, permits, utility company inspections, connection or meter charges, and other costs; making arrangements with the utility company for all work and materials provided by the utility company; removing, disconnecting, installing, and connecting all components, including poles, service supports, foundations, anchor bolts, riprap, enclosures, switches, breakers, service conduit (from the service equipment, including the elbow below ground), fittings, service conductors (from the service equipment, including the elbow below ground), brackets, bolts, hangers, and hardware; and materials, equipment, labor, tools, and incidentals.

5.3. **Removal**. This price is full compensation for coordinating with the utility company to disconnect and isolate the electrical service; removing the service supports; backfilling holes; and materials, equipment, labor, tools, and incidentals.

Item 666
Retroreflectorized Pavement Markings

1. DESCRIPTION

Furnish and place retroreflectorized or non-retroreflectorized (shadow) pavement markings.

2. MATERIALS

2.1. **Type I Marking Materials (Thermoplastic)**. Furnish in accordance with DMS-8220, "Hot Applied Thermoplastic."

2.2. **Type II Marking Materials (Traffic Paint)**. Furnish in accordance with DMS-8200, "Traffic Paint."

2.3. **Type III Marking Materials (Multipolymer)**. Furnish in accordance with DMS-8230, "Multipolymer Pavement Markings."

2.4. **Glass Traffic Beads**. For Type I, Type II, and Type III pavement markings, furnish drop-on glass beads in accordance with DMS-8290, "Glass Traffic Beads," to meet the specified retroreflective performance requirements for all permanent, longitudinal pavement markings.

2.5. **Labeling**. To sample material, use clearly marked containers that indicate material type, color, mass, manufacturer, and batch number.

3. EQUIPMENT

3.1. **General Requirements**. Use pavement marking equipment that:

- is maintained in satisfactory condition;
- meets or exceeds the requirements of the National Board of Fire Underwriters and the Texas Railroad Commission for this application;
- applies beads by an automatic bead dispenser attached to the pavement marking equipment such that the beads are dispensed uniformly and almost instantly upon the marking as the marking is being applied to the road surface. The bead dispenser must have an automatic cut-off control, synchronized with the cut-off of the pavement marking equipment;
- has an automatic cut-off device with manual operating capabilities to provide clean marking with square ends;
- can produce the types and shapes of profiles specified; and
- can provide continuous mixing and agitation of the pavement marking material. The use of pans, aprons, or similar appliances that the die overruns will not be permitted for longitudinal striping applications exceeding a project length of 2,000 ft., unless otherwise approved.

When placing multipolymer pavement markings (MPM), use equipment designed for pavement preparation and the application of selected type of MPM material.

Provide a handheld thermometer capable of measuring the temperature between 300°F and 450°F to measure the temperature of marking material in the field, when applying Type I material.

3.1.1. **Measuring Retroreflectivity**. Use a mobile retroreflectometer approved by the Materials and Tests Division and certified by the Texas A&M Transportation Institute (TTI) Mobile Retroreflectometer Certification Program.

Use a portable retroreflectometer that:

- uses 30-meter geometry and meets the requirements described in ASTM E1710;
- has either an internal Global Positioning System (GPS) or the ability to be linked with an external GPS with a minimum location accuracy of 16.5 ft., in accordance with the Circular Error Probability (CEP) method (CEP is the radius of the circle with its origin at a known position that encompasses 50% of the readings returned from the GPS instrument); and
- can record and export the GPS location and retroreflectivity reading for each measurement.

3.2. **Material Placement Requirements**. Use equipment that can place:

- a minimum length of 30,000 ft. for 6-in. solid or broken non-profile markings per working day at the specified thickness, unless otherwise approved;
- a minimum length of 15,000 ft. of solid or broken profile pavement markings per working day at the specified thickness;
- linear non-profile markings up to 8 in. wide in a single pass;
- non-profile pavement markings other than solid or broken lines at an approved production rate;
- a centerline and no-passing barrier-line configuration (consisting of one broken line and two solid lines simultaneously) to the alignment, spacing, and thickness for non-profile pavement markings shown on the plans;
- solid and broken lines simultaneously;
- white line from both sides;
- lines with clean edges, reasonably square ends, uniform width with a tolerance of ±1/8 in., and uniform thickness;
- skip lines between 10 and 10.5 ft., a stripe-to-gap ratio of 10 to 30, and a stripe-gap cycle between 39.5 ft. and 40.5 ft., automatically; and
- beads uniformly and almost instantly on the marking as the marking is applied.

For Type I markings, equipment must be capable of providing uniform heating of striping materials to temperatures exceeding 390°F (199°C). Ensure that the material is not heated to a temperature above the maximum temperature recommended by the manufacturer.

For Type I markings, equipment must be capable of maintaining the thermoplastic striping material in a plastic state in all mixing and conveying parts, including the line dispensing device, until applied.

4. CONSTRUCTION

Place markings before opening to traffic unless short-term or work zone markings are allowed.

4.1. **General**. Obtain approval for the sequence of work and estimated daily production. Minimize interference to roadway operations when placing markings on roadways open to traffic. Use traffic control as shown on the plans or as approved. Protect all markings placed under open-traffic conditions from traffic damage and disfigurement. Replace markings when more than 5% of the markings are damaged or disfigured.

Establish guides to mark the lateral location of pavement markings as shown on the plans or as directed and have guide locations verified. Use material for guides that will not leave a permanent mark on the roadway.

Apply markings on completely dry pavement that passes the following tests.

- **Type I Marking Application**. Place a sample of Type I marking material on a piece of tarpaper placed on the pavement. Allow the material to cool to ambient temperature, then inspect the underside of the tarpaper in contact with the pavement. Pavement will be considered dry if there is no condensation on the tarpaper.

- **Type II and Type III Marking Application**. Place a 1-sq. ft. piece of clear plastic on the pavement and weigh down the edges. The pavement is considered dry if, when inspected after 15 min., no condensation has occurred on the underside of the plastic.

Apply markings:

- using personnel skilled and experienced in installation of pavement markings;
- that meet the requirements of Tex-828-B;
- that meet minimum retroreflectivity requirements;
- using widths and colors shown on the plans;
- at locations shown on the plans;
- in proper alignment with the guides without deviating from the alignment more than 1 in. per 200 ft. of roadway or more than 2 in. maximum;
- without abrupt deviations;
- free of blisters and with no more than 5% holes or voids (percent by area);
- with uniform cross-section, density, and thickness;
- with clean and reasonably square ends; and
- that are retroreflectorized with drop-on glass beads.

Remove all applied markings that are not in alignment or sequence as shown on the plans or in accordance with the specifications at the Contractor's expense, in accordance with Item 677, "Eliminating Existing Pavement Markings and Markers," except for measurement and payment.

4.2. **Spot Striping**. Perform spot striping on a callout basis with a minimum callout quantity as shown on the plans.

4.3. **Surface Preparation**. Prepare surfaces in accordance with this Section unless otherwise shown on the plans.

4.3.1. **Surface Cleaning for Pavement Marking Applications on New Asphalt Surfaces with No Existing Pavement Markings and for Retracing of Existing Pavement Markings on All Surfaces**. Use air blast or broom to clean the pavement surface to remove loose material unless otherwise shown on the plans. A sealer for Type I markings is not required unless otherwise shown on the plans. If cleaning is needed beyond what is specified, Engineer can use force account to compensate for the extra effort. This is mainly applied when the pavement is covered with thick layer of dirt or mud or there is grass growing on the pavement.

4.3.2. **Surface Cleaning for All Concrete Surfaces and Asphalt Surfaces Only When Specified in the Plans (Excludes New Asphalt Surfaces with No Existing Pavement Markings and Retracing)**. Clean surfaces in accordance with Item 678, "Pavement Surface Preparation for Markings," to remove curing membrane, dirt, grease, existing loose and flaking construction markings, and other forms of contamination.

4.3.3. **Sealer for Type I Markings**. Apply a pavement sealer when shown on the plans. Pavement sealers are recommended for old asphalt surfaces (more than 3 yr. old) and for all concrete surfaces before placing Type I markings on locations that do not have existing markings. The pavement sealer may be either a Type II marking or an acrylic or epoxy sealer as recommended by the Type I marking manufacturer, unless otherwise shown on the plans. Follow the manufacturer's directions for application of acrylic or epoxy sealers. Clean the surface of sealer that becomes dirty after placement by washing or in accordance with Section 666.4.3.1., "Surface Cleaning for Pavement Marking Applications on New Asphalt Surfaces with No Existing Pavement Markings and for Retracing of Existing Pavement Markings on All Surfaces," as directed. Place the sealer in the same configuration and color (unless clear) as the Type I markings unless otherwise shown on the plans.

4.4. **Application**. Apply markings during favorable weather unless otherwise directed. If markings are placed at Contractor option when inclement weather is impending and the markings are damaged by subsequent precipitation, the Contractor is responsible for all required replacement costs.

4.4.1. **Type I Markings**. Place all Type I markings after the sealer cures. Apply within the temperature limits recommended by the material manufacturer. Flush the spray head if spray application operations cease for 5 min. or longer, by spraying marking material into a pan or similar container until the material being applied is at the recommended temperature.

Apply on clean, dry pavement passing the moisture test in accordance with Section 666.4.1., "General," and with a surface temperature above 50°F when measured in accordance with Tex-829-B.

The Engineer will measure thickness of markings in accordance with Tex-854-B.

4.4.1.1. **Non-Profile Pavement Markings**. Apply Type I non-profile markings with a minimum thickness of:

- 0.100 in. (100 mils) for new markings and retracing water-based markings on surface treatments involving Item 316, "Seal Coat,"
- 0.060 in. (60 mils) for retracing on thermoplastic pavement markings, or
- 0.090 in. (90 mils) for all other Type I markings.

4.4.1.2. **Profile Pavement Markings**. Apply Type I profile markings with a minimum thickness of 0.090 in. (90 mils) for the longitudinal stripe portion.

In addition, at a longitudinal spacing shown on the plans, the markings must be profiled in a vertical manner such that the profile is transverse to the longitudinal marking direction. The profile must not be less than 0.30 in. (300 mils) nor greater than 0.41 in. (410 mils) in height when measured from the normal top surface plane of the base marking to the top of the raised profile marking. The transverse width of the profile must not be less than 5.25 in. and the longitudinal width not less than 2 in., when measured at the top surface plane of the profile bar. The profile may be either a one or two transverse bar profile. When the two transverse bar profile is used, the spacing between the bases of the profile bars must not exceed 0.50 in. The above dimensions for transverse bars are for 6-in. wide longitudinal marking.

The raised profile markings must be uniform in size, appearance, and spacing. When profile markings are applied in a two-step process, the raised profile markings must be applied first and then the stripe applied over them. The raised profile markings in a two-step process may be circular in shape. The circular profile markings must be uniform in diameter and the diameter must not be less than 5.25 in. The height of the apex must not be less than 0.30 in. (300 mils) nor greater than 0.41 in. (410 mils) when measured from the normal top surface of the base marking to the top of the raised profile marking.

4.4.1.3. **Type I All-Weather Pavement Markings**. Apply Type I all-weather markings to at least 100-mil film thickness.

4.4.2. **Type II Markings**. Apply on surfaces with a minimum surface temperature of 50°F when measured in accordance with Tex-829-B. Apply at least 30 gal. per mile on concrete and asphalt surfaces and at least 33 gal. per mile on surface treatments for a solid 6-in. line. Adjust application rates proportionally for other widths. When Type II markings are used as a sealer for Type I markings, apply at least 22-1/2 gal. per mile using Type II drop-on beads.

Apply Type II all-weather markings to at least 25-mil wet film thickness.

4.4.3. **Type III Markings**. Apply in conformance with the manufacturer's recommendations.

4.4.4. **Bead Coverage and Embedment**. Provide a uniform distribution of beads across the surface of the stripe with 40–60% bead embedment.

4.4.5. **Durability**. Provide markings that do not lose more than 5% of the striping material in any 1-ft. section of stripe during their performance period in accordance with Section 666.4.8., "Performance Period." Measure the durability in accordance with ASTM D913.

4.5. **Retroreflectivity Requirements**. Retroreflectivity requirements are not required for Contracts with less than 20,000 total ft. of longitudinal pavement markings, callout work, black shadow markings, or work zone pavement markings. Retroreflectivity requirements are for dry conditions unless otherwise specified.

4.5.1. **Type I Markings**. All Type I markings, including profile markings, must meet the following minimum retroreflectivity values for all longitudinal edgeline, centerline, no-passing barrier line, and lane line markings.

- **White Markings (ASTM E1710)**. 250 millicandelas per square meter per lux (mcd/m^2/lx).
- **Yellow Markings (ASTM E1710)**. 175 mcd/m^2/lx.

Collect retroreflectivity measurement for markings applied on pavement surface other than seal coat after 10 days but not later than 30 days from the time of application. For markings applied on seal coat, measure retroreflectivity after 3 days but not later than 10 days from the time of application.

4.5.2. **Type I High-Performance Markings**. Type I high-performance markings must meet the following minimum retroreflectivity values for all longitudinal edgeline, centerline, no-passing barrier line, and lane line markings when measured any time after 30 days but not later than 60 days from the time of application.

- **White Markings (ASTM E1710)**. 400 mcd/m^2/lx.
- **Yellow Markings (ASTM E1710)**. 250 mcd/m^2/lx.

4.5.3. **Type I All-Weather Markings**. Type I all-weather markings must meet the following minimum retroreflectivity values for all longitudinal edgeline, centerline, no-passing barrier line, and lane line markings when measured any time after 30 days but not later than 60 days from the time of application.

- **White Markings Dry (ASTM E1710)**. 400 mcd/m^2/lx.
- **Yellow Markings Dry (ASTM E1710)**. 250 mcd/m^2/lx.
- **White Markings Wet Continuous (ASTM E2832)**. 150 mcd/m^2/lx.
- **Yellow Markings Wet Continuous (ASTM E2832)**. 125 mcd/m^2/lx.

4.5.4. **Type II Markings**. Type II markings must meet the following minimum retroreflectivity values for all longitudinal edgeline, centerline, no-passing barrier line, and lane line, markings.

- **White Markings**. 175 mcd/m^2/lx.
- **Yellow Markings**. 125 mcd/m^2/lx.

Collect retroreflectivity measurement for markings applied on pavement surface other than seal coat after 10 days but not later than 30 days from the time of application. For markings applied on seal coat, measure retroreflectivity after 3 days but not later than 10 days from the time of application.

4.5.5. **Type II All-Weather Markings**. Meet the following minimum retroreflectivity values for all longitudinal edgeline, centerline, no-passing barrier line, and lane line markings.

- **White Markings Dry (ASTM E1710)**. 250 mcd/m^2/lx.
- **Yellow Markings Dry (ASTM E1710)**. 150 mcd/m^2/lx.
- **White Markings Wet Continuous (ASTM E2832)**. 100 mcd/m^2/lx.
- **Yellow Markings Wet Continuous (ASTM E2832)**. 75 mcd/m^2/lx.

Collect retroreflectivity measurement for markings applied on pavement surface other than seal coat after 10 days but not later than 30 days from the time of application. For markings applied on seal coat, measure the retroreflectivity after 3 days but not later than 10 days from the time of application.

4.5.6. **Type III Markings**. Type III markings must meet the following minimum retroreflectivity values for all longitudinal edgeline, centerline, no-passing barrier line, and lane line markings when measured any time after 30 days but not later than 60 days from the time of application.

- **White Markings**. 400 mcd/m^2/lx.
- **Yellow Markings**. 250 mcd/m^2/lx.

4.5.7. **Type III All-Weather Markings**. Type III all-weather markings must meet the following minimum retroreflectivity values for all longitudinal edgeline, centerline, no-passing barrier line, and lane line markings when measured any time after 30 days but not later than 60 days from the time of application.

- **White Markings Dry (ASTM 1710)**. 400 mcd/m^2/lx.
- **Yellow Markings Dry (ASTM 1710)**. 250 mcd/m^2/lx.
- **White Markings Wet Continuous (ASTM 2832)**. 150 mcd/m^2/lx.
- **Yellow Markings Wet Continuous (ASTM 2832)**. 125 mcd/m^2/lx.

4.6. **Retroreflectivity Measurements**. Use a mobile retroreflectometer to measure the retroreflectivity of markings for Contracts with more than 50,000 total ft. of longitudinal pavement markings, unless otherwise shown on the plans. For Contracts between 20,000 and 50,000 total ft. of longitudinal pavement markings, mobile or portable retroreflectometers may be used at the Contractor's discretion. Coordinate with and obtain authorization from the Engineer before starting any retroreflectivity data collection.

Use a portable retroreflectometer for measuring the wet continuous retroreflectivity in accordance with ASTM E2832. Notify the Department when wet retroreflectivity measurements are to be taken. The Department will observe the wet retroreflectivity readings.

4.6.1. **Mobile Retroreflectometer Measurements**. Provide mobile measurement averages for every 0.1 mi. unless otherwise specified or approved. Take measurements on each section of roadway for each series of markings (e.g., edgeline, center skip line, and each line of a double line) and for each direction of traffic flow. Measure each line in both directions for centerlines on two-way roadways (i.e., measure both double solid lines in both directions and measure all center skip lines in both directions). Furnish measurements in accordance with Item 667, "Mobile Retroreflectivity Data Collection for Pavement Markings," unless otherwise approved. The Engineer may require a field comparison check using a calibrated portable retroreflectometer for verification and to ensure accuracy. Use all equipment in conformance with the manufacturer's recommendations and directions. Inform the Engineer and TTI at least 24 hr. before taking any measurements.

A marking meets the retroreflectivity requirements if:

- the combined average retroreflectivity measurement for a 1-mi. segment meets the minimum retroreflectivity values specified and no more than 30% of the retroreflectivity measurement values are below the minimum retroreflectivity requirements value within that 1-mi. segment; or
- the combined average retroreflectivity measurement for a 1-mi. segment does not meet the minimum retroreflectivity values specified, but no more than 20% of the retroreflectivity measurements within that 1-mi. segment are below the minimum retroreflectivity requirement.

The 1-mi. segment will start from the beginning of the data collection and end after a mile's worth of measurements have been taken. Each subsequent mile of measurements will be a new segment. Centerlines with two stripes (either solid or broken) will result in 2 mi. of data for each mile segment. Each centerline stripe must be tested for compliance as a stand-alone stripe.

Restripe at the Contractor's expense if the markings fail retroreflectivity requirements. Take retroreflectivity measurements of all restriped markings following the time interval allowed based on the type of marking and the pavement surface for the latest application.

For all Type I markings, if the restripe application does not meet minimum retroreflectivity requirements or the initial stripe combined with the restripe exceeds 0.180 in. (180 mils), the Engineer may require:

- removal of all existing markings,
- a new application as initially specified, and
- a repeat of the application process until minimum retroreflectivity requirements are met.

For all Type III markings, if the first application does not meet minimum retroreflectivity requirements, the Engineer may require removal of all existing markings, a new application as initially specified, and a repeat of the application process until minimum retroreflectivity requirements are met.

4.6.2. **Portable Retroreflectometer Measurements**. For non-all-weather markings, provide portable measurement averages for every 1.0 mi. unless otherwise specified or approved. Using a portable reflectometer, take at least 20 measurements for each 1-mi. section of roadway for each series of markings (e.g., edgeline, center skip line, and each line of a double line) and direction of traffic flow. Measure each line in both directions for centerlines on two-way roadways (i.e., measure both double solid lines in both directions and measure all center skip lines in both directions). The spacing between each measurement must be at least 100 ft. The Engineer may decrease the mileage frequency for measurements if the previous measurements provide satisfactory results. The Engineer may resume the original number of measurements if concerns arise.

For all-weather markings, take at least three measurements for each series of markings (e.g., edgeline, center skip line, and each line of a double line) and direction of traffic flow and average the three measurements for each marking. The spacing between each measurement must be at least 100 ft. If the average of the three measurements taken on an individual marking falls below the minimum acceptable retroreflectivity value, take at least six additional measurements on that individual marking and average them. These six additional measurements must also be spaced at least 100 ft. apart. If the average of these six measurements falls below the minimum acceptable retroreflectivity value, the marking does not meet the performance requirements.

Restripe at the Contractor's expense if the averages of these measurements fail. Retake portable retroreflectometer measurements of all restriped markings following the time interval allowed based on the type of marking and the pavement surface for the latest application.

4.7. **Traffic Control**. Provide traffic control, as required, when taking portable retroreflectivity measurements after marking application. For the minimum traffic control requirements on low-volume roadways (as shown on the plans), refer to "Temporary Road Closure" in Part 6 of the TMUTCD. For all other roadways, the minimum traffic control requirements will be as shown on the Traffic Control Plan (TCP) standard sheets TCP (3-1) and TCP (3-2). The lead vehicle will not be required on divided highways. The TCP and traffic control devices must meet the requirements listed in Item 502, "Barricades, Signs, and Traffic Handling." Time restrictions that apply during striping application will also apply during the retroreflectivity inspections, except when using the mobile retroreflectometer, unless otherwise shown on the plans or approved.

4.8. **Performance Period**. All longitudinal markings must meet the minimum retroreflectivity requirements within the timeframe specified. All markings must meet all other performance requirements in accordance with this Item for at least 30 calendar days after installation. Unless otherwise directed, remove pavement markings that fail to meet requirements and replace them at the Contractor's expense. Replace failing markings within 30 days of notification. All replacement markings must also meet all requirements in accordance with this Item for at least 30 calendar days after installation.

5. MEASUREMENT

This Item will be measured by the foot; by each word, symbol, or shape; or by any other unit shown on the plans. Each stripe will be measured separately.

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

Acrylic or epoxy sealer, or Type II markings when used as a sealer for Type I markings, will be measured by the foot; by each word, symbol, or shape; or by any other unit shown on the plans.

Profile pavement markings will be measured as a marking consisting of both the pavement marking stripe and the raised profile, regardless of the installation method used.

6. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Pavement Sealer" of the size specified; "Pavement Sealer (Call Out)" of the size specified; "Retroreflectorized Pavement Markings" of the type, color, shape, width, size, and thickness specified; "Non-Retroreflectorized Shadow Pavement Markings" of the type, width, size, and thickness specified; "Type I High Performance Pavement Markings" of the color, width, size, and thickness specified; "All-Weather Pavement Markings" of the type, color, shape, width, and thickness specified; "Pavement Marking (Call Out)" of the type, color, width, size, and thickness specified; or "Retroreflectorized Profile Pavement Markings" of the color, shape, size, and width specified.

This price is full compensation for application of pavement markings, materials, equipment, labor, tools, and incidentals.

Surface cleaning for all concrete surfaces and asphalt surfaces only when shown on the plans (excludes new asphalt surfaces with no existing pavement markings and retracing) will be paid for under Item 678. Surface cleaning for pavement marking applications on new asphalt surfaces with no existing pavement markings and for retracing of existing pavement markings on all surfaces will not be paid for directly, but will be subsidiary to this Item. If cleaning is needed beyond regular brooming and blowing compressed air, the Engineer may use force account to compensate for the extra effort. This is mainly applied when the pavement is covered with a thick layer of dirt or mud or grass is growing on the pavement.

Surface preparation of any surface where pavement markings are being retraced, except for sealing, will not be paid for directly, but will be subsidiary to this Item.

If the Engineer requires that markings be placed in inclement weather, repair or replacement of markings damaged by the inclement weather will be paid for in addition to the original plans quantity.

Item 672
Raised Pavement Markers

1. DESCRIPTION

Furnish and install raised pavement markers (RPMs).

2. MATERIALS

2.1. **Markers**. Furnish RPMs in accordance with the following.

- **Reflectorized Pavement Markers**. DMS-4200, "Pavement Markers (Reflectorized)," Types I-A, I-C, I-R, II-A-A, II-C-C, and II-C- R
- **Traffic Buttons**. DMS-4300, "Traffic Buttons," W, Y, and B. Round or oval unless otherwise shown on the plans
- **Plowable Reflectorized Pavement Markers**. DMS-4210, "Snowplowable Pavement Markers," Types I-A, I-C, I-R, II-A-A, II-C-C, and II-C- R

The following are descriptions for each type of RPM.

- **Type I-A**. The approach face must retroreflect amber light. The body, other than the retroreflective face, must be yellow.
- **Type I-C**. The approach face must retroreflect white light. The body, other than the retroreflective face, must be white or silver-white.
- **Type I-R**. The trailing face must retroreflect red light. The body, other than the retroreflective face, must be white or silver-white, except for I-R plowable markers, which may be black.
- **Type II-A-A**. The two retroreflective faces (approach and trailing) must retroreflect amber light. The body, other than the retroreflective faces, must be yellow.
- **Type II-C-R**. Contains two retroreflective faces with an approach face that must retroreflect white light and a trailing face that must retroreflect red light. The body, other than the retroreflective faces, must be white or silver-white.
- **Type II-C-C**. Contain two retroreflective faces (approach and trailing) that retroreflect white light. The body, other than the retroreflective face, must be white or silver-white.
- **Type W**. Must have a white body and no reflective faces.
- **Type Y**. Must have a yellow body and no reflective faces.
- **Type B**. Must have a black body and no reflective faces.

2.2. **Adhesives**. Furnish adhesives in accordance with the following.

- DMS-6100, "Epoxies and Adhesives," Type II—Traffic Marker Adhesives
- DMS-6130, "Bituminous Adhesive for Pavement Markers"

The Contractor may propose alternate adhesive materials for consideration and approval.

2.3. **Sampling**. The Engineer will sample in accordance with Tex-729-I.

3. CONSTRUCTION

Remove existing RPMs in accordance with Item 677, "Eliminating Existing Pavement Markings and Markers," except for measurement and payment. Furnish RPMs for each class from the same manufacturer. Prepare all surfaces in accordance with Item 678, "Pavement Surface Preparation for Markings," when shown on the

plans. Ensure the bond surfaces are free of dirt, curing compound, grease, oil, moisture, loose or unsound pavement markings, and any other material that would adversely affect the adhesive bond.

Establish pavement marking guides to mark the lateral location of RPMs as shown on the plans and as directed. Do not make permanent marks on the roadway for the guides.

Place RPMs in proper alignment with the guides. Acceptable placement deviations are shown on the plans.

If necessary, remove and replace RPMs placed out of alignment or sequence, as shown on the plans or in accordance with this Item, at the Contractor's expense in accordance with Item 677 (except for measurement and payment).

Use the following adhesive materials for placement of reflectorized pavement markers and traffic buttons, unless otherwise shown on the plans:

- standard or flexible bituminous adhesive for applications on bituminous pavements, and
- epoxy adhesive or flexible bituminous adhesive for applications on hydraulic cement concrete pavements.

Use epoxy adhesive for plowable reflectorized pavement markers.

Apply enough adhesives to:

- ensure that 100% of the bonding area of RPMs is in contact with the adhesive, and
- ensure that RPMs, except for plowable markers, are seated on a continuous layer of adhesive and not in contact with the pavement surface.

Apply adhesives in conformance with manufacturer's recommendations unless otherwise required by this Article. Apply bituminous adhesive only when pavement temperature and RPM temperature are 40°F or higher. Do not heat bituminous adhesive above 400°F. Machine agitate bituminous adhesive continuously before application to ensure even heat distribution.

Machine-mix epoxy adhesive. Apply epoxy adhesive only when pavement temperature is 50°F or higher.

Furnish RPMs free of rust, scale, dirt, oil, grease, moisture, and contaminants that might adversely affect the adhesive bond.

Place RPMs immediately after the adhesive is applied and ensure proper bonding. Do not use adhesives or any other material that impairs the functional retroreflectivity of the RPMs.

All RPMs must meet performance requirements for at least 30 calendar days after installation.

Replace all missing, broken, or non-reflective RPMs. Visual evaluations will be used for these determinations. Upon request, the Engineer will allow a Contractor representative to accompany the Engineer on these evaluations.

The Engineer may exclude RPMs from the replacement provisions of the performance, provided the Engineer determines the failure is a result of causes other than defective material or inadequate installation procedures. Examples of outside causes are extreme wear at intersections, damage by snow or ice removal, and pavement failure.

Replace all missing or non-reflective RPMs identified during the performance period within 30 days after notification. The end of the performance period does not relieve the Contractor from the performance deficiencies requiring corrective action identified during the performance period.

4. MEASUREMENT

This Item will be measured by each RPM.

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Reflectorized Pavement Marker," "Traffic Button," or "Plowable Reflectorized Pavement Marker" of the types specified. This price is full compensation for removing existing markers; furnishing and installing RPMs; and materials, equipment, labor, tools, and incidentals.

No additional payment will be made for replacement of RPMs failing to meet the performance requirements.

Item 713

Cleaning and Sealing Joints and Cracks (Concrete Pavement)

1. DESCRIPTION

Clean and seal joints and cracks in concrete pavement.

2. MATERIALS

Furnish sealant, boards, and backer rods in accordance with DMS-6310, "Joint Sealants and Fillers." The sealant must be Type 4, 5, 7, or 8 unless otherwise shown on the plans or in conformance with specifications. Furnish primer when required by the sealant manufacturer.

3. EQUIPMENT

Use equipment in conformance with the sealant manufacturer's recommendations. Furnish equipment capable of placing the sealant, backer rods, and boards as shown on the plans. Furnish equipment capable of removing all foreign material from the concrete joint or the grooved crack. The following equipment is recommended to meet cleaning and sealing requirements:

- power concrete saw,
- sandblasting equipment,
- power router,
- high-pressure air, and
- sealant dispenser.

4. WORK METHODS

Use dimensions for joint details in accordance with Standard Drawing *Concrete Paving Details, Joint Seals,* unless other dimensions are shown on the plans. Make a groove, follow the cracks to be sealed, and rout the groove approximately 1/2 in. deep × 5/8 in. wide, unless otherwise directed or shown on the plans. The Engineer will select joints and cracks to be cleaned and sealed.

Remove all foreign material from the joint or groove reservoir. Clean the joint by sandblasting or other approved methods. If directed, saw joint sides to remove embedded foreign material in the concrete that sandblasting will not remove. Do not place sealant when the concrete pavement is below 55°F or above 90°F. Do not place sealant in a wet or damp joint or groove. Use approved drying method if joints or grooves are sealed within 24 hr. of rain. Apply primer when required by the sealant manufacturer. Blow out joint or groove by high pressure air or other approved methods before placing sealant. Remove and replace sealant when placed flush with or above the pavement surface. The various types of joints and cracks are shown in Table 1.

Table 1
Types of Joints and Cracks Requirements

Joint or Crack Type	Requirement
Transverse contraction joints	Backer rods and sealants
Longitudinal contraction joint	Sealant
Longitudinal construction joint	Sealant
Expansion joints	Boards, backer rods, and sealant
Cracks in concrete pavement	Sealant

5. MEASUREMENT

Joint cleaning and sealing will be measured by the foot of joint cleaned and sealed. Crack cleaning and sealing will be measured by the foot of crack cleaned and sealed.

6. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Joint Sealing and Cleaning" of the type specified, or "Crack Cleaning and Sealing."

Item 752
Tree and Brush Removal

1. DESCRIPTION

Remove and dispose of trees, brush, shrubs, and vines. Trim trees and shrubs. Remove stumps.

2. MATERIALS

Furnish commercially available pruning paint.

3. EQUIPMENT

Provide equipment necessary to complete the work.

4. WORK METHODS

Perform tree and brush removal and trimming from right of way line to right of way line or other widths and locations shown on the plans. Ensure trees, shrubs, and other landscape features that are to remain are not damaged. Dispose of debris within 48 hr. of cutting, off the right of way, in conformance with federal, state, and local regulations unless otherwise approved. When approved, chip debris and spread in a thin layer on the right of way.

4.1. **Tree Removal**. Remove trees of various diameters as shown on the plans, or as directed. Remove tree stumps to at least 12 in. below the surrounding terrain unless otherwise shown on the plans, or as directed. Backfill holes with acceptable material and compact flush with surrounding area.

4.2. **Tree Trimming**. Remove dead tree limbs. Remove tree limbs to the limits shown on the plans. Prune trees in accordance with ANSI A300 Standard Practices for shade trees. Make cuts as close as possible to the trunk or parent limb without cutting into the branch collar or leaving a protruding stub. Remove suckers to the height of the lowest main branch.

When removing limbs 2 in. in diameter or larger:

- undercut 1/3 way through the limb 8–12 in. from the main stem,
- remove limb 4–6 in. outside the first cut,
- remove stub with an even flush cut so that a trace (collar) protrudes approximately 1/2 in.,
- do not allow limb to fall free if it can damage other limbs or items, and
- treat exposed cuts on oak trees with wound dressing within 20 min. of the cut.

Disinfect tools using 70% methyl alcohol, benzalkonium chloride, chlorine solution, or other approved disinfectant when trimming oak trees and when shown on the plans before cutting and sterilize or sanitize again before cutting another tree. Avoid pruning between February 15 and June 15, the period for maximum insect and fungal activity.

4.3. **Brush Removal**. Remove brush including, but not limited to, bushes, small trees, and vines growing within the right of way by cutting parallel to and within 1 in. of the ground and to the limits shown on the plans. Remove brush from under bridges, around culverts, and in channels to the limits shown on the plans.

4.4. **Channel Work**. Trim trees and remove brush to the limits shown on the plans, including areas under bridges and easements.

4.5. **Stump Removal**. Remove tree stumps at least 12 in. below the surrounding terrain unless otherwise shown on the plans, or as directed. Backfill holes with acceptable material and compact flush with surrounding area.

4.6. **Spot Tree Trimming and Brush Removal**. Trim trees in accordance with Section 752.4.2., "Tree Trimming," and remove brush in accordance with Section 752.4.3., "Brush Removal."

5. MEASUREMENT

This Item will be measured as follows.

5.1. **Tree Removal**. By each tree of the diameter specified. The diameter will be measured 3 ft. above the ground. Trees less than 4 in. in diameter are considered brush. Trees with multiple trunks at the point of measurement will be measured separately and paid for according to the specified diameter. Removal of the stump will be subidiary to "Tree Removal."

5.2. **Tree Trimming and Brush Removal**. By the centerline mile of the dimension specified. "Centerline mile" is defined as the continuous measurement along the center of the right of way.

5.3. **Tree Trimming and Brush Removal for Channels**. By the acre.

5.4. **Stump Removal**. By each stump removed. This Item is for stumps where others previously removed the tree.

5.5. **Spot Tree Trimming and Brush Removal**. **"**Brush Removal" will be measured by the foot along the length of the right of way. "Tree Trimming" will be measured by the foot along the length of the right of way to the outer edges of the tree canopy. For areas with tree trimming and brush removal, use the greatest length combination along the right of way.

6. PAYMENT

The work performed in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Tree Removal" of the diameter specified, "Tree Trimming" of the dimension specified, "Brush Removal," "Tree Trimming and Brush Removal," "Stump Removal," and "Spot Tree Trimming and Brush Removal." This price is full compensation for removal, trimming, disposal, equipment, traffic control, labor, and incidentals.

When not shown on the plans as a separate pay item, payment for tree trimming and brush removal in channels will be included in payment by the centerline mile. When shown on the plans as a separate pay item, tree trimming and brush removal in channels will be paid for at the unit price bid for "Tree Trimming and Brush Removal (Channels)."

The limits shown on the plans are the limits for pay purposes unless otherwise modified in accordance with Article 4.4., "Changes in the Work."

Item 778
Concrete Rail Repair

1. DESCRIPTION

Repair or replace damaged concrete railing on bridges, culverts, parapet walls, retaining walls, or other structures as shown on the plans and as directed.

2. MATERIALS

Provide materials in accordance with the following Items except as shown on the plans.

- Item 427, “Surface Finishes for Concrete”
- Item 429, “Concrete Structure Repair”
- Item 450, “Railing”
- Item 776, “Metal Rail Repair”

Submit information regarding pre-packaged repair materials, epoxy anchorage systems, and concrete mix design at least 10 calendar days before beginning work.

3. EQUIPMENT

Provide equipment in accordance with Item 429.

4. WORK METHODS

Obtain approval for all materials and work methods at least 10 calendar days before beginning work.

Repair or replace damaged concrete rail as shown on the plans. Perform the work in accordance with Item 429 and Item 450, as directed.

Contain concrete during removal to prevent falling onto lower roadway or into waterway.

Remove and replace full height of rail if damage exceeds half of the rail height, except as shown on the plans and as directed.

Remove existing metal rail components and attachments, and salvage for reuse when undamaged or repairable.

Saw-cut perimeter of concrete repair region 1/2 in. deep. Remove concrete to limits shown on the plans and as directed to remove spalled and delaminated areas. Increase repair length to remove the cracked concrete as directed where cracks associated with impact damage remain outside the specified repair area.

Repair rail supporting structure (e.g., bridge deck and wingwall) when damaged in conformance with additional Items of work as shown on the plans and as directed. Include new rail anchorage reinforcing steel in supporting structure as required.

Drill into undamaged base concrete and add epoxy anchored reinforcing steel to restore severed or damaged rail anchorage reinforcing steel. Provide epoxy anchorage system rated to obtain yield strength of bar being anchored based on the product literature for the epoxy and steel anchor being used. Use 60-ksi reinforcing steel. Clean and extend existing reinforcing steel and replace any damaged steel or add additional steel as shown on the plans. Restore shape of rail to match original.

Provide surface finish to match original.

Provide and apply paint in accordance with Item 427 to match color of existing rail if the existing rail was previously painted.

Reinstall metal rail components and attachments where previously present.

Salvage and reinstall metal components of expansion joint and joint seal to match existing conditions when repair and replacement occur at an expansion joint. This work will be subsidiary to this Item.

5. MEASUREMENT

This Item will be measured by the foot of rail repaired or replaced and by each rail post repaired or replaced.

6. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Concrete Rail Repair," "Concrete Rail Replacement," "Concrete Post Repair," and "Concrete Post Replacement" of the type identified. This price is full compensation for removing and reinstalling metal rail components; breaking back and restoring concrete rail; furnishing and placing all materials; salvaging and reinstalling existing expansion joints; and all labor, tools, equipment, and incidentals necessary to complete the work.

Item 780
Concrete Crack Repair

1. DESCRIPTION

Repair cracks in concrete members by epoxy injection, gravity filling, routing and sealing, or surface sealing.

2. MATERIALS

Provide materials in accordance with the Department's *Concrete Repair Manual*. Select a pre-approved material in conformance with the applicable DMS when available.

3. WORK METHODS

Follow the procedures in accordance with the Department's *Concrete Repair Manual*. Submit alternative procedures to the Engineer for approval before proceeding with repair work.

The manual includes the following categories of concrete crack repair:

- pressure-injected epoxy,
- gravity-fed sealant,
- routing and sealing, and
- surface sealing.

4. MEASUREMENT

This Item will be measured by the foot of exterior crack length, injected gallon, square footage for flood coats, or lump sum.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Concrete Crack Repair" of the type specified. This price is full compensation for furnishing and installing all repair materials, equipment, labor, and incidentals.

Special Specification 6000
Duct Cable

1. DESCRIPTION

Furnish and install duct cable consisting of a complete assembly of conductors enclosed in a high-density polyethylene conduit.

2. MATERIALS

Provide new materials as shown on the plans, with conductors that meet the material requirements of Item 620, "Electrical Conductors." Furnish duct cable from new materials in accordance with DMS-11060, "Duct Cable."

Provide pre-qualified duct cable from the Department's MPL. When required by the Engineer, notify the Department in writing of selected materials from the MPL intended for use on each project.

Ensure the complete assembly is packaged on reels with sufficient diameter to prevent permanent set or damage to the duct cable. Ensure each reel is clearly and durably marked to show the voltage rating, type of insulation, number of conductors, conductor size, length, duct size, and either the name or the trademark of the manufacturer.

3. CONSTRUCTION

Perform work as shown on the plans and in accordance with this Item.

Use established industry and utility safety practices when installing duct cable located near underground utilities. Consult with the appropriate utility company before beginning work.

Install duct cable by open trench methods in accordance with the NEC. Backfill the trench in accordance with Item 400, "Excavation and Backfill for Structures," except for measurement and payment. When removal of existing pavement or concrete surface is allowed, backfill with material equal in composition and density to the surrounding area and replace removed surfacing, such as asphalt pavement or concrete riprap, with like material to equivalent condition or as shown on the plans.

Splicing the duct is not allowed. Make all connections in ground boxes or pole bases. Form bends with large radii to provide free movement of conductors. After installation, demonstrate the conductors can move freely. Duct cable that has been kinked or in which the conductors cannot move freely is not acceptable and will be repaired or replaced at no cost to the Department. Splice conductors and test insulation in accordance with Item 620.

4. MEASUREMENT

This Item will be measured by the foot of duct cable.

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Duct Cable" of the types and sizes specified. This price is full compensation for furnishing and installing all duct cable; excavating and backfilling the trenches; replacing riprap, pavement structure, topsoil, sod, or other surface; testing insulation resistance; and materials, equipment, labor, tools, and incidentals.

Special Specification 4023
Cured-in-Place Pipe (CIPP) (Drainage Structures)

1. DESCRIPTION

Reconstruct existing cross-drainage structures by forming a new pipe within an existing deteriorated structure, which has generally maintained its original shape.

Reconstruct the pipes by installing thermosetting resin-impregnated flexible felt fiber tube, coated on one side with an elastomeric coating, installed within the existing line pipe, using a water column or other approved method. Cure by circulating hot water, applying steam, or other approved methods throughout the length of the installed tube to cure the thermosetting resin into a hard, impermeable pipe with the elastomeric coating on the inside surface of the new pipe. Provide a cured-in-place pipe (CIPP) extending the full length of the original pipe, which is structurally sound, jointless, and close-fitting.

This Specification references ASTM F1216, “Rehabilitation of Pipelines by the Inversion and Curing of a Resin-Impregnated Tube”; ASTM F1743, “Rehabilitation of Pipelines by Pulled-in-Place Installation of a Cured-in-Place Thermosetting Resin Pipe”; ASTM D790, “Test Methods for Flexural Properties of Unreinforced Plastics”; ASTM D5813, “Standard Specification for Cured-in-Place Thermosetting Resin Sewer Piping Systems”; and ASTM D2990, “Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics,” which are made a part of this Specification by such references and refer to the latest editions and revisions. In case of conflicting requirements between this Specification and these referenced documents, this Specification will govern.

The Department reserves the right to approve materials or installation practices that differ from these standards.

The Contractor warrants to the Department that the methods, materials, and equipment used, where covered by license, are furnished in conformance with such license, and the prices included in this proposal include applicable royalties and fees in conformance with such license. The Contractor warrants and saves harmless the Department and its representative against claims for patent infringement and loss.

2. QUALIFICATION REQUIREMENTS

Install the CIPP using qualified products and contractors.

2.1. **Product Requirements**. Inliner, Insituform, and National Liner are preapproved products. If not using a preapproved product, provide documentation of long-term successful installation in storm sewer rehabilitation projects. A minimum of 500,000 ft. of the product should have been in successful service for a minimum of 5 yr.

2.2. **Contractor Requirements**. Contractors certified or licensed by Inliner, Insituform, or National Liner are preapproved. If not preapproved, provide documentation of successful installation of a minimum of 200,000 ft. of the exact product intended for use in the last 5 yr.

2.3. **Documentation Requirements**. Minimum documentation must consist of a list of projects, including location, pipe size, product used, dollar value of project, Engineer of Record, and contact information.

3. MATERIALS

3.1. **General**. Verify the pipe size in the field before fabrication. Fabricate the flexible felt fiber tube to a size that, when installed, neatly fits the internal circumference of the conduit. An allowance will be made for some circumferential stretching during inversion.

The minimum length is that deemed necessary by the Contractor to effectively span the distance from the inlet to the outlet of the respective access points unless otherwise specified on the plans. Verify the lengths in the field before impregnating the tube with resin. Individual installations can be made over one or more access points as determined in the field by the Contractor and as approved.

Before installing, ensure the outside of the tube has an impermeable plastic coating. This coating will form the inner layer of the finished pipe and is required for enhancement of corrosion, flow, and abrasion properties.

Ensure the layers that constitute the pipe wall are such that when the thermosetting resin cures, the total wall thickness is homogeneous with no internal layer of plastic that might weaken the pipe wall and allow internal shear. When cured, the CIPP must be mechanically locked within the conduit.

Before using the lining material, furnish satisfactory written certification of compliance with the ASTM and manufacturer's standards for all materials, including the tube, resin, and catalyst system.

In addition to the above structural requirements, provide satisfactory evidence that the proposed lining material will incorporate a polyester resin suitable for chemical resistance.

Provide a finished CIPP that is continuous over the entire length of an inversion run and as free as commercially practicable of visual defects, such as foreign inclusions, dry spots, pinholes, and delamination. Monitor installation pressures during cure as referenced in ASTM F1216, Section 7.6.3., or ASTM F1743, Section 6.6.

Repair any defects that will affect the integrity or strength of the CIPP at no expense to the Department, up to and including removal and replacement.

3.2. **Resin**. The resin system must be a corrosion-resistant polyester, vinyl ester, or epoxy and catalyst system that when properly cured within the tube composite meets the requirements of ASTM F1216 and ASTM F1743, the minimum physical properties herein, and those that are to be used and submitted for review in the design of the CIPP for this project. The resin must produce CIPP that complies with the structural and chemical resistance requirements of this Specification.

3.3. **Structural Requirements**. The CIPP must be designed per ASTM F1216, Appendix X1. The CIPP design must assume no bonding to the original pipe wall.

The Contractor must have performed long-term testing for flexural creep of the CIPP pipe material installed by their company. Such testing results must be used to determine the long-term, time-dependent flexural modulus to be used in the product design. This is a performance test of the materials (tube and resin) and general workmanship of the installation and curing. A percentage of the instantaneous flexural modulus value (as measured by ASTM D790 testing) must be used in design calculations for external buckling. The percentage, or the long-term creep retention value used, will be verified by this testing. Values in excess of 50% will not be applied unless substantiated by qualified third-party test data. The materials used for the contracted project must be of a quality equal to or better than the materials used in the long-term test with respect to the initial flexural modulus used in design.

The layers of the cured CIPP must be uniformly bonded. It must not be possible to separate any two layers using a probe or point of a knife blade so that the layers separate cleanly or the probe or knife blade moves

freely between the layers. If separation of the layers occurs during testing of field samples, new samples must be cut from the work. Any reoccurrence may cause rejection of the work.

The CIPP must conform to the structural properties and minimum structural standards in accordance with Table 1.

Table 1
Minimum Physical Properties

Property	Test Method	Minimum (psi)
Flexural stress	ASTM D790	4,500
Flexural modulus of elasticity	ASTM D790	250,000

Values shown are for polyester. Vinyl ester and epoxy resins may be substituted when applicable.

The required structural CIPP wall thickness must be based, at minimum, on the physical properties in Table 1 or greater values if substantiated by independent lab testing, and in accordance with the design equations in the appendix of ASTM F1216, and the following design parameters.

- **Design Safety Factor**. 2.0.
- **Retention Factor for Long-Term Flexural Modulus to be Used in Design**. 50% (maximum).
- **Ovality**. 2%.
- **Soil Modulus**. 500 psi (minimum)–2,000 psi (maximum).
- **Soil Density**. 120 pcf.
- **Live Load**. Highway HS20.
- **Design Condition (Partially or Fully Deteriorated)**. Fully deteriorated.

Additional information, such as pipe depth and size, required for the CIPP wall thickness design is shown on the plans.

Any layers of the tube that are not saturated with resin before insertion into the existing pipe must not be included in the structural CIPP wall thickness computation.

3.4. **Testing Requirements**.

3.4.1. **Chemical Resistance**. The CIPP must meet the chemical resistance requirements of ASTM F1216, Appendix X2. CIPP samples for testing must be of tube and resin system similar to that proposed for actual construction. CIPP samples with and without plastic coating must meet these chemical testing requirements.

3.4.2. **Hydraulic Capacity**. Overall, the hydraulic profile must be maintained as large as possible. The CIPP must have a minimum of the full flow capacity of the original pipe before rehabilitation. Calculated capacities may be derived using a commonly accepted roughness coefficient for the existing pipe material based on new condition.

3.4.3. **CIPP Field Samples**. When requested, submit test results from field installations in the United States of the same resin system and tube materials as proposed for the actual installation. These test results must verify that the CIPP physical properties specified in Table 1 have been achieved in previous field applications.

4. CONSTRUCTION

4.1. **Reference Specifications**. This Specification references standard test methods as defined in ASTM specifications previously listed.

4.2. **Pre-Installation Procedures**. Adhere to the following installation procedures unless otherwise approved.

4.2.1. **Safety**. Perform operations in strict conformance with all applicable Department and OSHA standards. Pay particular attention to those safety requirements involving work and entry into a confined space or the use of steam.

4.2.2. **Cleaning**. Remove debris located within the pipe. Debris is defined as dirt and other material not part of the drainage system. Clean, as needed, using high-velocity jet cleaners, mechanically powered equipment, cable-attached devices, fluid-propelled devices, or other approved methods.

4.2.3. **Inspection**. Perform video inspection using experienced personnel trained in locating breaks, obstacles, and service connections by closed-circuit television inspection. Carefully inspect the interior of the pipe. Note which locations need point repair. Also, notify the Engineer if any conditions exist that may prevent proper installation of the CIPP so these conditions can be corrected as approved. Keep a video record and suitable log for later reference by the Engineer, consisting of no less than the following.

- Provide video records in CD or DVD format.
- Label each video indicating the Department, the location and lines recorded on the video, and the name of the Contractor.
- Prepare logs from each line inspected during the actual field inspection activities.
- Submit video and logs in a timely manner after the completion of all field activities.
- If requested, make additional copies of the video on professional duplication equipment at no additional cost to the Department.

4.2.4. **Bypassing**. Provide for the flow of water around the structure or structures that are to be lined. Create the bypass by bypassing the line at an existing upstream location and pumping the flow into a downstream location or adjacent system. Use a pump and bypass lines of adequate capacity to manage the flow. Contractor must ensure full drainage capacity under the roadway at all times.

4.2.5. **Line Obstructions and Pipe Damage**. If inspection reveals pipe damage, an obstruction that cannot be removed, or a condition that will prevent completion of the installation process, make a point repair as approved.

4.3. **Installation Procedures**.

4.3.1. **Wet Out**. Designate a location where the tube will be impregnated (wet out) with resin using distribution rollers and vacuum to thoroughly saturate the tube felt fiber before installing. Ensure that there are no resin voids or weak areas. The Engineer must inspect the materials and wet-out procedure. Use a catalyst system compatible with the resin and tube.

4.3.2. **Insertion**. Dewater the pipe so it is free of incoming water. If infiltrating water is present, take measures to control contact of the water using the inverting tube, as required.

Insert the wet-out tube through an existing manhole or other approved access by means of an inversion, pull-in, or other approved procedure to install the impregnated tube from end to end. Hold the tube tight against the existing pipe wall and flared ends of the CIPP.

4.3.3. **Curing**. After the installation of the tube is completed, supply a suitable heat source capable of delivering steam, hot water, or ambient temperature water or air uniformly throughout the section to effect a consistent cure of the resin. Use a curing temperature recommended by the resin system manufacturer. Fit the heat source with suitable monitors to gauge the temperature of the incoming and outgoing water supply. Place another such gauge between the impregnated tube and the invert of the original pipe at the termination end to determine the temperatures during the resin curing process. When the exposed portions of the CIPP appear to be hard and the remote temperature sensing device indicates the cure temperature in the pipe or tube interface complies with the recommendation by the resin system manufacturer, the initial cure is complete.

4.3.4. **Cool-Down**. Cool the hardened CIPP to a temperature below 100°F if using a water cure and below 130°F if using a steam cure system before relieving the internal curing pressure.

4.4. **Post-Installation Procedures**.

4.4.1. **Inspection**. After the CIPP installation, perform inspection and provide video records as outlined in Section 4023.4.2.3., "Inspection," showing completed work.

4.4.2. **Cleanup**. Upon acceptance of the installation work and testing, reinstate the project area affected.

5. MEASUREMENT

This Item will be measured by the foot. Measurement will be made from end to end of the reconstructed pipe.

Cleaning will be measured by the foot.

Television inspection work will be measured by the foot.

6. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Cured-in-Place Pipe (CIPP) (Drainage Structures)" of the size specified by the inside diameters of the existing pipe to be lined. This price is full compensation for testing; for the installation procedures (including wet out of tube, insertion of tube, curing of tube, and reopening existing structure); for furnishing, hauling, placing, and reinstating the project area affected by the Contractor's operations; and for all materials, equipment, labor, tools, and incidentals. Cleaning, television inspection, bypassing and stopping the storm sewer drainage during the construction operation, and line obstruction and pipe damage repair work will not be paid for directly, but will be subsidiary to pertinent Items.

Special Specification 6033
Portable Changeable Message Sign

1. DESCRIPTION

Furnish, operate, and maintain portable trailer mounted changeable message sign (PCMS) units.

2. MATERIALS

Furnish new or used material in accordance with the requirements of this Item and the details shown on the plans. Provide a self-contained PCMS unit with the following.

- sign controller
- changeable Message Sign
- trailer
- power source

Paint the exterior surfaces of the power supply housing, supports, trailer, and sign with Federal Orange No. 22246 or Federal Yellow No. 13538 of Federal Standard 595C, except paint the sign face assembly flat black.

2.1. **Sign Controller**. Provide a controller with permanent storage of a minimum of 75 pre-programmed messages. Provide an external input device for random programming and storage of a minimum of 75 additional messages. Provide a controller capable of displaying up to 3 messages sequentially. Provide a controller with adjustable display rates. Enclose sign controller equipment in a lockable enclosure.

2.2. **Changeable Message Sign**. Provide a sign capable of being elevated to at least 7 ft. above the roadway surface from the bottom of the sign. Provide a sign capable of being rotated 360° and secured against movement in any position.

Provide a sign with 3 separate lines of text and 8 characters per line minimum. Provide a minimum 18 in. character height. Provide a 5 × 7 character pixel matrix. Provide a message legibility distance of 600 ft. for nighttime conditions and 800 ft. for normal daylight conditions. Provide for manual and automatic dimming light sources.

The following are descriptions for 3 screen types of PCMS:

- **Character Modular Matrix**. This screen type comprises of character blocks.
- **Continuous Line Matrix**. This screen type uses proportionally spaced fonts for each line of text.
- **Full Matrix**. This screen type uses proportionally spaced fonts, varies the height of characters, and displays simple graphics on the entire sign.

2.3. **Trailer**. Provide a 2-wheel trailer with square top fenders, 4 leveling jacks, and trailer lights. Do not exceed an overall trailer width of 96 in. Shock-mount the electronics and sign assembly.

2.4. **Power Source**. Provide a diesel generator, solar powered power source, or both. Provide a backup power source as necessary.

2.5. **Cellular Telephone**. When shown on the plans, provide a 4G LTE (long-term evolution) cellular telephone connection to communicate with the PCMS unit remotely. The PCMS unit needs to be TxDOT Advanced Traffic Management System (ATMS) compatible to be able to control and to post messages remotely.

3. CONSTRUCTION

Place or relocate PCMS units as shown on the plans or as directed. The plans will show the number of PCMS units needed, for how many days, and for which construction phases.

Maintain the PCMS units in good working condition. Repair damaged or malfunctioning PCMS units as soon as possible. PCMS units will remain the property of the Contractor.

4. MEASUREMENT

This Item will be measured by each PCMS or by the day used. All PCMS units must be set up on a work area and operational before a calendar day can be considered measurable. When measurement by the day is specified, measure for each PCMS set up and operational on the worksite for at least minimum 18 hr. in 24-hr. period to charge as a day.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Portable Changeable Message Sign." This price is full compensation for PCMS units; set up; relocating; removing; replacement parts; batteries (when required); fuel, oil, and oil filters (when required); cellular telephone charges (when required); software; and equipment, materials, tools, labor, and incidentals.

Special Specification 6058
Roadway Weather Information System

1. DESCRIPTION

Furnish and install a Roadway Weather Information System (RWIS) to monitor weather conditions at the locations as shown on the project plans. The RWIS must include bridge deck pavement sensors; pavement sensors with integrated pavement temperature probes; and complete weather station to monitor wind information, air temperature humidity, and other items defined in this Item. The system must be specifically designed for monitoring and displaying pavement surface conditions, pavement temperature, freeze point temperature, pavement friction coefficient, and subsurface temperature. Nonintrusive sensors must be installed at the RWIS sites to monitor roadway surface status conditions, including dry, wet, chemical wet, ice watch, ice warning roadway temperature, and roadway grip or friction coefficient.

Atmospheric or meteorological conditions monitored may include any of the following.

- Air temperature,
- Relative humidity,
- Barometric pressure,
- Accumulated precipitation, and
- Wind or speed direction.

The information from the RWIS sites will be transmitted back to the Transportation Management Center by the Department's Intelligent Transportation System (ITS) network, where the data will be presented to the operations staff. The Department's Lonestar™ software will poll the RWIS to ask for data on a preset time interval specified by the Department to transfer and refresh with current conditions. Data from the RWIS must comply with standard National Transportation Communications for Intelligent Transportation System Protocol (NTCIP).

The RWIS must include all hardware, software, and licenses to operate as follows.

- Nonintrusive surface sensors will measure bridge deck or roadway pavement surface temperature, roadway grip or friction coefficient, and surface wetness, and communicate the data to the remote processing unit (RPU).
- Roadway atmospheric sensors will measure their respective weather parameters and communicate the data from each sensor to the RPU.
- Atmospheric weather sensors will measure their respective weather parameters and communicate the data from each sensor to the RPU.
- RPU will acquire data from all connected sensors. The RPU will process and temporarily store the output from the pavement sensors and atmospheric sensors.
- RWIS server will poll the RPU of each local RWIS system on a scheduled basis. The RPU will respond to the poll and transfer all its data to the RWIS server.
- All data transfers between the RWIS server and local RWIS must be compliant with federal standard NTCIP Environmental Sensor Station (ESS) protocols.
- RWIS user displays will include all sensor and historical data in a Windows-based graphical user interface or browser-based data display format.

2. MATERIALS

2.1. **RWIS RPU**. Furnish and install a controller-mounted RPU at locations as shown on the project plans.

The RPU must gather, process, and store data from all connected atmospheric sensors, pavement sensors, and camera. The data must be transmitted to Lonestar™ upon polled request by NTCIP ESS protocols.

The RPU must be a ruggedized industrial PC with an operating system using Windows-CE. The unit must have an integrated LCD touch screen; size must be at least 7 in. The integrated LCD touch screen display will allow any person at the site to work on the RWIS site without the need for a service laptop in case of such onsite activities as setups, firmware-uploads data views, extensions, or parameter settings. The RPU must be fully NTCIP-compliant. The RPU must be password-protected.

Integration of new sensors must be accomplished by plugging in digital or analog modules along a DIN rail.

The RPU and module units must allow for the following.

- Galvanic isolation between sensor supply and communication,
- Host communication by RS232 (PC/GPRS-modem), RS485 (EAK),
- Small housing with top hat rail mounting and bus connection,
- Firmware update by RS232,
- Common power supply (24V) for UMB modules and (heated) sensors,
- Online data transfer (no memory),
- Network with up to 32 modules,
- Communication watchdog for reliable sensor function (reset),
- Overvoltage protection for all interfaces,
- LED indication for operation mode,
- Power supply 20 VDC–28 VDC,
- Power consumption 10 VA,
- Ambient temperature -22°F–140°F,
- Relative humidity <90%,
- USB Interface USB2.0B,
- CDMA modem, GPRS modem, Ethernet connectivity, and UMB bus interfaces,
- Display size 7- in.,
- Display resolution 800 × 480 pixel,
- DIN rail and modules,
- Power supply 12 VDC–26 VDC,
- Power consumption <100 mA,
- Ambient temperature -22°F–140°F,
- Relative humidity <95%,
- Protection type Ingress Protection (IP) 20,
- Module width 1-in.,
- RS232 connector DSUB9, and
- Sensor connector screw-type.

The RPU must have the capability of being modified to use solar power or other power sources in place of conventional commercial electric power. Solar-powered RPU sites must operate at least 72 hr. without sunlight or solar charging of the batteries. Autonomy will be calculated based on the type and quantity of sensors as indicated by the plans or as directed and in accordance with Specifications.

The RPU hardware and software must meet the following technical specifications.

The RPU must be able to collect data from all connected sensors and remote pavement sensors, and process, store, and transmit these data to the RWIS server upon polled request. The RPU must be capable of collecting data from the following sensors.

- Wired precipitation radar-based type sensor,
- Wired air temperature and relative humidity sensor,

- Wired road surface and subsurface sensors,
- Wired subsurface sensor,
- All-in-one smart atmospheric sensor,
- Nonintrusive pavement condition and temperature sensor,
- Nonintrusive Doppler radar water level sensor,
- Rain sensor,
- Mechanical and ultrasonic wind speed and direction sensor,
- Barometric pressure sensor, and
- Wired pan-tilt-zoom camera.

The RPU must include an IP66, NEMA 4X-rated lockable aluminum steel AISI 316 enclosure that is resistant to weather, sunshine, deicing chemicals, corrosion, and damage from falling debris (ice, small rocks, and tree branches) and vandalism. The enclosure must be capable of being mounted on poles with an outside diameter range of 6 in.–24 in. The enclosure must house all RPU electronics, power supplies, and communication equipment, and not exceed 30-in. height × 24-in. width × 12-in. depth dimensions.

RPU communication with the server must use federal standard NTCIP ESS protocol, with some manufacturer-specific objects. The server must poll the RPU by one of the following communications modes.

- Ethernet,
- PMPP leased line,
- PMPP spread spectrum radio, or
- PMPP serial fiberoptic.

The RPU must incorporate watchdog circuitry, monitor its own operation, and reset itself if the RPU software enters an indeterminate state. The RPU must also have the capability to be reset by a “user administrator” from the server.

2.2. **RPU Mounting Requirements**. The RPU panel must be enclosed inside an RWIS-specific communication cabinet, traffic signal controller cabinet, ITS cabinet, or communications building as shown on the plans.

2.3. **All-in-One Atmospheric Sensor (Air Temperature/Relative Humidity/Barometric Pressure/Ultrasonic Wind Speed and Direction)**. The sensor design must be an all-in-one design within one sensor housing to allow ease of installation, maintenance, and upgrades. The sensors form factor must be of one integrated unit. Multiple sensors are not allowed. The sensor must support remote firmware upgrades without the need for personnel to be onsite; include wind detection with birdproof construction; and be a compact all-in-one weather sensor with low power, heater, aspirated radiation shield, maintenance-free operation, and open communication protocol.

The sensor must measure temperature, relative humidity, precipitation intensity, precipitation type, precipitation quantity, air pressure, wind direction, and wind speed.

The measurement technology must be Ultrasonic/Wind, NTC/T, Capacitive/RH, MEMS Capacitive/Pressure, 24-GHz Doppler Radar/Precipitation.

The ultrasonic wind sensor must be precise and maintenance-free while delivering measurement of wind velocity and wind direction, as well as calculation of acoustic virtual temperature. The digital or analog output must deliver instantaneous, average, minimum or maximum value with a flexible measuring rate. The unit must be heated to remove frost and ice formation from the sensor.

The sensor must operate within a minimum temperature range of -40°F–140°F at 0%–100% relative humidity and meet an IP66 rating. The sensor must operate to Specifications at cable lengths up to 324 ft. from the RPU.

The sensor must operate within a power range of 11 VDC–32 VDC. The sensor must include RS-485 two-wire serial data communication and resistance level outputs.

Communication and power cable connecting the combined sensor to the RPU must be shielded, with ultraviolet (UV) stable jacket rated for outdoor use. The Contractor is responsible for providing the correct length of cable based on the planned installation.

The sensor must include all mounting hardware necessary to complete the installation.

2.3.1. **Temperature**.

- **Principle**. NTC.
- **Measuring Range**. -58°F–140°F.
- **Accuracy**. ±0.2 (-4°F–122°F), otherwise ±0.5 (>-22°F).

2.3.2. **Relative Humidity**.

- **Capacitive**.
- **Measuring Range**. 0%–100%.
- **Accuracy**. ±2%.

2.3.3. **Precipitation (Liquid)**.

- **Principle**. 24-GHz Doppler radar.
- **Droplet Size**. 0.011 in.–19 in.
- **Detection Sensitivity**. 0.0003 in/h.
- **Particle Velocity**. 0.2 mph–34.6 mph.
- **Precipitation Types**. Rain/snow.
- **Solid Precipitation**. 0.20 in.–~1.18 in.
- **Intensity Range**. 0.00196 in/h–0.00780 in/h.
- **Intensity Resolution**. 0.00039 in/h.
- **Amount Resolution**. 0.0039 in.
- **Accuracy**. 20% under laboratory conditions.
- **Reproducibility**. Typical >90% under laboratory conditions.

2.3.4. **Air Pressure**.

- **MEMS Capacitive**.
- **Measuring Range**. 300 hPa–1,200 hPa.
- **Accuracy**. ±0.5 hPa (32°F–104°F).

2.3.5. **Wind Direction**.

- **Ultrasonic**.
- **Measuring Range**. 0°–359.9°.
- **Accuracy**. <3° RMSE >2.2 mph.
- **Resolution**. 0.1.
- **Startup Threshold.** 0.67 mph.

2.3.6. **Wind Speed**.

- **Ultrasonic**.
- **Measuring Range**. 0 mph–134 mph.
- **Accuracy**. ±0.67 mph or ±3% (0 mph–78 mph) ±5% (>78 mph) RMSE.
- **Resolution**. 0.22 mph.
- **Startup Threshold**. 0.67 mph.

2.4. **Precipitation Sensor (Standalone Sensor)**. Precipitation detection sensors must be versatile instruments that can function as a precipitation classifier and a precipitation rate meter. The radar-based precipitation sensor must be able to differentiate type, size, and intensity of falling precipitation. The precipitation sensor must sense the onset and cessation of precipitation in the form of rain, snow, sleet, and freezing rain, and must indicate when precipitation is occurring. The sensor must provide all precipitation classification and measurements of intensity. The sensor must operate within a minimum temperature range of -40°F–140°F at 0%–100% relative humidity and meet an IP66, IP67 rating. The sensor must operate to Specifications at cable lengths up to 100 ft. from the RPU.

The sensor must operate within a power range of 12 VDC–30 VDC and use no more than 5W of power. The sensor must include RS-232, RS-485 data communication and 4-mA–20-mA outputs, and be capable of operating to Specifications at cable lengths up to 100 ft. from the RPU.

Communication and power cable connecting the sensor to the RPU must be shielded, with UV stable jacket rated for outdoor use. The Contractor is responsible for providing the correct length of cable based on the planned installation.

Optical precipitation sensors are not allowed. The measuring technology must be Doppler radar. The sensor must support remote firmware upgrades without the need for personnel to be onsite.

2.5. **Air Temperature and Relative Humidity Sensor (Standalone Sensor).** The air temperature and relative humidity sensor must have an air-temperature sensing element that measures temperatures within a minimum range of -40°F–140°F with an accuracy within 1° of actual temperature. The relative humidity sensing element must be of the capacitance type and have a measuring range of 10%–100% within 1% of actual humidity levels. The sensor must be protected by UV-stabilized white thermoplastic solar- and wind-radiation shield and meet IP66 rating.

System dew point temperature will be calculated by the system from the air temperature and relative humidity. Both atmospheric sensing elements must be mounted on the RWIS tower at the standard meteorological height of approximately 6 ft. above ground level.

The sensor must operate within a power range of 7 VDC–30 VDC and use no more than 5W of power. The sensor must include RS-485 two-wire serial data communication, 0V–10V, and resistance-level outputs, and be capable of operating to Specifications on cable lengths up to 100 ft. from the RPU.

Communication and power cable connecting the combined sensor to the RPU must be shielded, with UV stable jacket rated for outdoor use. The Contractor is responsible for providing the correct length of cable based on the planned installation.

The sensor must include all mounting hardware necessary to complete the installation.

2.6. **In-Pavement Roadway Sensor.** Furnish and install intrusive pavement sensors as shown on the project plans or as directed. The intrusive sensor supplied must be a single solid-state electronic device that is installed in the roadway or bridge deck pavement at the locations as shown on the plans or as directed. Exact sensor placement will be as determined by the Engineer with guidance from the equipment supplier.

The sensor must be constructed of materials that have thermal characteristics similar to common pavement materials. The top of the sensor must be installed with epoxy sealer so the top is flush with the surrounding roadway surface. The sensor must be thermally nonintrusive, providing stable operation over a temperature range of -40°F–140°F. Weather conditions, traffic, or ice control chemicals must not degrade its performance. The sensor must be supplied with 300 ft. of attached molded cable that is waterproofed and sealed as an integral part of the assembly. Each sensor must be capable of operating at extended cable lengths up to 4,000 ft. from the RPU by splicing to direct-burial sensor extension cable.

The in-pavement sensors must allow for the removal of the electronics after installation of the sensor in the roadway. This must be accomplished without the use of coring or other pavement-altering means. The electronics must be field-replaceable. The sensor must support remote firmware upgrades without the need

for personnel to be onsite. Although only one may be required, the in-pavement sensor must allow for two subsurface probes to extend from the housing. Separate subsurface probes from the passive sensor are not allowed.

The sensor must operate within a power range of 9 VDC–14 VDC, typically 12 VDC. The sensor must include RS-485 two-wire serial data communication, baud rate from 2,400 bit/s–38,400 bit/s, Standard 19200. The sensor must meet IP68 rating.

The sensor must electronically sample the following pavement parameters.

- Detectable road conditions (dry/damp/wet/ice or snow/residual salt content/freezing wetness).
- Surface temperature at the sensor head.
- Pavement surface conductivity, friction coefficient.
- Road surface temperature and below-ground temperature, with depth of subsurface up to 3 ft.
- Water film height using radar technology up to a resolution of 0.0004 in.
- Dry is absence of moisture on the surface sensor.
- Trace moisture is when pavement moisture is above freezing (no precipitation).
- Wet is when precipitation has occurred and there is a continuous film of moisture on the pavement sensor.
- Chemically wet is continuous film of water and ice mixture at or below freezing (32°F) with enough chemical to keep the mixture from freezing, and precipitation is not occurring.
- Ice warning is continuous film of ice and water mixture at or below freezing (32°F) with insufficient chemical to keep the mixture from freezing (active precipitation).
- Ice watch is thin or spotty film of moisture at or below freezing (32°F), and precipitation is not occurring.

After bid opening and before Contract execution, the successful Contractor must supply actual field test documentation that substantiates pavement sensor performance.

2.7. **Subsurface Temperature Probe**. Furnish and install the subsurface temperature probes in the roadway at a depth of 18 in. The probe will measure the ground temperature below the roadway pavement surface. The temperature-sensing element of the probe must operate over a temperature range of -40°F–140°F.

The probe must be supplied attached to the in-pavement sensor canister with cable that is waterproofed and sealed as an integral part of the assembly. Each sensor must be capable of operating at extended cable lengths up to 4,000 ft. from the RPU.

The wired subsurface sensor must be installed per manufacturer's recommendations to detect temperature at a depth of 18 in. Exact placement of the sensor must be as determined by the field engineer with guidance from the manufacturer. All cabling for the sensor, where it is not embedded in the road, must be installed in conduit at a minimum depth of 36 in. Installation must eliminate all cable splicing. The sensor must be configured and calibrated to function as designed with the RPU.

2.8. **Nonintrusive Pavement Condition and Temperature Sensor**. The noninvasive road weather sensor must work with optical technology and measure surface conditions such as wetness, ice, snow, or frost, as well as water film height, ice percentage, and freeze point temperature. It must also provide friction coefficient and optional freeze point data of the pavement and roadway surface. The sensor must support remote firmware upgrades without the need for personnel to be onsite. The sensor must measure the roadway parameters using infrared technology. Laser technology is not permitted.

The sensor must be capable of accurate measurements within a minimum range of 7 ft.–40 ft. The sensor must operate in a minimum temperature range of -40°F–140°F at 0%–100% relative humidity. The sensor must measure road surface temperature from -40°F–158°F. The sensor must measure water film height using optical technology for a range of 0 in.–0.0787 in. for water and 0 in.–0.3937 in. for snow. The sensor must meet IP65 rating.

The sensor must be powered from a 9-VDC–30-VDC source and use no more than 4W of power. The sensor must provide RS-232 and RS-485 serial data communication interfaces and be capable of operating to Specifications at cable lengths up to 300 ft. from the RPU for RS-232 and 495 ft. from the RPU for RS-485.

If the RWIS is greater than 25 ft. from the white edge line of the roadway being measured, then the nonintrusive pavement condition sensor must include a steel pole with breakaway assembly per Department standards and underground conduit to install the sensor at an appropriate height to detect conditions of the closest lane of travel.

Communication and power cable connecting the sensor to the RPU must be shielded, with UV stable jacket rated for outdoor use. The Contractor is responsible for providing the correct length of cable based on the planned installation.

The sensor must include all mounting hardware necessary to complete the installation. The quantity of nonintrusive pavement condition sensors and desired sensor detection location must be provided on the plans or directed.

The sensor must include all mounting hardware necessary to complete the installation.

2.9. **Wind Speed Sensor (Standalone Sensor)**. The wind monitor sensor must be installed at the standard meteorological height of approximately 30 ft. above ground level. The sensor must be mounted such that birds are not able to perch or nest on the sensor. The sensor may be a combination wind speed and direction sensor of lightweight corrosion-resistant construction. The sensor must be based on three-transducer ultrasonic technology and not have any moving parts.

The sensor must have an operating range of 0 ft./sec.–200 ft./sec., with a survival operation limit of 279 ft./sec. Accuracy must be +1 ft./sec. Wind speed resolution must be 1.0 ft./sec. Wind direction accuracy must be +2%. Wind direction resolution must be 1°. The sensor must operate within a minimum temperature range of -40°F–140°F, and the sensor must meet IP66 and IP67 ratings.

The sensor must operate within a power range of 9 VDC–40 VDC and use no more than 30W of power. The sensor must include 0-mV–5,000-mV analog and RS-232/RS-485 digital outputs and be capable of operating to Specifications on cable lengths up to 100 ft. from the RPU.

Communication and power cable connecting the sensor to the RPU must be shielded, with UV stable jacket rated for outdoor use. The Contractor is responsible for providing the correct length of cable based on the planned installation.

The sensor must include all mounting hardware necessary to complete the installation.

2.10. **Pan-Tilt-Zoom Camera (Optional)**. The pan-tilt-zoom camera must be furnished by the Department and installed per manufacturer recommendations on the RWIS approximately 3 ft. below the top of the structure or on top of the structure or as directed, and configured for a minimum of two preset positions as determined. The installation of the pan-tilt-zoom camera will be paid for under bid item 6010-6011 CCTV FIELD EQUIP (DIGITAL)(INSTL ONLY).

The Contractor is responsible for using the appropriate communication protocol based on RPU-to-sensor connection to maximize communications reliability.

All sensor and camera cables connecting to the RPU must be secured to themselves and the structure every 3 ft. Cables should enter through the bottom of the RPU enclosure, be labeled by sensor type and location where applicable, and connect to the appropriate port on the RPU. All cabling must be installed in a neat and workmanlike manor.

2.11. **Nonintrusive Surface Water Level Flood Sensor (Optional Sensor for Roadway Flood Detection)**. This device is a surface water measurement sensor that uses maintenance-free radar measurement technology.

The sensor must measure water level and distance to water. The measurement technology must be noncontact pulse radar. Measurement range must be from 1.3 ft.–115 ft. The sensor must be capable of measuring water level or depth to water from a bridge, pier, or mounting arm.

The sensor must operate within a temperature range of -40°F–140°F and meet IP67 rating. The sensor must operate within a power range of 5 VDC–28 VDC. The sensor must include RS-485 serial data communication interface using SDI-12 interface.

Communication and power cable connecting the sensor to the RPU must be shielded, with UV stable jacket rated for outdoor use. The Contractor is responsible for providing the correct length of cable based on the planned installation. The sensor must include all mounting hardware necessary to complete the installation.

3. CONSTRUCTION

Install the RWIS in accordance with the RWIS vendor's recommendations; the plans; Standard Specifications; and all federal, state, and local codes and requirements. The Contractor is responsible for providing all traffic control and safety work zones for the installation of the roadway sensors in conformance with Department traffic control requirements.

To be able to add future measuring points or capabilities into the system, which could include, but not be limited to, data communication, visualization, and alerting by the system, the entire data structure of the system must be provided. This includes, but is not limited to, sensor protocols, RPU protocols, and administrative rights to the system. This will allow a third party, other than the manufacturer, to perform integration into the data structure and software visualization.

3.1. **RWIS System Commissioning**. Upon completion of the RWIS system equipment installation, the system vendor must provide an onsite field engineer to start up and test the entire system. This engineer will make all final sensor connections to the RPU and perform all final system checks, sensor alignments, software setup, and software configuration to provide a fully operational RWIS system.

3.2. **RWIS System Vendor**. Furnish a detailed description (technical cut sheets) of the RWIS to be supplied by the Contractor and the experience of the vendor or manufacturer in supplying such RWIS to other like agencies.

Before any award, the Department may require the Contractor to demonstrate the proposed RWIS can provide interoperability and connectivity to the existing statewide RWIS system. The RWIS equipment vendor chosen by the Contractor must have at least 10 successful RWIS system installations in North America. As part of the equipment approval process, the Department may ask the Contractor to provide the names of at least five agencies, with names, telephone numbers, and contact person to verify said RWIS installations were successful.

3.3. **Warranty**. Provide a limited, onsite warranty covering all equipment for a 24-mo. period from the RWIS commissioning date and 1-yr. telephone technical support at no additional charge to the Department. The technical support must include access to a trained service representative who can respond within 24 hr. to questions related to all RWIS-related equipment problems and maintenance issues.

3.4. **RWIS System Equipment Warranty**. Furnish all RWIS system equipment for this project that will be state-of-the-art and in current manufacture at the time of purchase. The vendor must factory-warranty the RPU and sensors for not less than 36 mo. Batteries will be supported by their respective manufacturer's warranty.

3.5. **Training**. Provide at least 24 hr. of instruction to 10 designated personnel in the operation and maintenance procedures of equipment or systems installed. Provide the training during installation, testing, and integration. Provide the training through practical demonstrations, seminars, and other related technical procedures.

The training session must be conducted by the vendor representative. Furnish a training session agenda, a complete set of training material (manuals and schematics), and the names and qualifications of proposed instructors for approval 60 days before the training. The Department will determine the training location and provide the training facility. Provide one copy of the course material for each person.

Provide training in the following areas of interest and as shown on the plans or as directed.

- Hands-on operation for each type of equipment;
- Explanation of all system commands, their function, and use;
- Required preventive maintenance procedures;
- All equipment servicing procedures; and
- System troubleshooting or problem identification procedures.

4. MEASUREMENT

This Item will be measured by the complete RWIS installed and by each individual RWIS component installed. The cable will be subsidiary to each component installed.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit bid price for "Furnish and Install Roadway Weather Information System," "All-in-One Atmospheric Sensor," "Precipitation Type Sensor," "Air Temperature/Relative Humidity Sensor," "Road Surface Sensor," "Subsurface Sensor," "Non-Intrusive Pavement Condition and Temperature Sensor," "Rain Sensor," "Windspeed/Direction Sensor," "Barometric Pressure Sensor," and "Non-Intrusive Surface Water Level Flood Sensor." This price is full compensation for furnishing, placing, and testing all materials and equipment; mounting equipment; accessories; software licensing; and all tools, labor, supplies, and incidentals. All incidental items, including costs associated with arranging for the manufacturer's representative to be onsite during installation, commissioning, and testing, will not be paid for separately, but will be subsidiary to "Furnish and Install Roadway Weather Information System."

Special Specification 7014
Curb Inlet Sediment Control Device

1. DESCRIPTION

Install, maintain, and remove sediment control devices placed at the openings of curb inlets.

2. MATERIALS

Furnish Curb Inlet Guard™ manufactured by ERTEC Environmental Systems, Alameda, CA, or GeoCurve Inlet Filter manufactured by Geosolutions, Austin, TX, or approved equal. If using approved equal, provide product sample and manufacturer's installation literature to Engineer for approval. Retrofitted sediment control fence, hail screen, or sandbags are not acceptable.

2.1. **Size**. Furnish curb inlet sediment control device designed, by the manufacturer, to fit the curb inlet opening. The device and its anchors may not extend more than 10 in. horizontally from face of curb toward travel lanes and must extend vertically to reach the top of the curb inlet throat.

2.2. **Structure**. Furnish curb inlet sediment control device made from ultraviolet stable materials that are resistant to performance deterioration from sunlight for a minimum of 3 yr. The device must have intimate contact with the bottom of the inlet throat to prevent stormwater from underflowing.

2.3. **Sediment Filtering Capacity**. Furnish curb inlet sediment control device equipped with filter fabric meeting the following physical requirements and capable of removing soil particles from stormwater at flow depth of 2 in. or greater in accordance with Table 1.

Table 1
Filter Fabric Physical Requirements

Apparent opening size	400 microns (µm)–600 µm
Percent open area	>10%
Flow rate	130 gal. per square foot per minute with clean water or greater

2.4. **High-Flow Bypass**. Furnish curb inlet sediment control device with a high-flow bypass flow mechanism capable of handling high stormwater flows to prevent flooding of the travel lanes.

3. CONSTRUCTION

3.1. **Installation**. Install curb inlet sediment control devices in conformance with manufacturer's installation instructions at locations shown on the plans or as directed.

3.2. **Maintenance**. Perform maintenance as required by removing accumulated sediment and debris in conformance with manufacturer's instructions or as directed. Inspect following rainfall events and at least daily during prolonged rainfall events.

3.3. **Removal**. Remove as directed.

4. MEASUREMENT

This Item will be measured by the foot of curb inlet to be protected.

5. PAVEMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit bid price for "Curb Inlet Sediment Control Device (Install)." After removal, all sections of the product that are deemed reusable by the Engineer may be reinstalled at new locations and payment will be made at the unit bid price for "Curb Inlet Sediment Control Device (Re-use)." These prices are full compensation for materials, installation, reinstallation, maintenance, removal and disposal, equipment, labor, tools, and incidentals. All repair and replacement of devices damaged by Contractor operations will not be paid for directly, but will be subsidiary to this Item.

CONTRACT AGREEMENT

THE STATE OF TEXAS)
)
COUNTIES OF DALLAS/TARRANT)

THIS CONTRACT dated the DAY of MONTH, YEAR and effective when signed by all parties, is entered into by the DALLAS-FORT WORTH INTERNATIONAL AIRPORT BOARD, a public body, established under the laws of the State of Texas and hereunto duly authorized by contract between the CITY OF DALLAS, a municipal corporation of Dallas County, Texas, and the CITY OF FORT WORTH, a municipal corporation of Tarrant County, Texas, herein called "Board", and NAME OF CONTRACTOR a STATE OF INCORPORATION OR REGISTRATION KIND OF BUSINESS, with offices at ADDRESS OF CONTRACTOR herein called "Contractor".

WITNESSETH

1. CONTRACT AMOUNT

That for and in consideration of the payments and agreement hereinafter mentioned to be made and performed by the Board, the Contractor hereby agrees with the Board to commence and complete the construction of certain improvements herein referred to as the "Work" as further defined herein as follows: **"PROJECT NAME HERE "** Project, for the amount of CONTRACT AMOUNT SPELLED IN WORDS ($CONTRACT AMOUNT NUMERICAL). The actual amount due the Contractor for the Work shall be determined in accordance with the Contract Documents.

2. COMMENCEMENT OF WORK

The Contractor hereby agrees and binds himself to commence the construction of the Work within ten (10) calendar days of the date set forth in the written Notice to Proceed, diligently proceed with the Work, and complete the Work within the specified _____ ( ) consecutive calendar days of the date set forth in the Notice To Proceed for Substantial Completion with an additional _____ ( ) consecutive calendar days for Final Completion, for a total of _____ ( ) consecutive calendar days.

3. SURETY BOND

The Contractor agrees that at or prior to the Contractor's execution of the Contract, and before beginning the Work, to make, execute, and deliver to the BOARD, a good and sufficient Surety Bond for the faithful performance of the terms and stipulations of the Contract, and agrees to make, execute, and deliver to the BOARD a good and sufficient Surety Bond as a guarantee that he will pay in full all bills and accounts for materials and labor used in the construction of the Work as provided by law in accordance with the BOARD's requirements set forth in "Contract". The Surety Company shall be a Surety company duly and legally authorized to do business in the State of Texas and acceptable to the BOARD.

4. VENUE

It is mutually agreed and understood that this agreement is made and entered into by the parties hereto in accordance with the existing laws of the State of Texas with reference to and governing all matters affecting this Contract, and the Contractor agrees to fully comply with all the provisions of the same. Venue of any action brought under this Contract shall lie in Dallas or Tarrant County exclusively.

SAMPLE

5. ENTIRE AGREEMENT/ORDER OF PRECEDENCE/CONFLICT

This Contract, the documents issued hereunder, and the accompanying Special Provisions, General Provisions, Technical Specifications, Plans, Addenda (if applicable), Bid Documents (if applicable), any required Performance Bond and Payment Bond and any required Insurance Certificates as identified on Exhibit A hereto and other instruments specifically referred to herein constitute the entire agreement between the parties, and no prior or contemporaneous written or oral agreement exists now which can be deemed to alter the provisions hereof. If there is a conflict between any of the documents constituting the Contract, the Airport Improvement Program Required Provisions will take precedence.

6. EXECUTION OF AGREEMENT

EXECUTED on behalf of the DALLAS-FORT WORTH INTERNATIONAL AIRPORT BOARD as duly authorized by Resolution of said BOARD, approved on the DAY of MONTH, YEAR specifying the payment of the consideration herein provided from the account of the Joint Airport Fund designated in Board Resolution, and on behalf of CONTRACTOR FIRM NAME by the duly authorized officer whose name is subscribed below.

Contractor: CONTRACTOR FIRM NAME

_____

_____

Typed Name Title Date

Approved As To Form:

_____

LEGAL COUNSEL TO THE DALLAS/FORT WORTH INTERNATIONAL AIRPORT BOARD Date

Dallas/Fort Worth International Airport Board:

_____

AUTHORIZED REPRESENTATIVE PROCUREMENT AND MATERIALS MANAGEMENT Date

SAMPLE

EXHIBIT 1 - PERFORMANCE BOND

THE STATE OF TEXAS)
COUNTY OF DALLAS AND)
COUNTY OF TARRANT)

KNOW ALL MEN BY THESE PRESENTS: That _____, of _____, hereinafter called Principal, and _____, a corporation organized and existing under the laws of the State of _____ and fully authorized to transact business in the State of Texas, as Surety, are held and firmly bound unto the Dallas/Fort Worth International Airport Board, acting on behalf of the Cities of Dallas and Fort Worth, municipal corporations organized and existing under the laws of the State of Texas, hereinafter called Board, in the penal sum of _____ _____ DOLLARS ($_____) in lawful money of the United States, to be paid in Dallas County or Tarrant County, Texas, for the payment of which sum well and truly to be made, we hereby bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents. This Bond shall automatically be increased by the amount of any Change Order which increases the Contract price, but in no event shall a Change Order which reduces the Contract price decrease such obligations.

THE OBLIGATION TO PAY SAME is conditioned as follows:
Whereas the Principal entered into a certain Contract designated as **Contract Number XXXXXXX** with the Dallas/Fort Worth International Airport Board, the Board, dated the DAY of MONTH, YEAR a copy of which is hereto attached and made a part hereof, for the "**CONTRACT NAME"** Project.

NOW, THEREFORE, if the Principal shall well, truly, and faithfully perform and fulfill all of the undertakings, covenants, terms, conditions, and agreements of said Contract in accordance with the plans, specifications, and Contract documents during the original term thereof and any extension thereof which may be granted by the Board, with or without notice to the Surety, and during the life of any guaranty or warranty required under this Contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of any and all duly authorized modifications of said Contract that may hereafter be made, notice of which modifications to the Surety being hereby waived; and, if the Principal shall repair and/or replace all defects due to faulty materials and workmanship that appear within a period of one (l) year from the date of substantial completion of the Work; and, if the Principal shall fully indemnify and save harmless the Board from all costs and damages which Board may suffer by reason of failure to so perform herein and shall fully reimburse and repay Board all outlay and expense which the Board may incur in making good any default or deficiency, then this obligation shall be void; otherwise, it shall remain in full force and effect.

PROVIDED FURTHER, that if any legal action be filed upon this Bond, venue shall lie in Tarrant or Dallas County, State of Texas.

AND PROVIDED FURTHER, that the said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the Work to be performed thereunder or the Specifications accompanying the same shall in anyway affect its obligation on this Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the Work or to the Specifications.

This Bond is given pursuant to the provisions of Chapter 2253, Public Work Performance and Payment Bond, Texas Government Code Title 10, and any other applicable statutes of the State of Texas.

The undersigned and designated agent is hereby designated by the Surety herein as a Texas Registered Agent with a Texas-authorized surety company to write surety bonds in the State to whom any requisite notices

SAMPLE

may be delivered and on whom service of process may be had in matters arising out of such suretyship, as provided by Article 7.19-1 of the Insurance Code, Vernon's Annotated Civil Statutes of the State of Texas.

IN WITNESS WHEREOF, this instrument shall be deemed an original, this, the _____.

Principal:

_____

_____

BY:_____
Typed Name Title

Surety:

_____

_____

By:_____
Typed Name Title

The Texas-Authorized Registered Agent of the Surety in Texas, for delivery of notice and service of process is:

NAME:_____
STREET ADDRESS:_____
PHONE NUMBER:_____
(Note: Date of Performance Bond must be date of Contract. If Resident Agent is a corporation, give a person's name.)

SAMPLE

EXHIBIT 2 – PAYMENT BOND

THE STATE OF TEXAS)
COUNTY OF DALLAS AND)
COUNTY OF TARRANT)

KNOW ALL MEN BY THESE PRESENTS: That _____, of _____, hereinafter called Principal, and _____, a corporation organized and existing under the laws of the State of _____ and fully authorized to transact business in the State of Texas, as Surety, are held and firmly bound unto the Dallas/Fort Worth International Airport Board, acting on behalf of the Cities of Dallas and Fort Worth, municipal corporations organized and existing under the laws of the State of Texas, hereinafter called Board, in the penal sum of DOLLARS ($_____) in lawful money of the United States, to be paid in Dallas County or Tarrant County, Texas, for the payment of which sum well and truly to be made, we hereby bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents. This Bond shall automatically be increased by the amount of any Change Order which increases the Contract price, but in no event shall a Change Order which reduces the Contract price decrease such obligations.

THE OBLIGATION TO PAY SAME is conditioned as follows:
Whereas, the Principal entered into a certain Contract designated as **Contract Number XXXXXXX** with the Dallas/Fort Worth International Airport Board, the Board, dated the DAY of MONTH, YEAR a copy of which is hereto attached and made a part hereof, for the **"CONTRACT NAME"** Project.

NOW, THEREFORE, if the Principal shall well, truly, and faithfully perform its duties and make prompt payment to all persons, firms, subcontractors, corporations, and claimants supplying labor and/or materials in the prosecution of the Work provided for in said Contract and any and all duly authorized modifications of said Contract that may hereafter be made, notice of which modification to the Surety is hereby expressly waived, then this obligation shall be void; otherwise it shall remain in full force and effect.

PROVIDED FURTHER, that if any legal action be filed on this Bond, venue shall lie in Tarrant or Dallas County, Texas.

AND PROVIDED FURTHER, that the said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration, or addition to Contract, or to the Work performed thereunder, or the Plans, Specifications, Drawings, etc., accompanying the same, shall in anyway affect its obligations on this Bond, and it does hereby waive notice of any such change, extension of time, alteration, or addition to the terms of the Contract, or to the Work to be performed thereunder.

This Bond is given pursuant to the provisions of Chapter 2253, Public Work Performance and Payment Bond, Texas Government Code Title 10, and any other applicable statutes of the State of Texas.

The undersigned and designated agent is hereby designated by the Surety herein as a Texas Registered Agent with a Texas-authorized surety company to write surety bonds in the State to whom any requisite notices may be delivered and on whom service of process may be had in matters arising out of such suretyship, as provided by Article 7.19-1 of the Insurance Code, Vernon's Annotated Civil Statutes of the State of Texas.

IN WITNESS WHEREOF, this instrument shall be deemed an original, this, the _____.

Principal:

SAMPLE

_____

_____

BY:_____
Typed Name Title

Surety:

_____

_____

By:_____
Typed Name Title

The Texas-Authorized Registered Agent of the Surety in Texas, for delivery of notice and service of process is:

NAME:_____
STREET ADDRESS:_____
PHONE NUMBER:_____
(Note: Date of Payment Bond must be date of Contract. If Resident Agent is a corporation, give a person's name.)

SAMPLE

EXHIBIT 3 – BID DETAILS

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EXHIBIT 4 – INSURANCE CERTIFICATES

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EXHIBIT 5 – SPECIAL PROVISIONS

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1.0 LIQUIDATED DAMAGES – CONSTRUCTION

A. Contractor agrees to complete the construction of the Project in accordance with the agreed-upon Project Schedule, Substantial Completion Date, and Final Completion Date.

B. If Contractor fails to achieve Substantial Completion of the Work on or before the Substantial Completion Date, Contractor must pay $7,500.00 per Day for each Day that Contractor fails to achieve Substantial Completion.

2.0 SMALL BUSINESS ENTERPRISE (SBE) PROGRAM

Refer to Exhibit B – Small Business Enterprise (SBE) Special Contract Provisions for specific goals and compliance requirements.

3.0 INSURANCE PROVISIONS

Refer to Exhibit A – Insurance Requirements for general requirements, required coverages and sample insurance certificate.

4.0 PROJECT INITIATION

The Mobilization fee shall not exceed eight percent (8%) of the total Contract Amount.

5.0 WORK PERFORMED BY CONTRACTOR'S EMPLOYEES

The value of the Work performed by the Contractor with its own employees shall not be less than twenty percent (20%) of the Contract Sum.

6.0 ACCESS TO WORK

6.1.1 The Owner reserves the right to contract for and perform other or additional work on or near the Work.

6.1.2 The Contractor shall provide the Owner and its separate contractors, suppliers installers, and consultants access to the Work in preparation and during construction on or near the project site. The Contractor shall notify the Owner and its separate contractors regarding Project safety criteria, measures, and programs, which the Owner, and its contractors, installers, and consultants, shall comply with while at site.

6.1.3 The Contractor shall be responsible for the coordination and consistency of its work, its schedules, and its activities with the work, schedules, and activities of the Owner's own forces and of each separate contractor through joint review and mutual agreement Such coordination of schedules shall be collaborative and eliminate potential conflicts.

6.1.4 The Contractor shall afford the Owner and separate contractors' reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities and shall connect and coordinate the Contractor's construction and operations with theirs as required by the project documents.

7.0 INTEREST OF PUBLIC OFFICIALS

The Contractor represents and warrants that no employee, official, or member of the OWNER is or will be pecuniarily interested or benefited directly or indirectly in the Contract. The Contractor further represents and warrants that it has not offered or given gratuities (in the form of entertainment, gifts, or otherwise) to any employee, official, or member of the OWNER with a view toward securing favorable treatment in the awarding, amending, or evaluating the performance of this Contract. For breach of any representation or warranty in this Section, the OWNER shall have the right to annul the Contract without liability and/or have recourse to any other remedy it may have at law.

8.0 CONTRACT PROHIBITIONS

A. Contractor/Consultant verifies and agrees that:
   1. it does not boycott Israel; and
   2. it will not boycott Israel during the Contract term.

B. "Boycott Israel" means refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations specifically with Israel, or with a person or entity doing business in Israel or in an Israeli-controlled territory, but does not include an action made for ordinary business purposes.

C. This Contract will immediately terminate for default if Contractor/Consultant
   1. boycotts Israel, effective upon the first "boycott Israel" action under the definition; or
   2. is placed on any list identifying a company that:
      a. contracts with or provides supplies or services to a foreign terrorist organization;
      b. engages in certain scrutinized business operations in Sudan, Iran or with a designated foreign terrorist organization; or
      c. has been complicit in the Darfur genocide during any preceding 20-month period.[1]

D. Contractor/Consultant warrants to Board that it will not be placed on any of those lists during the Contract term.

E. Verification: Each Bidder must execute and submit with its Bid the Verification of Contracting Prohibitions form. That verification will: [i] form a material part of its Bid; and [ii] will be incorporated into any awarded contract.

F. Pursuant to Section 2274.002, Texas Government Code, enacted by SB 13 in the 2021 Regular Session, the Contractor hereby represents that it (i) does not boycott energy companies; and (ii) will not boycott energy companies.

G. Pursuant to Section 2274.002, Texas Government Code, as enacted by SB 19 in the 2021 Regular Session, the Contractor hereby represents that it (i) does not have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association; and (ii) will not discriminate during the term of the contract against a firearm entity or firearm trade association.

9.0 AIRPORT IMPROVEMENT PROGRAM REQUIRED PROVISIONS

1 FAA Publication: The provisions herein comply with the FAA's required Contract Provisions for Airport Improvement Program and for Obligated Sponsors, which may be found at https://www.faa.gov/airports/aip/procurement/federal_contract_provisions/. If there is a conflict between these provisions and the Contract, the FAA Provisions control. Any new or revised required federal contract provisions issued by the FAA in the future are hereby incorporated by reference.

2 Contractor Obligations: Contractor:
   a. (including all subcontractors) must insert these FAA Provisions in each lower tier contract (e.g. subcontract or sub-agreement);
   b. (including all subcontractors) must incorporate these FAA Provisions by reference for work done under any purchase orders, rental agreements, and other agreements for supplies or services; and
   c. Is responsible for compliance with these FAA Provisions by any subcontractor, lower-tier subcontractor, or service provider.

[1] See Texas Government Code; Chapter 2252; Subchapter F; Prohibition on Contracts with Certain Companies (including Sections 2252.152 and 2252.153); Chapter 2270; Prohibition on Contracts with Companies Boycotting Israel; and Chapter 2270; Prohibition on Investing Public Money in Certain Investments (including Sections 2270.0001, 2270.0052, 2270.0102 and 2270.0152).

3 Conflicts: All federal laws and regulations applicable to this Agreement/Contract take precedence over any conflicting local or state laws.

4 Contractor must comply with the following:

4.1 **GENERAL CIVIL RIGHTS PROVISIONS:**

In all its activities within the scope of its airport program, the Contractor or Consultant (hereinafter referred to as "the contractor") agrees to comply with pertinent statutes, Executive Orders, and such rules as identified in Title VI List of Pertinent Nondiscrimination Acts and Authorities to ensure that no person shall, on the grounds of race, color, national origin, creed, sex, age, or disability be excluded from participating in any activity conducted with or benefiting from Federal assistance.

The above provision binds the Contractor and subcontractors from the bid solicitation period through the completion of the contract.

4.2 **TITLE VI ASSURANCE:**

4.2.1 **Title VI Notice**

As a condition of a grant award, the Sponsor shall demonstrate that it complies with the provisions of Title VI of the Civil Rights Act of 1964 (42 U.S.C. §§ 2000d et seq) and implementing regulations (49 CFR part 21) including amendments thereto, the Airport and Airway Improvement Act of 1982 (49 U.S.C. § 47123), the Age Discrimination Act of 1975 (42 U.S.C. 6101 et seq.), Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. § 794 et seq.), the Americans with Disabilities Act of 1990 (42 U.S.C. § 12101, et seq.), U.S. Department of Transportation and Federal Aviation Administration (FAA) Assurances, and other relevant civil rights statutes, regulations, or authorities, including any amendments or updates thereto.

This may include, as applicable, providing a current Title VI Program Plan to the FAA for approval, in the format and according to the timeline required by the FAA, and other information about the communities that will be benefited and impacted by the project. A completed FAA Title VI Pre-Grant Award Checklist is required for every grant application, unless excused by the FAA. The Sponsor shall affirmatively ensure that when carrying out any project supported by this grant that it complies with all federal nondiscrimination and civil rights laws based on race, color, national origin, sex, creed, age, disability, genetic information, in consideration for federal financial assistance. The Department's and FAA's Office of Civil Rights may provide resources and technical assistance to recipients to ensure full and sustainable compliance with Federal civil rights requirements. Failure to comply with civil rights requirements will be considered a violation of the agreement or contract and be subject to any enforcement action as authorized by law.

4.2.2 **List of Pertinent Nondiscrimination Acts and Authorities**

During the performance of this contract, the Contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "Contractor") agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d et seq., 78 stat. 252) (prohibits discrimination on the basis of race, color, national origin);
- 49 CFR Part 21 (Non-discrimination in Federally-Assisted programs of the Department of Transportation—Effectuation of Title VI of the Civil Rights Act of 1964) including amendments thereto;
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601) (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. § 794 et seq.), as amended (prohibits discrimination on the basis of disability); and 49 CFR part 27

(Nondiscrimination on the Basis of Disability in Programs or Activities Receiving Federal Financial Assistance);

- The Age Discrimination Act of 1975, as amended (42 .U.S.C. § 6101 et seq.) (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982 (49 U.S.C. § 47123), as amended (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987 (P.L. 100-259) (broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, the Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms “programs or activities” to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);
- Titles II and III of the Americans with Disabilities Act of 1990 (42 U.S.C. § 12101, et seq) (prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities) as implemented by U.S. Department of Transportation regulations at 49 CFR Parts 37 and 38;
- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. § 1681, et seq).

4.2.3 **Compliance with Nondiscrimination Requirements**

During the performance of this contract, the Contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the “Contractor”), agrees as follows:

1. Compliance with Regulations: The Contractor (hereinafter includes consultants) will comply with the Title VI List of Pertinent Nondiscrimination Acts and Authorities, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.

2. Nondiscrimination: The Contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, national origin), creed, sex, age, or disability in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The Contractor will not participate directly or indirectly in the discrimination prohibited by the Nondiscrimination Acts and Authorities, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR part 21 including amendments thereto.

3. Solicitations for Subcontracts, including Procurements of Materials and Equipment: In all solicitations, either by competitive bidding or negotiation made by the Contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the Contractor of the contractor’s obligations under this contract and the Nondiscrimination Acts and Authorities on the grounds of race, color, or national origin.

4. Information and Reports: The Contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Sponsor or the Federal Aviation Administration to be pertinent to ascertain compliance with such Nondiscrimination Acts and Authorities and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the Contractor will so certify to the Sponsor or the Federal Aviation Administration, as appropriate, and will set forth what efforts it has made to obtain the information.

5. Sanctions for Noncompliance: In the event of a Contractor’s noncompliance with the non-

discrimination provisions of this contract, the Sponsor will impose such contract sanctions as it or the Federal Aviation Administration may determine to be appropriate, including, but not limited to:

a. Withholding payments to the Contractor under the contract until the Contractor complies; and/or

b. Cancelling, terminating, or suspending a contract, in whole or in part.

6. Incorporation of Provisions: The Contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations, and directives issued pursuant thereto. The Contractor will take action with respect to any subcontract or procurement as the Sponsor or the Federal Aviation Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the Contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the Contractor may request the Sponsor to enter into any litigation to protect the interests of the Sponsor. In addition, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

4.3 OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970:

All contracts and subcontracts that result from this solicitation incorporate by reference the requirements of 29 CFR Part 1910 with the same force and effect as if given in full text. Contractor must provide a work environment that is free from recognized hazards that may cause death or serious physical harm to the employee. The Contractor retains full responsibility to monitor its compliance and their subcontractor's compliance with the applicable requirements of the Occupational Safety and Health Act of 1970 (20 CFR Part 1910). The Contractor must address any claims or disputes that pertain to a referenced requirement directly with the U.S. Department of Labor – Occupational Safety and Health Administration.

4.4 FEDERAL FAIR LABOR STANDARDS ACT (FEDERAL MINIMUM WAGE):

4.4.1 All contracts and subcontracts that result from this solicitation incorporate by reference the provisions of 29 CFR Part 201, the Federal Fair Labor Standards Act (FLSA), with the same force and effect as if given in full text. The FLSA sets minimum wage, overtime pay, recordkeeping, and child labor standards for full and part time workers.

4.4.2 Contractor/Consultant has full responsibility to monitor compliance to the referenced statute or regulation. The Contractor/Consultant must address any claims or disputes that arise from this requirement directly with the U.S. Department of Labor – Wage and Hour Division.

END OF SPECIAL PROVISIONS

VERIFICATION OF CONTRACTING PROHIBITIONS

(ATTACH SIGNED FORM HERE)

EXHIBIT 6 – GENERAL PROVISIONS

SAMPLE

CONSTRUCTION CONTRACT

GENERAL PROVISIONS

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GENERAL PROVISIONS
SECTION 10 - DEFINITION OF TERMS

Whenever the following terms are used in these General Provisions, in the Contract or the Contract Documents, or in any documents or other instruments pertaining to construction where these General Provisions govern, the intent and meaning shall be interpreted as follows:

10-1 ACCESS ROAD. The right-of-way, the roadway and all improvements constructed thereon connecting the Airport to a public highway.

10-2 ADMINISTRATION BUILDING. The principal office of the Dallas-Fort Worth International Airport Board, located on the Airport site, 3200 East Airfield Drive, Dallas-Fort Worth Airport, Texas.

10-3 ADVERTISEMENT. A public announcement, as required by local law, inviting bids for Work to be performed and/or Materials to be furnished.

10-4 AIP. The Airport Improvement Program, a grant-in-aid program, administered by the Federal Aviation Administration.

10-5 AIR OPERATIONS AREA (AOA). For the purpose of these General Provisions, the term Air Operations Area shall mean any area of the Airport used or intended to be used for the landing, takeoff, or surface maneuvering of aircraft. An Air Operation Area shall include such paved or unpaved areas that are used or intended to be used for the unobstructed movement of aircraft in addition to its associated Runway, Taxiway, or apron.

10-6 AIRPORT. Airport means the Dallas/Fort Worth International Airport.

10-7 ASTM. The American Society for Testing and Materials.

10-8 AWARD. The acceptance, by the Owner, of the successful Bidder's Proposal.

10-9 BIDDER. Any individual, partnership, firm, or corporation, acting directly or through a duly authorized representative, who submits a Proposal for the Work.

10-10 BOARD. Shall mean the Dallas-Fort Worth International Airport Board (BOARD), a public body, established under the laws of the State of Texas and hereunto duly authorized by contract between the City of Dallas, a municipal corporation of Dallas County, Texas, and the City of Fort Worth, a municipal corporation of Tarrant County, Texas, or its Authorized Representatives.

10-11 BUILDING AREA. An area on the Airport to be used, considered, or intended to be used for Airport buildings or other Airport facilities or rights-of-way together with all Airport buildings and facilities located thereon.

10-12 CALENDAR DAY. Every day shown on the calendar.

10-13 CHANGE ORDER. A written order signed by the Contractor and the Owner covering changes in the Plans, Specifications, or Proposal quantities and establishing the basis of payment and Contract Time adjustment, if any, for the Work affected by such changes. Work covered by a Change Order shall be considered to be within the scope of the Contract. Certain Change Orders may require Board approval before they are effective.

10-14 CITIES. The term “Cities” will refer to Dallas, Texas and Fort Worth, Texas.

10-15 CONSTRUCTION MANAGER (CM). Is the person or entity designated by the Owner to provide construction management services during design and construction of the Work, and may include Owner employees or firms under Contract with the Owner. The Construction Manager is an Authorized Representative of the Owner for monitoring, coordination, and inspection of the Work.

10-16 CONTRACT. The Contract Documents form the Contract and cover the Work to be performed. The Contract represents the entire and integrated agreement between the parties and supersedes prior negotiations, representations or agreements, either written or oral. The Contract Documents shall not be construed to create a contractual relationship of any kind between any persons or entities other than the Owner and the Contractor, except that the Owner may assert the Contractor’s rights against third-parties with whom the Contractor contracts for the Project.

10-17 CONTRACT DOCUMENTS. The Contract Documents (also referred to as the “Design-Build Documents” if applicable) consist of the Contract between Owner and Contractor (identified by Contract number) and its attached Exhibits (hereinafter, the “Contract”), other documents listed in the Contract (for example but not by way of limitation, the Design Criteria Package, if any, the Contract, these General Provisions, Special Provisions, Technical Specifications/Provisions, the Plans, the Proposal (the Proposal is part of the Contract Documents only for the purpose of providing a description of the Work to be performed and for no other purpose and is, accordingly, superseded by all other Contract Documents), the Performance Bond, the Payment Bond, any required insurance certificates, any addenda issued to Bidders, Instruments of Service, Plans, and Specifications), and Modifications. A Modification is (1) a written

amendment to the Contract signed by both parties, (2) a Change Order, or (3) Force Account Work. If any provision of the Contract Documents is found to be invalid or unenforceable, the remaining provisions shall not be impaired.

10-18 CONTRACT ITEM (PAY ITEM). A specific unit of Work for which a price is provided in the Contract, which price includes but is not limited to, all costs, markup, and overhead incurred or paid by the Contractor for its performance of such Contract Item in strict accordance with the Contract Documents.

10-19 CONTRACT SUM. The Contract Sum is the amount to be paid to the Contractor for the proper and complete performance of the Work in strict accordance with the Contract Documents. The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items of Work covered by allowances shall be supplied for such amounts.

10-20 CONTRACT TIME. The number of Calendar Days or working days, stated in the Contract, allowed for Substantial Completion or, if applicable, Final Completion of the Contract, including authorized time extensions, and as further defined in Section 80 herein. If a calendar date of completion is stated in the Contract, in lieu of a number of Calendar or Working Days, the Contract shall be completed by that date. Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Contract, the Contractor confirms that the Contract Time is a reasonable period for completing the Work.

10-21 CONTRACTOR. The individual, partnership, firm, or corporation primarily liable for the acceptable performance of the Work and for the payment of all legal debts pertaining to the Work who acts directly or through lawful agents or employees to complete the Work. The Contractor shall be authorized to do business in the state where the Project is located and shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor is referred to throughout the Contract Documents as if singular in number and means a Contractor or an authorized representative of the Contractor.

10-22 DRAINAGE SYSTEM. The system of pipes, ditches, and Structures by which surface or subsurface waters are collected and conducted from the Airport.

10-23 ENGINEER. The individual, partnership, firm, or corporation duly authorized by the Owner who acts as the Owner's representative and acting directly or through an authorized representative. The term "Engineer" may include Owner employees or firms under contract with the Owner. The Engineer's responsibilities may include inspection of the Work; however, the Contractor shall not be relieved of the obligation to perform the Work in accordance with the Contract Documents by the activities, tests, inspections, or approvals by the Owner or the Engineer.

10-24 EQUIPMENT. All machinery, together with the necessary supplies for upkeep and maintenance, and also all tools and apparatus necessary for the proper construction and acceptable completion of the Work.

10-25 FAA. The Federal Aviation Administration of the U.S. Department of Transportation. When used to designate a person, FAA shall mean the Administrator or his/her duly authorized representative.

10-26 FEDERAL SPECIFICATIONS. The Federal Specifications and Standards, Commercial Item Descriptions, and supplements, amendments, and indices thereto are prepared and issued by the General Services Administration of the Federal Government. Federal Specifications cannot be amended by the Owner.

10-27 FORCE ACCOUNT. Force Account Work is a written order by the Owner directing a change in the Work prior to or absent an agreement on adjustment, if any, in the Contract Sum or Contract Time. The Owner may, without invalidating the Contract, order changes in the Work consisting of additions, deletions, or other revisions. Force Account Work shall be used in the absence of agreement on the terms of a Change Order. An order for Force Account Work signed by the Contractor is the Contractor's agreement therewith, including, if any, an adjustment in the Contract Sum and/or the Contract Time, and such written agreement shall be effective as stated in the written order or immediately, whichever is sooner, and shall become a Change Order.

10-28 INSPECTOR. An authorized representative of the Owner or Engineer assigned to make all necessary inspections and/or tests of the Work performed or being performed, or of the Materials furnished or being furnished by the Contractor. The Contractor shall not be relieved of the obligation to perform the Work in accordance with the Contract Documents by the activities, tests, inspections, or approvals by the Inspector.

10-29 INTENTION OF TERMS. Whenever, in these General Provisions or on the Plans, the words "directed," "required," "permitted," "ordered," "designated," "prescribed," or words of the like import are used, it shall be understood that the direction, requirement, permission, order, designation, or prescription of the Engineer or the Owner is intended; and similarly, the words "approved," "acceptable," "satisfactory,"

or words of like import, shall mean approved by, or acceptable to, or satisfactory to the Engineer, if applicable, subject in each case to the final determination of the Owner. Any reference to a specific requirement of a numbered paragraph of the Contract Documents or a cited standard shall be interpreted to include all general requirements of the entire section, specification item, or cited standard that may be pertinent to such specific reference.

10-30 LABORATORY. The official testing laboratories of the Owner or such other laboratories as may be designated by the Engineer.

10-31 LIGHTING. A system of fixtures providing or controlling the light sources used on or near the Airport or within the Building Area. The field Lighting includes all luminous signals, markers, floodlights, and illuminating devices used on or near the Airport or to aid in the operation of aircraft landing at, taking off from, or taxiing on the Airport surface.

10-32 MATERIALS. Any substance specified or required for use in the construction of the Work.

10-33 NOTICE TO PROCEED. A written notice to the Contractor to begin the Work by a specified date. If applicable, the Notice to Proceed shall state the date on which the Contract Time begins.

10-34 OWNER. Shall mean the Dallas-Fort Worth International Airport Board (BOARD), a public body, established under the laws of the State of Texas and hereunto duly authorized by contract between the City of Dallas, a municipal corporation of Dallas County, Texas, and the City of Fort Worth, a municipal corporation of Tarrant County, Texas, or its Authorized Representatives. Authorized Representatives shall be designated in writing with specific limits of authority, and may be employees of the Owner or employees of firms under contract (Owner's Representatives) with the Owner to provide specific services. The Owner is a governmental entity under Texas law and must follow applicable laws to take certain actions, including actions that are contractually binding, modifications to the Contract, modifications to the Work, increases/decreases in the Contract Sum, or alteration of any other terms of the Contract Documents. Accordingly, the Owner’s authorized representative(s) may not be authorized to modify the Contract Documents without the Board’s legislative approval. The Contractor is deemed to understand all legal limitations on those individuals representing the Owner. For AIP contracts, the term “Sponsor” shall have the same meaning as the term “Owner.”

10-35 PAVEMENT. The combined surface course, base course, and subbase course, if any, considered as a single unit.

10-36 PAYMENT BOND. The approved form of security furnished by the Contractor and his/her Surety as a guaranty that he will pay in full all bills and accounts for Materials and labor used in the performance of the Work. Said security shall be in accordance with the provisions of Chapter 2253, Government Code. The Contractor is not obligated to furnish, and the Owner will not pay for, a Subcontractor’s Payment Bond.

10-37 PERFORMANCE BOND. The approved form of security furnished by the Contractor and his/her Surety as a guaranty that the Contractor will complete the Work in accordance with the terms of the Contract, and that the Contractor will maintain the Work constructed by it in good condition for the period of time required; said security shall be in accordance with the provisions of Chapter 2253, Government Code. The Contractor is not obligated to furnish, and the Owner will not pay for, a Subcontractor’s Performance Bond.

10-38 PLANS. The official drawings or exact reproductions which show the location, character, dimensions and details of the Airport and the Work and which are to be considered as a part of the Contract, supplementary to the Specifications.

10-39 PROJECT. The Project is the total design and construction of which the Work performed under the Contract Documents may be the whole or a part, and may include design and construction by the Owner and by separate contractors.

10-40 PROPOSAL/BID FORM. The written offer of the Bidder (when completely and accurately submitted on the approved Proposal Form) to perform the contemplated Work and furnish the necessary materials in accordance with the provisions of the Plans and Specifications. Reference to the Proposal does not constitute, nor shall it be deemed or understood, to constitute an agreement by the Owner as to the terms and conditions of the Proposal. Any description of the schedule of performance of the Work set forth in the Proposal shall only be deemed to be in fulfillment of the obligations of the Contractor to the extent that such schedule is separately approved in writing by the Owner. No provision of the Proposal which purports to add any term or condition to the Contract other than as a description of the Work to be performed shall become part of the Contract Documents, and shall be considered null and void.

10-41 PROPOSAL GUARANTY/BID GUARANTY. The security furnished with a Proposal to guarantee that the Bidder will enter into a contract if his/her Proposal is accepted by the Owner.

10-42 QUALITY ASSURANCE. For all tests needed to ensure specification compliance of in-place Work, the Owner shall appoint, and employ, the services of an independent materials testing agency of its choosing. The payment for these services shall be borne by the Owner. The costs for any retesting, brought about by the indicated failure of performance in the initial test, shall be borne exclusively by the Contractor. The Quality Assurance tests shall be the basis for determining payment and/or adjustments to payment.

10-43 QUALITY CONTROL. All materials testing services relative to engineering and selection of design components, such as herein required for paving and concrete design mixes, as well as in-process testing, shall be performed by a duly qualified and certified materials testing agency of the Contractor's choosing. The testing shall be as necessary to comply with the Contract Documents. The costs of these services shall be paid directly by the Contractor.

10-44 RUNWAY. The area on the Airport prepared for the landing and takeoff of aircraft.

10-45 SPECIFICATIONS. A part of the Contract containing the written directions and requirements for completing the Work. Standards for specifying materials or testing which are cited in the Specifications by reference shall have the same force and effect as if included in the Contract physically.

10-46 STRUCTURES. Airport facilities such as bridges; culverts; catch basins, inlets, retaining walls, cribbing; storm and sanitary sewer lines; water lines; underdrains; electrical ducts, manholes, handholes, lighting fixtures and bases; transformers; flexible and rigid pavements; navigational aids; buildings; vaults; and, other manmade features of the Airport that may be encountered in the Work and not otherwise classified herein.

10-47 SUBGRADE. The soil which forms the Pavement foundation.

10-48 SUBCONTRACTOR. A business or individual that has entered into an agreement with the Contractor to perform a portion of the Work required under the Contract Documents.

10-49 SUPERINTENDENT. The Contractor's executive representative who is present on the Project during progress, authorized to receive and fulfill instructions from the Owner or Engineer, and who has the authority to supervise and direct the Work.

10-50 SUPPLIER. A business or individual that provides materials, equipment, or products used in the performance of the Work.

10-51 SURETY. The corporation, partnership, or individual, other than the Contractor, executing Payment or Performance Bonds which are furnished to the Owner by the Contractor. The Owner reserves the right to reject the Surety proposed by the Contractor.

10-52 TAXIWAY. For the purpose of this document, the term Taxiway means the portion of the Air Operations Area of the Airport that has been designated by the Airport for movement of aircraft to and from the Airport's Runways or aircraft parking areas.

10-53 WORK. The furnishing of all labor, services, materials, tools, implements, equipment, supplies, apparatus, appliances, fixtures, supervision, transportation, utilities, storage, and related services and incidentals required, necessary, or reasonably inferred as necessary or convenient to fulfill the Contractor's performance of all duties and obligations imposed by the Contract Documents, whether completed or partially completed. The Work may constitute the whole or a part of the Project.

10-54 WORKING DAY. A Working Day is any Calendar Day scheduled for active performance of Contract requirements.

END OF SECTION 10

SECTION 20 - GENERAL REQUIREMENTS AND CONDITIONS

20-1 INTERPRETATION OF ESTIMATED PROPOSAL QUANTITIES. For unit price contracts, an estimate of quantities of Work to be done and Materials to be furnished in the Proposal is given only as a basis for comparison of Proposals and the Award of the Contract. The Owner does not expressly or by implication agree that the actual quantities involved will correspond exactly therewith, nor shall the Contractor plead misunderstanding or deception because of such estimates of quantities, or of the character, location, or other conditions pertaining to the Work. Payment to the Contractor will be made only for the actual quantities of Work performed or Materials furnished in accordance with the Contract Documents. It is understood that the quantities or any allowance amounts may be increased or decreased as provided in the Contract Documents without in any way invalidating the unit bid prices.

20-2 EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE. The Contractor is expected to carefully examine the site of the Work, the Proposal, Plans, Specifications, and all other Contract Documents. The Contractor shall satisfy itself as to the character, quality, and quantities of Work to be performed, Materials to be furnished, and as to the requirements of the Contract Documents. The submission of a Proposal and subsequent execution of the Contract shall be prima facie evidence that the Contractor has made such examination, has informed itself of all matters that may affect the Work, and is satisfied as to the conditions to be encountered in performing the Work and as to the requirements of the Contract Documents. If the Owner's information or criteria conflicts with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall notify the Owner of the conflict. The Contractor shall bear responsibility for, and shall not be entitled to recover damages, costs, or losses relating to, any claim arising from any such inaccuracies, errors, inconsistencies, or omissions if it fails to provide such notice to Owner, and shall be responsible to the Owner for all costs, damages, and losses related to and necessary for correction.

The cost of the Work shall not exceed the Owner's budget limitations unless agreed to in writing by Owner. If the cost of the Work, proposed or otherwise, exceeds the Owner's budget, the Owner may, in its sole discretion: (1) give written approval of an increase in its budget; (2) require revisions to the Plans and/or Specifications as necessary to comply with the Owner's budget for the Work, without the Owner's payment of additional compensation to do so; (3) revise the Project's program, scope, or quality to reduce the cost of the Work, in which case the Owner may require modifications, without additional compensation, to the Plans and/or Specifications as necessary to comply with the Owner's budget; (4) terminate the Contract for convenience; or (5) implement any other alternative.

Boring logs and other records of subsurface investigations and other tests are available for inspection on request, if applicable. It is understood and agreed that such subsurface information, whether included in the Plans, Specifications, or otherwise made available to the Contractor, was obtained and is intended for the Owner's design and estimating purposes only. Such information has been made available solely for the convenience of the Contractor, and the Owner makes no representations or warranties as to the accuracy or completeness of such information or any information provided by the Owner and information prepared by third-parties. It is further understood and agreed that the Contractor is solely responsible for all assumptions, deductions, or conclusions which he may make or obtain from his/her examination of the boring logs and other records of subsurface investigations and tests that are furnished by the Owner.

20-3 GENERAL CONDITIONS. General Conditions costs are defined as the reasonable and necessary costs incurred by the Contractor for the management and support of the Project, excluding direct costs of labor, materials, and Subcontractor Work. These costs must be solely and directly attributable to the proper performance of the Work, must be pre-approved by the Owner as a condition to payment, and shall be documented in compliance with all applicable laws, including Federal Aviation Administration (FAA) guidelines where applicable. Subject to the foregoing, examples of General Conditions costs are:

a. Site Management and Supervision: Salaries and wages (on a pro-rated basis) for the on-site project manager, superintendent, and safety personnel directly responsible for and actively working on the Project, and costs associated with Project coordination, scheduling, and compliance monitoring.

b. Temporary Facilities & Utilities: Costs for temporary offices, fencing, sanitation, water, electricity, and other utilities required for performance of the Work.
c. Site Safety & Security Compliance: Expenses related to meeting TSA, FAA, and airport-specific security requirements, including background checks, badging, and restricted area access control.
d. Permits & Fees: Costs for obtaining necessary airport permits, access credentials, and compliance documentation
e. Project Coordination & Administration: Costs related to Project scheduling, reporting, meetings, and other administrative tasks necessary for Project execution.
f. Small Tools & Consumables: Costs for minor equipment, tools, and supplies essential for performance of the Work but not incorporated into the final Work.
g. Site Maintenance & Cleanup: Waste disposal, dumpsters, site cleaning, and compliance with environmental regulations, including stormwater pollution prevention (SWPPP) measures.

For the avoidance of doubt, General Conditions costs do not include and shall not be paid by the Owner: (i) overhead costs not specific to the Project, including corporate or home office expenses, executive and other non-Project-related salaries, and indirect or unrelated administrative costs, (ii) additional insurance and bonding costs, (iii) markups, fees, or costs that are duplicative or otherwise covered in other Contract line items, (iv) any costs not directly necessary for the performance of the Work, and (v) any costs not pre-approved by the Owner or deemed unnecessary for the direct execution of the Project. There will be no markup (overhead) when General Conditions are applicable.

The Owner reserves the right to audit, review, and approve all General Conditions costs to ensure they are reasonable, necessary, and compliant with all Contract requirements and applicable laws and regulations.

END OF SECTION 20

SECTION 30 - CONTRACT FUNDING

30-1 LOSS OF FUNDING. Performance by the Owner under the Contract may be dependent upon the appropriation and allotment of funds by its the Owner's board members, acting as a legislative body. If there is a failure to appropriate or allot the necessary funds to continue the Contract, the Owner will issue written notice to the Contractor and the Owner may terminate the Contract without further duty or obligation under it. the Contractor acknowledges that appropriation, allotment, and allocation of funds are beyond the control of the Owner.

END OF SECTION 30

SECTION 40 - SCOPE OF WORK

40-1 INTENT OF CONTRACT. The intent of the Contract Documents is for the Contractor to provide for construction and completion, in every detail, of the Work described or reasonably inferable therefrom. It is further intended that the Contractor shall furnish all necessary superintendence, labor, machinery, Equipment, tools, Materials, transportation and supplies required to complete the Work in accordance with the Plans, Specifications, and all other terms of the Contract Documents. Any failure or neglect on the part of Owner to enforce provisions dealing with supervision, control, inspection, testing, or acceptance and approval of the Work shall never relieve Contractor from full compliance with the Contract Documents nor render the Owner liable to the Contractor for damages, extensions of time, or increased compensation of any kind.

The Contract Documents contain instructions and descriptions covering the construction and workmanship necessary for building and completing the various units or elements of the Work. The Contract Documents are intended to be so written that only first class material, workmanship, and finish of the best grade and quality will result. The fact that the Contract Documents may fail to be so complete as to cover all details will not relieve the Contractor of full responsibility for providing a completed Project of high quality, first class finish and appearance, and satisfactory for operation, all within the intent of the Contract Documents. Accordingly, the Contractor shall supervise and direct the Work using in a good and workmanlike manner, in accordance with the professional and other standards imposed by applicable laws and the Contract Documents, using the Contractor's best skill and attention, and shall in all cases act in the Owner's best interests and act in good faith in connection with the Work. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures, and for coordinating all portions of the Work. The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work. Design professionals, *e.g.*, architects, engineers, and similarly licensed professionals, shall perform their part of the Work in accordance with the professional skill and care ordinarily provided by competent engineers, architect, or other applicable professionals practicing under the same or similar circumstances and professional license, and as expeditiously as is prudent considering the ordinary professional skill and care of a competent engineer, architect, or other applicable professional.

The Contractor shall provide and pay for all direct and indirect costs including labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services, necessary for proper execution and completion of the Work, whether temporary or permanent, and whether or not incorporated or to be incorporated in the Work. The Contractor shall be responsible for securing, insuring, and shall bear all risk of loss (including theft) for all (a) tools, equipment, machinery, and similar items either located at the Project site or stored offsite, and (b) all materials prior to incorporation of such materials into the Work.

The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them, and shall perform the Work with the proper number of experienced, skilled, and, where applicable, licensed personnel, qualified by education and experience to perform their assigned tasks. The Contractor will use only persons authorized to be employed in the United States, under United States immigration laws. The Contractor shall be responsible for verifying the employment status of each person directly employed by it to perform the Work, and for obtaining and maintaining the "I-9" and any other documentation required for any of its directly hired personnel and will expressly require all persons carrying out the Work to comply with this subsection. The Contractor will comply and will expressly require all persons carrying out the Work to comply with all immigration-related regulations.

At all times during performance of this Contract and until the Work is completed and accepted, the Contractor shall have on the site a competent representative who has full authority to act for the Contractor. For projects of $5 million or more, the Contractor is required to establish an office at the Project site to conduct its day-to-day operations unless otherwise directed by the Owner or its authorized representative. As a minimum, the project manager, secretary and project/office engineer are to be located on the Project site. Operations to be conducted on site are to include, but shall not be limited to, change order preparation

and negotiation, shop drawing processing, schedule preparation and monitoring, preparation of and receipt of project correspondence. The project manager will be assigned to the Project full time for the entire duration of the Contract. Contractor shall provide the Owner with a listing of emergency telephone numbers for all key Contractor personnel.

The Contractor shall pay sales, consumer, use and similar taxes, for the Work provided by the Contractor, whether or not yet effective or merely scheduled to go into effect. The Owner shall not be responsible for income, franchise or property taxes, and is exempt from state sales and use taxes. The Owner can provide a tax exemption certificate to the Contractor on request. The Contractor will provide the Owner with requested tax documentation prior to the Owner issuing any payment under the Contract. Notwithstanding any provision to the contrary, the Contractor shall timely remit all tax payments required of it by law to the appropriate governmental authority in each respective jurisdiction.

Unless otherwise provided in the Contract Documents, the Contractor shall, before commencing the Work, where applicable, secure and pay for, provide to the Owner, and maintain during its performance of the Work the building permit as well as any other permits, approvals, fees, licenses, and inspections by government agencies, including, without limitation, federal and state regulatory permits, *e.g.*, stormwater discharge permits, necessary for proper execution of the Work, Substantial Completion, and Final Completion.

The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, applicable to performance of the Work. If the Contractor determines that implementation of any instruction received from the Owner, including those in the Owner's criteria, would cause a violation of any applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall notify the Owner in writing.

The Contractor shall, within seventy-two (72) hours after bid opening, provide to the Owner in writing the name and location of the place of business of each proposed major Subcontractor and Supplier as determined by the Owner, including those who will furnish materials or fabricated equipment. This list of major Subcontractors and Suppliers is generally limited to first tier Subcontractors and Suppliers.

The Contractor shall not employ personnel, or contract with Subcontractors, Suppliers, or other personnel to whom the Owner has made reasonable objection. If any personnel, Subcontractors, or Suppliers are rejected, an acceptable replacement will be provided at no additional cost to the Owner. The Contractor shall not, without the advance, written consent of the Owner, change any of the personnel, Subcontractors, or Suppliers identified in the Contract Documents or permit any subcontract to be assigned or transferred or allow any subcontract to be performed by anyone other than the personnel, Subcontractors, and/or Suppliers identified in the Contract Documents. The Owner may reply to the Contractor in writing, stating (1) whether the Owner has reasonable objection to the proposed change or (2) that the Owner requires additional time to review. If the Owner has a reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another who is pre-approved in writing by the Owner and to whom the Owner has no reasonable objection. The Contractor must remove any personnel reasonably determined by the Contractor or the Owner to be unfit or to be acting in violation of any provision of the Contract Documents or whose presence the Owner determines is not in its best interests within 7 Calendar Days of the Owner's removal notice.

Any Work that is performed for, on behalf of, or at the direction of the Contractor shall be pursuant to a written agreement between the Contractor and such person or entity that shall preserve and protect the rights of the Owner under the Contract Documents and be consistent with the Contract Documents. The Contractor shall require, where appropriate, each such person or entity to enter into similar agreements with its Subcontractors, subconsultants, and similar persons. The Contractor shall ensure (and shall be deemed to have warranted to the Owner) that each of its agreements contain "flow-down" provisions that, at a minimum: (1) require that all Work be performed in accordance with the requirements of the Contract Documents; (2) require the Contractor's timely payment of all sums consistent with the Contract; (3) waive all rights against the Owner for damages caused by fire or other perils covered by insurance; (4) recognize the Owner's right to assignment of contracts and require such person or entity to complete the unperformed

obligations under its agreement with the Contractor and, if requested by the Owner, to enter into an appropriate agreement evidencing the fact that such person or entity is bound to the Owner under its agreement in the manner in which it had been bound to the Contractor; (5) require the purchase and maintenance of insurance in accordance with the requirements of the Contract Documents; (6) include any Federally-mandated clauses; and (7) contain no provisions inconsistent with the Contract Documents. The Contractor shall further include in each of its subcontracts the following provisions:

> "The Contractor and _____ [*insert title of Subcontractor*] ("Subcontractor") agree that by executing this agreement they intend to directly and not incidentally secure (a) benefit(s) for the Dallas/Fort Worth International Airport ("the Owner"), the governmental entity for which the Work under this agreement is ultimately being provided in accordance with that certain Agreement No. _____; _____ ("Contract") between the Owner and the Contractor dated _____, 20__, and that they are executing this agreement for the Owner's direct and not incidental benefit.
>
> Subcontractor also agrees that the Contractor has provided it with a copy of the Contract Documents and that such Contract Documents have been incorporated into this agreement by reference. Subcontractor agrees that all the obligations that the Contractor has to the Owner under the Contract Documents are obligations that Subcontractor has to the Contractor by the Contract Documents' incorporation by reference into this agreement; accordingly, the Contract shall govern and control in all cases regarding Subcontractor's obligations to the Contractor and the Owner, and any conflict, ambiguity, or omission involving the Contract and this agreement shall be resolved in favor of the Contract.
>
> It is the further intent of the Contractor and Subcontractor that the Owner will have all rights and remedies (including rights of enforcement directly against such Subcontractor) under this agreement that the Contractor has, notwithstanding that the Owner is not a signatory to this agreement. The Owner's admission into evidence in any litigation involving this agreement of a copy of it will be irrefutable, prima facie evidence of the Owner's third-party beneficiary status under this agreement."

If the Contractor has knowledge that any actual or potential labor dispute is delaying or threatens to delay the timely performance of the Contract, the Contractor immediately shall give notice, including all relevant information to the Owner. The Contractor agrees to insert the substance of this paragraph, in any subcontract under which a labor dispute may delay the timely performance of the Contract; except that each subcontract shall provide that in the event its timely performance is delayed or threatened by delay by any actual or potential labor dispute, the Subcontractor shall immediately notify the next higher tier Subcontractor or the Contractor, as the case may be, of all relevant information concerning the dispute.

40-2 MAINTENANCE OF TRAFFIC. The Work is located on a major operational airport. The OWNER considers the safety and unrestricted flow of the traveling public, as well as other users of the Airport, to be of the utmost importance, and therefore, to be an essential and material part of the Contract. Material and equipment shall be stored and the Work shall be performed with as little obstruction to pedestrian and vehicle movement as possible. Sidewalks and other areas where pedestrians move about shall remain open and usable except as designated in the Contract Documents.

It is understood and agreed that the Contractor shall provide for the free and unobstructed movement of aircraft in the Air Operations Areas of the Airport with respect to his/her own operations and the operations of all his/her Subcontractors as specified in the subsection titled LIMITATION OF OPERATIONS of Section 80. It is further understood and agreed that the Contractor shall provide for the uninterrupted operations of visual and electronic signals (including power supplies thereto) used in the guidance of aircraft while operating to, from, and upon the Airport as specified in the subsection titled CONTRACTOR'S RESPONSIBILITY FOR UTILITY SERVICE AND FACILITIES OF OTHERS in Section 70.

With respect to his/her own operations and the operations of all his/her Subcontractors, the Contractor shall provide marking, Lighting, and other acceptable means of identifying: personnel, equipment, vehicles,

storage areas, and any Work area or condition that may be hazardous to the operation of aircraft, fire-rescue equipment, or maintenance vehicles at the Airport.

When the Contract requires the maintenance of vehicular traffic on an existing road, street, or highway during the Contractor's performance of Work that is otherwise provided for in the Contract Documents, the Contractor shall keep such road, street, or highway open to all traffic and shall provide such maintenance as may be required to accommodate traffic. The Contractor shall furnish erect, and maintain barricades, warning signs, flagmen, and other traffic control devices in reasonable conformity with the Manual of Uniform Traffic Control Devices for Streets and Highways (published by the United States Government Printing Office), unless otherwise specified herein. The Contractor shall also construct and maintain in a safe condition any temporary connections necessary for ingress to and egress from abutting property or intersecting roads, streets or highways. Unless otherwise specified herein, the Contractor will not be required to furnish snow removal for such existing road, street, or highway.

The Contractor shall make his/her own estimate of all labor, Materials, Equipment, and incidentals necessary for providing the maintenance of aircraft and vehicular traffic as specified in this subsection.

The cost of maintaining the aircraft and vehicular traffic specified in this subsection shall not be measured or paid for directly, but shall be included in the various Contract Items.

40-3 REMOVAL OF EXISTING STRUCTURES. All existing Structures encountered within the established lines, grades, or grading sections shall be removed by the Contractor, unless such existing Structures are otherwise specified to be relocated, adjusted up or down, salvaged, abandoned in place, reused in the Work or to remain in place. The cost of removing such existing Structures shall not be measured or paid for directly, but shall be included in the various Contract Items.

Should the Contractor encounter an existing structure (above or below ground) in the Work for which the disposition is not indicated on the Plans, the Engineer shall be notified prior to disturbing such structure. The disposition of existing Structures so encountered shall be immediately determined by the Engineer in accordance with the provisions of the Contract Documents.

Except as provided in the subsection titled RIGHTS IN AND USE OF MATERIALS FOUND IN THE WORK of this Section, it is intended that all existing materials or structures that may be encountered (within the lines, grades, or grading sections established for completion of the Work) shall be utilized in the Work as otherwise provided for in the Contract and shall remain the property of the Owner when so utilized in the Work.

40-4 RIGHTS IN AND USE OF MATERIALS FOUND IN THE WORK. Should the Contractor encounter any material such as (but not restricted to) sand, stone, gravel, slag, or concrete slabs within the established lines, grades, or grading sections, the use of which is intended by the Contract Documents to be either embankment or waste, he may at his/her option either:

a. Use such material in another Contract Item, providing such use is approved by the Owner and is in conformance with the Contract Documents applicable to such use; or,
b. Remove such material from the site, upon written approval of the Owner; or
c. Use such material for his/her own temporary construction on site; or
d. Use such material as intended by the terms of the Contract Documents.

Should the Contractor wish to exercise option a., b., or c., he shall request the Owner's approval in advance of such use.

Should the Owner approve the Contractor's request to exercise option a., b., or c., the Contractor shall be paid for the excavation or removal of such material at the applicable Contract price. The Contractor shall replace, at his/her own expense, such removed or excavated material with an agreed equal volume of material that is acceptable for use in constructing embankment, backfills, or otherwise to the extent that such replacement material is needed to complete the Work. The Contractor shall not be charged for his/her use of such material so used in the Work or removed from the site.

Should the Owner approve the Contractor's exercise of option a., the Contractor shall be paid, at the applicable Contract price, for furnishing and installing such material in accordance with requirements of the Contract Item in which the material is used.

It is understood and agreed that the Contractor shall make no claim for delays by reason of his/her exercise of option a., b., or c.

The Contractor shall not excavate, remove, or otherwise disturb any material, structure, or part of a structure which is located outside the lines, grades, or grading sections established for the Work, except where such excavation or removal is provided for in the Contract Documents.

Any objects excavated or exposed that may have historical significance shall immediately be brought to the attention of the Owner.

No provision in the Contract shall be construed as vesting Contractor with any right of property in materials used after they have been attached to or incorporated into the Work, nor materials, for which Contractor has received full or partial payment. All such materials, upon being so attached, incorporated or paid for, shall become the property of the Owner. Any gravel, sand, stone, minerals, timber and all other materials excavated, uncovered, developed or obtained in the Work, or on any land belonging to the Owner shall remain the sole property of the Owner.

END OF SECTION 40

SECTION 50 - CONTROL OF WORK

50-1 AUTHORITY OF THE ENGINEER. The Engineer shall decide any and all questions which may arise as to the quality and acceptability of Materials furnished, Work performed, and as to the manner of performance and rate of progress of the Work. The Engineer shall decide all questions which may arise as to the interpretation of the Specifications or Plans relating to the Work, the fulfillment of the Contract on the part of the Contractor, and the rights of different contractors on the Project. The Engineer shall determine the amount and quality of the several kinds of Work performed and Materials furnished which are to be paid for under the Contract.

For AIP contracts, the Engineer does not have the authority to accept Pavements that do not conform to FAA specification requirements.

50-2 CONFORMITY WITH PLANS AND SPECIFICATIONS. All Work and all Materials furnished shall be in substantial conformity with the lines, grades, grading sections, cross sections, dimensions, material requirements, and testing requirements that are specified (including specified tolerances) in the Contract Documents.

If the Engineer finds the Materials furnished, Work performed, or the finished product not within reasonably close conformity with the Plans and Specifications but that the portion of the Work affected will, in his/her opinion, result in a finished product having a level of safety, economy, durability, and workmanship acceptable to the Owner, he/she may advise the Owner of his/her determination that the affected Work be accepted and remain in place. In this event, the Engineer will document his/her determination and recommend to the Owner a basis of acceptance which will provide for an adjustment in the Contract Sum for the affected portion of the Work. The Engineer's determination and recommended Contract Sum adjustments will be based on the Engineer’s reasonable judgment and such tests or retests of the affected Work as are, in his/her opinion, needed. Changes in the Contract Sum shall be covered by Contract modifications as applicable.

If the Engineer finds the Materials furnished, Work performed, or the finished product are not in reasonably close conformity with the Plans and Specifications and have resulted in an unacceptable finished product, the affected Work or Materials shall be removed and replaced or otherwise corrected by and at the expense of the Contractor in accordance with the Engineer's written orders.

All Quality Assurance costs associated with replacing or otherwise correcting any Work item determined to be unacceptable shall be borne by the Contractor.

For the purpose of this subsection, the term "substantial conformity" shall not be construed as waiving the Contractor's responsibility to complete the Work in strict accordance with the Contract Documents and the Owner’s Construction and Fire Prevention Standards. The term shall not be construed as waiving the Owner's right to insist on strict compliance with the requirements of the Contract Documents during the Contractor's prosecution of the Work when, in the Engineer's opinion, such compliance is essential to provide an acceptable finished portion of the Work.

For the purpose of this subsection, the term "substantial conformity" is also intended to provide the Engineer with the authority to use engineering judgment in his/her determinations as to acceptance of Work that is not in strict conformity but will provide a finished product equal to or better than that intended by the requirements of the Contract Documents.

If it is found that the Material furnished, Work performed, or the finished product is not in substantial conformity with the Plans and Specifications, the Contractor shall bear all the expenses of such recovery, exposure, observation, inspection and testing and of satisfactory reconstruction including compensation for additional professional services and retesting, and an appropriate deductive Change Order shall be issued.

The Engineer will not be responsible for the Contractor’s means, methods, techniques, sequences, or procedures of construction of the safety precautions incident thereto.

50-3 COORDINATION OF CONTRACT DOCUMENTS. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all. For example, any provision contained in Plans that is not in the Specifications (or *vice versa*) shall be construed as being in both. If there is any inconsistency in the Contract Documents, the Contractor shall provide the better quality of and/or the correct quantity of the Work or Materials at issue, and such shall be the standard of workmanship and Materials throughout corresponding parts of the Work in a manner that is satisfactory to Owner. If any Work to be performed is not specifically included in the Contract Documents but is reasonably necessary or inferable to accomplish the purpose of the Contract, then it will be deemed to be included in the Work to the same extent as if specifically described in the Contract Documents.

Where compliance with two (2) or more reference standards are specified and reference standards establish different or conflicting requirements for minimum quantities or quality levels, the more restrictive/most stringent interpretation shall govern. Similarly, in case of a conflict within a part of the Contract Documents or other documents or laws, the provision with the more restrictive/most stringent interpretation shall govern. For example and not by way of limitation, calculated dimensions will govern over scaled dimensions; Contract Forms shall govern over Special Provisions, Special Provisions shall govern over General Provisions, General Provisions shall govern over Technical Specifications/Provisions, Technical Specification/Provisions shall govern over Plans, cited standards for materials or testing, and cited FAA advisory circulars (if applicable).

Conflicts in the application or interpretation of any parts of the Contract Documents shall be interpreted in accordance with the following order of precedence (the first listed being the highest precedence); however, documents shall be construed to be consistent and harmonized to the greatest extent feasible with resort to order of precedence only in the case of clear express conflict: applicable laws and regulations, permits, Modifications, the Contract, the Performance Bond, the Payment Bond, any required insurance certificates, Special Provisions, these General Provisions, Technical Specifications/Provisions, the Design Criteria Package, if any, and any addenda issued to Bidders, the Instruments of Service, Plans and Specifications, and, lastly, the Proposal, but the Proposal is included only for the purpose of providing a description of the Work to be performed and for no other purpose.

The Contractor shall not take advantage of any apparent error or omission on the Plans or Specifications, in other Contract Documents, or in test results relating to the Work hereunder. In the event the Contractor discovers any apparent error or discrepancy, he shall immediately call upon the Owner for his/her interpretation and decision, and such decision shall be final.

The Contractor shall refer uncertainties and requirements that are different but apparently equal to the Owner for decision before proceeding. Notwithstanding the foregoing, all interpretations or clarification of these General Provisions, including any conflicts, discrepancies, errors, or omissions involving these General Provisions, the Contract, and any Contract Documents or any other documents, shall be resolved by the Owner in its sole discretion, which decision shall be final. Any Work affected by such conflicts, discrepancies, errors, or omissions that is performed prior to the determination of the Owner or its authorized representative shall be performed at the Contractor's sole risk.

50-4 COOPERATION OF CONTRACTOR. The Contractor will be supplied with one copy each of the Plans and Specifications. The Contractor shall have available on the Work at all times one copy each of the Plans and Specifications. Additional copies of Plans and Specifications may be obtained by the Contractor for the cost of reproduction.

The Contractor shall give constant attention to the Work to facilitate the progress thereof, and he shall cooperate with the Engineer and his/her Inspectors and with other Contractors in every way possible. The Engineer shall allocate the Work and designate the sequence of construction in case of controversy between Contractors. The Contractor shall have a competent Superintendent on the Work at all times who is fully authorized as his/her agent on the Work. The Superintendent shall be capable of reading and thoroughly understanding the Contract Documents and shall receive and fulfill instructions from the Engineer or his/her authorized representative.

50-5 COOPERATION BETWEEN CONTRACTORS. The Owner reserves the right to contract for and perform other or additional work on or near the Work.

When separate contracts are let within the limits of any one Project, the Contractor shall conduct his/her Work so as not to interfere with or hinder the progress of completion of the work being performed by other contractors. Contractors working on the same Project shall cooperate with each other as directed.

The Contractor shall assume all liability, financial or otherwise, in connection with the Work and shall protect and save harmless the Owner from any and all damages or claims that may arise because of inconvenience, delays, or loss experienced by him/her because of the presence and operations of other contractors working within the limits of the same Project.

The Contractor shall arrange his/her Work and shall place and dispose of the Materials being used so as not to interfere with the operations of the other contractors within the limits of the same Project. The Contractor shall join his/her Work with that of the others in an acceptable manner and shall perform it in proper sequence to that of the others.

If part of the Contractor's Work depends upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, prepare a written report to the Owner, identifying apparent discrepancies or defects in the construction or operations by the Owner or the separate contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to report shall constitute an acknowledgment that the Owner's or the separate contractors completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a separate contractor because of the Contractor's delays, improperly timed activities or defective Work.

The Contractor shall promptly remedy damage the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or separate contractors.

50-6 CONSTRUCTION LAYOUT AND STAKES. When applicable, the Engineer shall establish horizontal and vertical control only. The Contractor must establish all layout required for the performance of the Work. Such stakes and markings as the Engineer may set for either his/her own or the Contractor's guidance shall be preserved by the Contractor. In case of negligence on the part of the Contractor or his/her employees resulting in the destruction of such stakes or markings, an amount equal to the cost of replacing the same may be deducted from subsequent estimates due the Contractor at the discretion of the Engineer.

50-7 AUTOMATICALLY CONTROLLED EQUIPMENT. Whenever batching or mixing plant Equipment is required to be operated automatically under the Contract and a breakdown or malfunction of the automatic controls occurs, the Equipment may be operated manually or by other methods for a period of 48 hours following the breakdown or malfunction, provided this method of operations will produce results which conform to all other requirements of the Contract Documents.

50-8 AUTHORITY AND DUTIES OF INSPECTORS. Inspectors employed by the Owner shall be authorized to inspect all Work done and all Material furnished. Such inspection may extend to all or any part of the Work and to the preparation, fabrication, or manufacture of the Materials to be used. Inspectors are not authorized to revoke, alter, or waive any provision of the Contract. Inspectors are not authorized to issue instructions contrary to the Contract Documents or to act as foreman for the Contractor.

Inspectors employed by the Owner are authorized to notify the Contractor or his/her representatives of any failure of the Work or Materials to conform to the requirements of the Contract Documents, and to reject such non-conforming Materials in question until such issues can be referred to the Engineer for his/her decision.

50-9 INSPECTION OF THE WORK. Inspections and tests by the Owner or its representatives are for the sole benefit of the Owner and do not: (1) relieve the Contractor of responsibility for providing adequate quality control measures; (2) relieve the Contractor of responsibility for damage to or loss of the Work or any material before acceptance; (3) constitute or imply acceptance; or (4) affect the continuing rights of the Owner after acceptance of the Work. Accordingly, the presence or absence of an authorized representative of the Owner does not relieve the Contractor from any requirement of the Contract Documents, nor may any requirements of the Contract Documents be changed without the Owner's prior written authorization.

The Contractor shall maintain an adequate inspection system and perform such inspections as will ensure that the Work conforms to the requirements of the Contract Documents. The Contractor shall maintain complete inspection records and make them available to the Owner. The Owner shall have the right to witness all tests performed by the Contractor. Tests performed by the Contractor are all tests to ensure compliance with the Contract Documents over and above the testing performed by the Owner. The Owner shall have the right to approve all tests including approval of test procedures and test conditions to assure compliance with the Contract Documents.

All Materials and each part or detail of the Work shall be subject to inspection by the Engineer. The Engineer shall be allowed access to all parts of the Work and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection. The Contractor shall promptly furnish, without additional charge, all facilities, labor, and material reasonably needed for performing safe and convenient inspections and tests as may be required by the Owner. The Owner 's authorized Materials Testing and Inspection Laboratory will charge to the Contractor and Contractor agrees to pay any additional cost of inspection or test when Work is not ready at the time specified by the Contractor for inspection or test, or when prior rejection makes re-inspection or retest necessary. Special, full size, and performance tests shall be performed as described in the Specifications. The Owner will perform all tests described and identified in the Specifications as the responsibility of the Owner; all other tests shall be performed by and shall be the responsibility of the Contractor.

If the Engineer requests it, the Contractor, at any time before acceptance of the Work, shall remove, tear out, or uncover such portions of the finished Work as may be directed, and the Contractor, on request, shall promptly furnish all necessary facilities, labor, and material for such removal, tear out, or uncovering. After examination, the Contractor shall restore said portions of the Work to the standard required by the Contract Documents. Should the Work thus exposed or examined prove acceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed may be paid for by Change Order or Force Account Work; but should the Work so exposed or examined prove unacceptable, the uncovering, tearing out, or removing, and the replacing of the covering or making good of the Work removed will be at the Contractor's expense. The Contractor shall promptly segregate and remove rejected material from the premises. If the Contractor does not promptly replace or correct rejected Work, the Owner may (1) by contract or otherwise, replace or correct the Work and charge the cost to the Contractor, or (2) terminate for default the Contractor's right to proceed and perform additional Work.

Any Work done or Materials used without supervision or inspection by an authorized representative of the Owner may be ordered removed and replaced and, if done, shall be at the Contractor's expense unless the Owner's representative failed to inspect after having been given reasonable notice in writing that the Work was to be performed.

Should the Work include relocation, adjustment, or any other modification to existing facilities, not the property of the Owner, authorized representatives of the owners of such facilities shall have the right to inspect such Work. Such inspection shall in no sense make any facility owner a party to the Contract, and shall in no way interfere with the rights of the parties to this Contract.

50-10 REMOVAL OF UNACCEPTABLE AND UNAUTHORIZED WORK. All Work which does not conform to the requirements of the Contract Documents will be considered unacceptable, whether discovered before or after Substantial Completion or Final Completion and whether or not fabricated, installed, or completed, unless otherwise determined acceptable by the Engineer as provided in the subsection titled CONFORMITY WITH PLANS AND SPECIFICATIONS of this Section.

Unacceptable Work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or any other cause found to exist prior to the final acceptance of the Work, shall be removed immediately and replaced in an acceptable manner in accordance with the provisions of the subsection titled CONTRACTOR'S RESPONSIBILITY FOR WORK of Section 70.

Work not in conformance with the Contract Documents or any Work done without authority will be considered as unauthorized and will not be paid for. Work so done may be ordered removed or replaced at the Contractor's expense.

Upon failure on the part of the Contractor to comply forthwith with any order of the Engineer made under the provisions of this subsection, the Engineer will have authority to cause unacceptable Work to be remedied or removed and replaced and unauthorized Work to be removed and to deduct the costs (incurred by the Owner) from any monies due or to become due the Contractor or, at the Owner's election, recover such costs from the Contractor directly.

50-11 LOAD RESTRICTIONS. The Contractor shall comply with all legal load restrictions in the hauling of materials on public roads beyond the limits of the Work. A special permit will not relieve the Contractor of liability for damage which may result from the moving of material or equipment.

The operation of equipment of such weight or so loaded as to cause damage to structures or to any other type of construction will not be permitted. Hauling of materials over the base course or surface course under construction shall be limited as directed. No loads will be permitted on a concrete pavement, base, or structure before the expiration of the curing period. The Contractor shall be responsible for all damage done by his/her hauling equipment and shall correct such damage at his/her own expense.

50-12 MAINTENANCE DURING CONSTRUCTION. The Contractor shall maintain the Work during construction and until the Work is accepted. This maintenance shall constitute continuous and effective Work prosecuted day by day, with adequate equipment and forces so that the Work is maintained in satisfactory condition at all times.

In the case of Work that includes a contract for the placing of a course upon a course or subgrade previously constructed, the Contractor shall maintain the previous course or subgrade during all construction operations.

All costs of maintenance work during construction and before the Project is accepted shall be included in the unit prices bid on the various Contract Items, and the Contractor will not be paid an additional amount for such work.

50-13 FAILURE TO MAINTAIN THE WORK. Should the Contractor at any time fail to maintain the Work as provided in the subsection titled MAINTENANCE DURING CONSTRUCTION of this Section, the Contractor shall promptly remedy such unsatisfactory maintenance condition. Should the Contractor fail to remedy such unsatisfactory condition to the satisfaction of the Engineer, the Engineer may suspend any Work necessary for the Owner to correct such unsatisfactory maintenance condition, depending on the exigency that exists. Any maintenance cost incurred by the Owner, shall be deducted from monies due or to become due the Contractor. The Engineer or the Owner shall retain the right to notify the surety of non-compliant Work.

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case, an appropriate Change Order or other Modification shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies even if the Contractor fails to sign such document. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner immediately on demand or, at Owner's sole election, be deducted

from any payment due the Contractor. At the Owner's option, the Owner may also remove and store any salvageable materials or equipment at the Contractor's expense. If the Contractor does not pay costs of such removal and storage within ten (10) days' written notice, the Owner may sell such materials and equipment. If such proceeds of sale do not cover the costs which the Contractor should have borne, (including, without limitation, design services and attorneys' fees relating to the correction) the Contract Sum shall be reduced by the deficiency. If payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner, immediately upon demand. The Owner may, but is not obligated to, contact the surety of a potential claim, or file an actual claim, to address the default.

50-14 SUBSTANTIAL COMPLETION. The Date of Substantial Completion of the Work is the date the Owner determines construction is sufficiently complete in accordance with the Contract Documents and as defined in the Specifications so the Owner may occupy or use the Work, or designated portion thereof, for its intended purpose, without restriction and all punch list items completed as defined in the Contract Documents (subject to completion of minor punch list items, the absence of completion of which does not interfere with Owner's intended use of the Project, including the intended normal business operations of the Project, or detract from the aesthetic appearance of the Project) and: (a) all designated or required governmental certificates of occupancy and other permits, inspections and certifications for the Project or such portion thereof as the case may be, have been achieved and issued to Owner and posted for the Project or such portion thereof, including, but not limited to, a finding by the building official that the Work does not violate applicable construction and fire prevention standards or other laws that may affect safe occupancy; (b) all elements and Project systems included in the Work (including, without limitation, all life safety systems) are operational and functioning as designed and scheduled in the Contract Documents, including written notice of ETAM Commissioning Authority acceptance; (c) all instruction of Owner's personnel in the operation of the Project systems has been completed; and (d) no claims, liens, or encumbrances have been made, filed, or are outstanding with respect to the Work.

Substantial Completion date(s), if any, are specified elsewhere in the Contract Documents.

When the Contractor considers that the Work, or a designated portion thereof that is acceptable to the Owner, is substantially complete as defined above, the Contractor shall prepare for submission to the Owner a list of items to be completed or corrected. The failure to include any items on such list does not alter the responsibility of the Contractor to complete the Work in accordance with the Contract Documents. When the Owner determines that the Work or designated portion thereof is substantially complete, it will issue a written notice to the Contractor establishing the date of Substantial Completion. The notice shall state the responsibilities of the Owner and the Contractor for (but not limited to) security, maintenance, heat, utilities, damage to the Work, and insurance, and shall list remaining items to be corrected or completed. The Work not fully completed or corrected shall be completed to the satisfaction of the Owner within the time period allowed by the Contract Documents. In the event the Contractor fails to complete or correct the remaining items within the allotted time, the Owner may complete or correct the items and deduct the cost thereof from the Contract Sum and any payments due the Contractor.

Warranties required by the Contract shall commence on the date of Substantial Completion unless otherwise provided in the notice of Substantial Completion. Each Project as a whole shall have a single Substantial Completion date and warranty date unless otherwise stated in the notice of Substantial Completion, in a Certificate of Partial Acceptance, or if otherwise stated in the Contract Documents. If portions of the Work are completed before others, the warranty period will be extended to coincide with the Project warranty date identified in the Notice of Substantial Completion. The Contractor shall transfer all warranties that it receives to the Owner.

The Contractor shall promptly remedy any defects in the Work and pay for any damage to other work resulting therefrom which appear within a period of twelve (12) months from the date of Substantial Completion of the Work, unless a longer period is otherwise stated in the Substantial Completion Notice(s) from Owner. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner, the Owner may correct it and charge all costs to the Contractor. The twelve month period for correction of Work shall be extended with respect to portions of

Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

Nothing herein shall be construed to establish a period of limitation with respect to the Contractor's obligations under the Contract Documents. Establishment of any period for correction of Work has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations. These Contractor obligations shall survive termination of the Contract and Final Completion.

Without limiting the foregoing: (1) the Contractor shall remedy at the Contractor's expense any damage to real or personal property owned or controlled by the Owner when the damage is the result of the Contractor's failure to conform to requirements of the Contract Documents or any defect of equipment, material, workmanship, or design furnished; (2) the Contractor shall restore any Work damaged in fulfilling the terms and conditions of this Section, and the warranty with respect to work repaired or replaced shall run for one year from the date of repair or replacement; and (3) if the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice from the Owner, the Owner shall have the right to replace, remove, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

50-15 PARTIAL OCCUPANCY/PARTIAL ACCEPTANCE. The Owner may occupy or use any portion of the Work at any stage. Such partial occupancy or use may commence whether or not the portion is substantially complete. If requested by the Owner, the Contractor shall inspect the area with the Owner in order to determine and record the condition of the Work in order to determine the responsibilities assigned to each of them for payments, security, maintenance, heat, utilities, damage to the Work and insurance, any period of correction of the Work, and commencement of warranties required by the Contract Documents.

The use or occupancy of a portion of the Work by Owner or its other contractors to inspect and/or correct defective workmanship or install furniture, fixtures, or Equipment or other Work shall not be considered as use and occupancy. Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents and the Owner's construction and fire prevention standards. Accordingly, a decision by the Owner to partially occupy and/or accept a portion of the Work shall not void or alter any provision of the Contract Documents.

The Owner may, at its sole discretion partially accept specific portions of the Work completed in accordance with the contract requirements, provided that such portions are independently operable, comply with all applicable specifications, and are finally complete as defined herein. The Contractor may request partial acceptance in writing, specifying the portion of Work completed and ready for review. The Owner shall conduct an inspection following receipt of the request to verify compliance with the Contract Documents. If the Owner finds that such portion of Work is finally complete, the Owner shall issue a written Partial Acceptance Certificate detailing the portion of the Work accepted and the effective date of such partial acceptance. Partial acceptance does not waive the Contractor's obligations regarding the completion of the entire project or any remaining Work. The warranty period for the accepted portion of the Work shall commence upon the date of partial acceptance in the Partial Acceptance Certificate unless otherwise specified in the Contract Document. The Owner retains the right to withhold retainage or make deductions as appropriate under the contract. Partial acceptance does not relieve the Contractor of liability for latent defects, nonconforming Work, warranty obligations, or its other obligations under the Contract Documents. The Owner reserves the right to reject any previously accepted Work if defects or deficiencies arise before final acceptance of the entire Project.

50-16 FINAL COMPLETION/FINAL ACCEPTANCE. The Contractor will have the number of days set forth in the Contract after Substantial Completion to complete the Work not fully completed or corrected to the satisfaction of the Owner. The Contractor shall give notice of Final Completion to the Owner upon completion of all items of Work. Upon written notice of Final Completion from the Contractor that all Work has been completed, the Owner will make an inspection. If all Work provided for and contemplated by the

Contract Documents is found to be completed in accordance with the Contract Documents, such inspection shall constitute the final inspection and Owner shall make final acceptance of the Work (Final Acceptance). The Owner shall notify the Contractor in writing of Final Acceptance as of the date of the final inspection.

If, however, the inspection discloses that the Work, or any part thereof, is not in compliance with the Contract Documents, the Owner will give the Contractor the necessary instructions for correction of same and the Contractor shall immediately comply with and execute such instructions. Upon correction of the Work, another inspection will be made which, if the Work is corrected as instructed, shall constitute the final inspection. Once all Work is corrected as instructed and the Owner finds the Work acceptable under the Contract Documents and the Contract fully performed, which approval shall not be unreasonably withheld, the Owner will make the Final Acceptance and notify the Contractor in writing of this acceptance as of the date of the final inspection.

50-17 CLAIMS FOR ADJUSTMENT AND DISPUTES. If for any reason the Contractor deems that additional compensation is due for work or materials not clearly provided for in the Contract Documents, not previously authorized, or for any other reason whatsoever, the Contractor shall notify the Engineer in writing of his/her intention to claim such additional compensation within ten (10) calendar days after either occurrence of the event giving rise to such claim or within ten (10) calendar days after the Contractor first recognizes the condition giving rise to such claim, whichever comes first, and, in all cases, the Contractor shall also notify the Engineer in writing of his/her intention to claim such additional compensation before beginning the work on which the claim is based and shall further notify Owner in writing if Contractor knows or has reason to believe that this additional compensation may cause the total compensation payable under the Contract to exceed the funds appropriated and allotted for the Contract, as this may trigger the provisions of the subsection titled LOSS OF FUNDING. If such notification is not given or the Engineer is not afforded proper opportunity by the Contractor for keeping strict account of actual cost as required, then the Contractor hereby agrees to waive any claim for such additional compensation and also any claim for additional time resulting therefrom. Such notice by the Contractor and the fact that the Engineer has kept account of the cost of the work shall not in any way be construed as proving or substantiating the validity of the claim. When the work on which the claim is based has been completed, the Contractor shall, within five (5) Calendar Days, update his/her written claim to the Engineer who will present it to the Owner for consideration in accordance with local laws or ordinances; failure to do so is a waiver of any claim for such additional compensation and also any claim for additional time resulting therefrom. Pending final resolution of a claim, the Contractor shall proceed diligently with performance of the Work and its obligations under the Contract Documents.

In the case of (1) subsurface or latent physical conditions at the Project site which differ materially from those indicated in the Contract, or (2) unknown physical conditions at the Project site, of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract (for the Owner to consider a condition “material,” for purposes of this paragraph, it must, at a minimum, cause costs not covered under unit price adjustments in excess of $10,000.00), the Contractor shall promptly, and before the conditions are disturbed, give written notice to the Owner. If the Owner’s investigation reveals that the site conditions do materially so differ and cause an increase or decrease in the Contractor’s cost of, or the time required for, performing any part of the Work under the Contract, the Owner shall determine what adjustment, if any, is to be made to the Contract Sum and/or the Contract Time. No request by the Contractor for an equitable adjustment to the Contract pursuant to this paragraph shall be allowed unless the Contractor has given the written notice required herein. Accordingly, the Contractor shall bear responsibility for, and shall not be entitled to recover damages, costs, or losses if it fails to provide the required written notice to Owner and shall be responsible to the Owner for all related costs, damages, and losses. Notwithstanding the foregoing, no request by the Contractor for an equitable adjustment to the Contract for differing site conditions shall be allowed if made after Substantial Completion or final payment, whichever comes first.

50-18 CONTRACTOR COST REDUCTION PROPOSALS. The provisions of this subsection will apply only to contracts awarded to the lowest Bidder pursuant to competitive bidding.

On Projects with original contract amounts in excess of $100,000, the Contractor may submit, in writing, proposals for modifying the Plans, Specifications or other requirements of the Contract Documents for the sole purpose of reducing the cost of the Work. The cost reduction proposal shall not impair, in any manner, the essential functions or characteristics of the Project, including but not limited to service life, economy of operation, ease of maintenance, desired appearance, design and safety standards. This provision shall not apply unless the proposal submitted is specifically identified by the Contractor as being presented for consideration as a value engineering proposal.

Not eligible for cost reduction proposals are changes in the basic design of a Pavement type, Runway and Taxiway Lighting, visual aids, hydraulic capacity of drainage facilities, or changes in grade or alignment that reduce the geometric standards of the Project.

As a minimum, the following information shall be submitted by the Contractor with each proposal:

a. A description of both existing Contract requirements for performing the Work and the proposed changes, with a discussion of the comparative advantages and disadvantages of each:
b. An itemization of the Contract requirements that must be changed if the proposal is adopted;
c. A detailed estimate of the cost of performing the Work under the existing Contract and under the proposed changes;
d. A statement of the time by which a Change Order adopting the proposal must be issued;
e. A statement of the effect adoption of the proposal will have on the time for completion of the Contract; and
f. The Work affected by the proposed changes, including any quantity variation attributable to them.

The Contractor may withdraw, in whole or in part, any cost reduction proposal not accepted, within the period specified in the proposal. The provisions of this subsection shall not be construed to require the Engineer to consider any cost reduction proposal that may be submitted.

The Contractor shall continue to perform the Work in accordance with the requirements of the Contract Documents until a Change Order incorporating the cost reduction Proposal has been issued. If a Change Order has not been issued by the date upon which the Contractor's cost reduction proposal specifies that a decision should be made, or such other date as the Contractor may subsequently have requested in writing, such cost proposal shall be deemed rejected.

The Engineer shall be the sole judge of the acceptability of a cost reduction proposal and of the estimated net savings from the adoption of all or any part of such proposal. In determining the estimated new savings, the Engineer may disregard the Contract bid prices if, in the Engineer's judgment such prices do not represent a fair measure of the value of the Work to be performed or deleted.

The Owner will not be liable for any delay in acting upon, or for any failure to act upon, any proposal submitted pursuant to this subsection. The decision of the Owner as to acceptance of any such proposal under the Contract shall be final. The submission of a proposal by the Contractor shall not in itself affect the rights or obligations of either party under the Contract.

The Owner may accept in whole or in part any proposal submitted pursuant to this subsection by issuing a Change Order which will identify the proposal on which it is based. The Change Order will provide for an equitable adjustment in the Contract Sum and, if applicable as determined by the Owner, will revise any other affected provisions of the Contract Documents. The equitable adjustment in the Contract Sum shall be established by determining the net savings resulting from the accepted change. The net savings resulting from the change shall be shared between the Contractor and the Owner on the basis of fifty percent (50%) for the Contractor and fifty percent (50%) for the Owner. Net savings shall be determined by deducting from the estimated gross savings, the Contractor's costs of developing and implementing the proposal (including any amount attributable to a Subcontractor) and the estimated amount of increased costs to the Owner resulting from the change, such as implementation, inspection, related items, and

Owner-furnished material. Estimated gross savings shall include Contractor's labor, material, Equipment, overhead, profit, and bond. The Contract Sum shall be reduced by the sum of the Owner's costs and share of the net savings and shall constitute full compensation to the Contractor for the cost reduction proposal and performance of the Work.

Acceptance of the cost-reduction proposal and performance of the cost-reduction Work shall not extend the time of completion of the Contract unless specifically provided for in the Change Order.

50-19 LIMIT OF LIABILITY. Neither party shall be liable to the other for special, indirect, and consequential damages arising out of or relating to the Contract. This waiver includes damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work. This waiver is applicable, without limitation, to all consequential damages due to either party's termination of the Contract.

Notwithstanding the foregoing or any other term or condition to the contrary, this subsection does not apply to or otherwise limit: (i) claims, damages, or losses covered by the Contractor's or its Subcontractors', consultants', or Suppliers' insurance or amounts recovered from the Contractor from Contractor's self-insurance if it has self-insured the claim, damage, or loss in accordance with the Contract; (ii) damages, costs, or losses incurred to correct the Contractor's defective Work or for completing the Contractor's incomplete Work, (iii) claims, damages, or losses arising from Contractor's gross negligence, intentional or willful misconduct, fraud, criminal acts, breach of confidentiality or data security obligations; (iv) cases of serious bodily injury or death, or property damage; (v) the Contractor's indemnification, hold harmless, and defense obligations, (vi) the Contractor's obligation to pay liquidated damages, which both parties recognize have been established, in part, to reimburse the Owner for some damages that may be deemed special, indirect, or consequential; or (vii) the Contractor's obligations in any other agreements with the Owner.

In no event shall the Owner's liability to the Contractor for any damages of any type arising out of or in connection with the Contract exceed the Contract Sum.

This Section shall survive Final Completion or termination of the Contract.

END OF SECTION 50

SECTION 60 - CONTROL OF MATERIALS

60-1 SOURCE OF SUPPLY AND QUALITY REQUIREMENTS. The Contractor warrants that the Work and materials used on the Work shall conform to the requirements of the Contract Documents and be free from defective material and workmanship and that all materials shall be of good quality and new (as compared to used or reprocessed). This warranty shall survive Final Completion and termination of the Contract. Work, materials, or equipment not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective.

When a material or system is specified in the Contract Documents, the Contractor may make substitutions only in accordance with Section 90.

In order to expedite the inspection and testing of materials, the Contractor shall furnish complete statements to the Owner as to the origin, composition, and manufacture of all materials. Such statements shall be furnished promptly after execution of the Contract but, in all cases, prior to delivery of such materials.

At the Owner's option, materials may be approved at the source of supply before delivery is stated. If it is found after trial that sources of supply for previously approved materials do not produce specified products, the Contractor shall furnish materials from other sources.

60-1.1 CONCRETE MATERIAL SUPPLY RESPONSIBILITY: For all major concrete operations under this Contract — including but not limited to Portland cement concrete pavement (P-501), structural concrete (P-610), taxiways, runways, aprons, airfield shoulders, roadway pavements, bridges, abutments, foundations, and other significant civil or structural components — the General Contractor/Prime shall be solely and directly responsible for procuring, contracting for, and maintaining all contracts with suppliers of ready-mix concrete, cementitious materials, and related admixtures. Subcontractors shall not be required or permitted to enter into separate or direct contracts with concrete suppliers for these major operations. The intent of this requirement is to ensure continuity of supply, uniformity and consistency of quality, accountability for schedule performance, strict compliance with FAA AC 150/5370-10H, DFW Airport Construction Standards and all other applicable laws and regulations, and to eliminate disputes that could jeopardize schedule, safety, or regulatory compliance.

For minor concrete operations of limited scope — such as sidewalks, small pads, duct bank encasements, light pole bases, and similar incidental work — this requirement may be modified or waived on a case-by-case basis only on the prior written approval of the Owner. The applicability of this clause to such smaller operations shall be determined and documented in the relevant subcontract package for each Project. Regardless of any such modification or waiver, the General Contractor shall remain fully responsible for all concrete material quality, testing, documentation, placement, and compliance with the requirements of the Contract.

The General Contractor shall coordinate, control, and supervise all ordering, scheduling, delivery, QA/QC testing, and payment for all concrete materials under its direct supply contracts for major operations. This includes responsibility for ensuring that all quality assurance and acceptance testing (including, without limitation, flexural strength testing, compressive strength correlations, maturity meter validation, PWL acceptance testing, etc.) are properly scheduled and documented to support Owner review and audit and compliance with all applicable standards.

Failure of the General Contractor to comply with this requirement will deem the bid as non-responsive and subject to rejection. Any subsequent unauthorized delegation of concrete procurement responsibilities to subcontractors shall constitute a material breach of contract. The Owner, in its sole discretion, may withhold payments, issue non-conformance directives/reports, or undertake corrective measures at the Contractor’s expense as necessary to maintain compliance with these provisions. The Contractor shall not be entitled to any extension of time, additional compensation, or claim of delay resulting from enforcement of this requirement by the Owner.

60-2 SAMPLES, TESTS, AND CITED SPECIFICATIONS. All materials shall be inspected, tested, and approved by the Owner before incorporation in the Work. Any Work in which untested materials are used without approval or written permission of the Owner shall be performed at the Contractor's risk. Materials

found to be unacceptable and unauthorized will not be paid for and, if directed by the Owner, shall be removed at the Contractor's expense. Unless otherwise designated, Quality Assurance tests in accordance with the cited standard methods of AASHTO or ASTM which are current on the date of Advertisement for bids will be made by and at the expense of the Owner.

Samples will be taken by a qualified representative of the Owner. All materials being used are subject to inspection, test, or rejection at any time prior to or during incorporation into the Work. Copies of all tests will be furnished to the Contractor's representative at his/her request.

60-3 CERTIFICATION OF COMPLIANCE. The Owner may permit the use, prior to sampling and testing, of certain materials or assemblies when accompanied by manufacturer's certificates of compliance stating that such materials or assemblies fully comply with the requirements of the Contract Documents. The certificate shall be signed by the manufacturer. Each lot of such materials or assemblies delivered to the Work must be accompanied by a certificate of compliance in which the lot is clearly identified.

Materials or assemblies used on the basis of certificates of compliance may be sampled and tested at any time and if found not to be in conformity with Contract requirements will be subject to rejection whether in place or not.

The form and distribution of certificates of compliance shall be as approved by the Owner.

When a material or assembly is specified by "brand name or equal" and the Contractor elects to furnish the specified "brand name", the Contractor shall be required to furnish the manufacturer's certificate of compliance for each lot of such material or assembly delivered to the Work. Such certificate of compliance shall clearly identify each lot delivered and shall certify as to:

a. Conformance to the specified performance, testing, quality or dimensional requirements; and,
b. Suitability of the material or assembly for the use intended in the Contract.

Should the Contractor propose to furnish an "or equal" material or assembly, he shall furnish the manufacturer's vendor data that includes detailed performance data for the specified brand name material or assembly. The Owner shall be the sole judge as to whether the proposed "or equal" is suitable for use in the Work.

The Owner reserves the right to refuse permission for use of Materials or assemblies on the basis of certificates of compliance.

60-4 PLANT INSPECTION. The Owner or his/her authorized representative may inspect, at its source, any specified material or assembly to be used in the Work. Manufacturing plants may be inspected from time to time for the purpose of determining compliance with specified manufacturing methods or materials to be used in the Work and to obtain samples required for his/her acceptance of the material or assembly.

Should the Owner conduct plant inspections, the following conditions shall exist:

a. The Owner shall have the cooperation and assistance of the Contractor and the producer with whom he has contracted for materials.
b. The Owner shall have full entry at all reasonable times to such parts of the plant that concern the manufacture or production of the materials being furnished.
c. If required by the Owner, the Contractor shall arrange for adequate office or working space that may be reasonably needed for conducting plant inspections. Office or working space should be conveniently located with respect to the plant.

It is understood and agreed that the Owner shall have the right to retest any material which has been tested and approved at the source of supply after it has been delivered to the site. The Owner shall have the right to reject only material which, when retested, does not meet the requirements of the Contract Documents.

60-5 FIELD OFFICE AND LABORATORY. When specified and provided for as a Contract Item, the Contractor shall furnish a building for the exclusive use of the Owner as a field office and field testing

laboratory. The building shall be furnished and maintained by the Contractor as specified herein and shall become property of the Contractor when the Work is completed.

60-6 STORAGE OF MATERIALS. Stored Materials are defined as materials to be incorporated into the Work. The Contractor shall furnish the Owner with satisfactory evidence of costs (invoices), photos, and adequate insurance coverage of such stored Materials. Materials shall be stored so as to assure the preservation of their quality and fitness for the Work. Stored materials, even though approved before storage, may again be inspected prior to their use in the Work. Stored materials shall be located so as to facilitate their prompt inspection. The Contractor shall coordinate the storage of all materials with the Owner. Materials to be stored on Airport property shall not create an obstruction to air navigation nor shall they interfere with the free and unobstructed movement of aircraft. Unless otherwise shown on the Plans, the storage of materials and the location of the Contractor's plant and parked equipment or vehicles shall be as directed by the Owner. Private property shall not be used for storage purposes without written permission of the Owner or lessee of such property. The Contractor shall make all arrangements and bear all expenses for the storage of materials on private property. Upon request, the Contractor shall furnish the Owner a copy of the property Owner's permission. Payments may be made to the extent of the delivered cost of Materials to be incorporated in the Work, provided that such Materials meet the requirements of the Contract Documents, and in accordance with subsection titled PAYMENT FOR MATERIALS ON HAND of Section 100.

All storage sites on private or Airport property shall be restored to their original condition by the Contractor at his/her entire expense, except as otherwise agreed to (in writing) by the Owner or lessee of the property.

60-7 UNACCEPTABLE MATERIALS. Any material or assembly that does not conform to the requirements of the Contract Documents shall be considered unacceptable and shall be rejected. The Contractor shall remove any rejected material or assembly from the site of the Work, unless otherwise instructed by the Owner.

Rejected material or assembly, the defects of which have been corrected by the Contractor, shall not be returned to the site of the Work until such time as the Owner has approved its used in the Work.

60-8 OWNER-FURNISHED MATERIALS. The Contractor shall furnish all materials required to complete the Work, except those specified herein (if any) to be furnished by the Owner. Owner-furnished materials shall be made available to the Contractor at the location specified herein.

All costs of handling, including transportation from the specified location to the site of Work, storage, and installing Owner-furnished materials shall be included in the price(s) bid for the Contract in which such Owner-furnished material is used.

After any Owner-furnished material has been delivered to the location specified, the Contractor shall be responsible for any demurrage, damage, loss, or other deficiencies which may occur during the Contractor's handling, storage, or use of such Owner-furnished material. The Owner will deduct from any monies due or to become due the Contractor any cost incurred by the Owner in making good such loss due to the Contractor's handling, storage, or use of Owner-furnished materials.

END OF SECTION 60

SECTION 70 - LEGAL REGULATIONS AND RESPONSIBILITY TO PUBLIC

70-1 LAWS TO BE OBSERVED. The Contractor shall keep fully informed of and shall comply with all applicable laws, including, but not limited to, Federal and state laws, all local laws, ordinances, and regulations and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the Project, or which in any way affect the conduct of the Work. The Contractor shall at all times observe and comply with all such laws, ordinances, regulations, orders, and decrees; and, **to the extent permitted by law, shall protect and indemnify the Owner and all his/her officers, agents, or servants against any claim or liability to the extent arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by the Contractor or his/her employees, agents, or representatives.**

70-2 PERMITS, LICENSES, AND TAXES. The Contractor shall procure all permits and licenses, pay all charges, fees, and taxes, and give all notices necessary and incidental to the due and lawful prosecution of the Work.

70-2.1 The Owner is exempt from State and Local Sales and use Taxes pursuant to Section 151.309 of the Texas State Tax Code. However, for the Contractor to be relieved of the Sales Tax liability, the Contract must be a “separated contract”, *i.e.*, costs of Materials incorporated into the Project must be separated from all other costs of the Project. As a seller, Contractor must issue a resale certificate (must hold a sales tax permit to do this) to the supplier in lieu of the sales tax at the time of the purchase. The Owner will issue to the Contractor an exemption certificate for the Contractor’s records in substantiating Materials “resold” to the Owner by the Contractor’s incorporation of said Materials on the Owner Project(s).

70-2.2 It shall be understood this tax-exempt status cannot be utilized by the Contractor for its purchase, lease, or rental of a motor vehicle. Vehicles, equipment and other products that remain the property of the Airport after contract expiration will be tax exempt and the Airport will provide a State of Texas Sales Tax Exemption Certificate for these purposes. Additional sales tax requirements may pertain to this Contract.

70-3 PATENTED DEVICES, MATERIALS, AND PROCESSES. If the Contractor is required or desires to use any design, device, material, or process covered by letters of patent or copyright, the Contractor shall provide for such use by suitable legal agreement with the patentee or owner of such rights. **THE CONTRACTOR AND ITS SURETY SHALL INDEMNIFY, HOLD HARMLESS AND DEFEND THE OWNER AND ITS SEPARATE CONTRACTORS AND CONSULTANTS, ANY THIRD PARTY, AND ANY POLITICAL SUBDIVISION FROM AND AGAINST SUITS OR CLAIMS FOR INFRINGEMENT OF COPYRIGHTS, TRADEMARKS, PATENTS, AND OTHER INTELLECTUAL PROPERTY RIGHTS OF ANY KIND, BUT SHALL NOT BE RESPONSIBLE FOR SUCH DEFENSE OR LOSS WHEN A PARTICULAR DESIGN, PROCESS OR PRODUCT OF A PARTICULAR MANUFACTURER OR MANUFACTURERS IS REQUIRED BY THE OWNER, OR WHERE THE COPYRIGHT VIOLATIONS ARE REQUIRED IN THE OWNER’S CRITERIA ON THE CONDITION THAT CONTRACTOR PROVIDES FOR SUCH USE BY SUITABLE LEGAL AGREEMENT WITH THE PATENTEE OR OWNER OF SUCH RIGHTS. FURTHER AND WITHOUT LIMITING THE FOREGOING OR CONTRACTOR’S OTHER OBLIGATIONS, IF THERE IS A REASON FOR THE CONTRACTOR TO BELIEVE THAT THE DESIGN, PROCESS OR PRODUCT REQUIRED IN THE OWNER’S CRITERIA IS AN INFRINGEMENT OF A COPYRIGHT OR A PATENT, THE CONTRACTOR SHALL BE RESPONSIBLE FOR SUCH LOSS UNLESS SUCH INFORMATION IS PROMPTLY FURNISHED TO THE OWNER. THE CONTRACTOR WILL REQUIRE ALL OF THOSE WITH WHOM IT CONTRACTS FOR THE PROJECT TO INCORPORATE THE SAME TERMS AND CONDITIONS SET FORTH IN THIS SECTION.**

70-4 RESTORATION OF SURFACES DISTURBED BY OTHERS. The Owner reserves the right to authorize the construction, reconstruction, or maintenance of any public or private utility service, FAA or National Oceanic and Atmospheric Administration (NOAA) facility, or a utility service of another Government agency at any time during the progress of the Work. To the extent that such construction, reconstruction, or maintenance has been coordinated with the Owner, such authorized work (by others) is indicated in the special conditions, or on the Plans.

Except as described above, the Contractor shall not permit any individual, firm, or corporation to excavate or otherwise disturb such utility services or facilities located within the limits of the Work without the written permission of the Owner.

Should the Owner of public or private utility service, FAA, or NOAA facility, or a utility service of another Government agency be authorized to construct, reconstruct, or maintain such utility service or facility during the progress of the Work, the Contractor shall cooperate with such Owners by arranging and performing the Work in the Contract so as to facilitate such construction, reconstruction or maintenance by others whether or not such work by others is listed above. When ordered by the Owner, the Contractor shall make all necessary repairs to the Work which are due to such authorized work by others, unless otherwise provided for in the Contract Documents. It is understood and agreed that the Contractor shall not be entitled to make any claim for damages due to such authorized work by others or for any delay to the Work resulting from such authorized work.

70-5 FEDERAL AID PARTICIPATION. For AIP contracts, the United States Government has agreed to reimburse the Owner for some portion of the Contract costs. Such reimbursement is made from time to time upon the Owner's (Sponsor's) request to the FAA. In consideration of the United States Government's (FAA's) agreement with the Owner, the Owner has included provisions in the Contract pursuant to the requirements of the Airport Improvement Act of 1982, as amended by the Airport and Airway Safety and Capacity Expansion Act of 1987, and the Rules and Regulations of the FAA that pertain to the Work.

As required by the Act, the Work is subject to the inspection and approval of duly authorized representatives of the Administrator, FAA, and is further subject to those provisions of the rules and regulations that are cited in the Contract Documents.

No requirement of the Act, the rules and regulations implementing the Act, or the Contract shall be construed as making the Federal Government a party to the Contract nor will any such requirement interfere, in any way, with the rights of either party to the Contract.

70-6 SANITARY, HEALTH, AND SAFETY PROVISIONS. The Contractor shall provide and maintain in a neat, sanitary condition such accommodations for the use of his/her employees as may be necessary to comply with the requirements of the state and local Board of Health, or of other bodies or tribunals having jurisdiction.

Attention is directed to Federal, state, and local laws, rules and regulations concerning construction safety and health standards. The Contractor shall not permit any worker to work in surroundings or under conditions that are unsanitary, hazardous, or dangerous to his/her health or safety.

70-7 PUBLIC CONVENIENCE AND SAFETY. Public safety and convenience requirements as described in the Contract Documents shall be the direct responsibility of the Contractor. The Contractor shall be responsible for taking proper safety and health precautions to protect the Work, property, materials, supplies, equipment, workers, and the public.

The Contractor shall control his/her operations and those of his/her Subcontractors and all Suppliers, to assure the least inconvenience to the traveling public. Under all circumstances, safety shall be the most important consideration.

The Contractor is fully responsible for the development and implementation of an on-site safety program. The Contractor’s safety program is to be submitted to the Owner for approval within seven (7) calendar days after the date of a Notice to Proceed (NTP).

The Contractor shall maintain the free and unobstructed movement of aircraft and vehicular traffic with respect to his/her own operations and those of his/her Subcontractors and all Suppliers in accordance with the subsection titled MAINTENANCE OF TRAFFIC of Section 40 hereinbefore specified and shall limit such operations for the convenience and safety of the traveling public as specified in the subsection titled LIMITATION OF OPERATIONS of Section 80 hereinafter.

70-8 BARRICADES, WARNING SIGNS, AND HAZARD MARKINGS. The Contractor shall furnish, erect, and maintain all barricades, warning signs, and markings for hazards necessary to protect the public and the Work. When used during periods of darkness, such barricades, warning signs, and hazard markings shall be suitably illuminated.

For vehicular and pedestrian traffic, the Contractor shall furnish, erect, and maintain barricades, warning signs, lights and other traffic control devices in reasonable conformity with the Manual of Uniform Traffic Control Devices for Streets and Highways (published by the United States Government Printing Office).

When the Work requires closing an Air Operations Area of the Airport or portion of such area, the Contractor shall furnish, erect, and maintain temporary markings and associated Lighting conforming to the requirements of AC 150/5340-1, Marking of Paved Areas on Airports.

The Contractor shall furnish, erect, and maintain markings and associated Lighting of open trenches, excavations, temporary stock piles, and his/her parked construction Equipment that may be hazardous to the operation of emergency fire-rescue or maintenance vehicles on the Airport in reasonable conformance to AC 150/5370-2, Operational Safety on Airports During Construction Activity.

The Contractor shall identify each motorized vehicle or piece of construction Equipment in reasonable conformance to AC 150/5370-2.

The Contractor shall furnish and erect all barricades, warning signs, and markings for hazards prior to commencing Work which requires such erection and shall maintain the barricades, warning signs, and markings for hazards until their dismantling is directed by the Engineer.

Open-flame type lights shall not be permitted within the Air Operations Areas of the Airport.

70-9 USE OF EXPLOSIVES. When the use of explosives is specified as necessary for the prosecution of the Work, the Contractor shall exercise the utmost care not to endanger life or property, including new Work. The Contractor shall be responsible for all damage resulting from the use of explosives.

All explosives shall be stored in a secure manner in compliance with all laws and ordinances, and all such storage places shall be clearly marked. Where no local laws or ordinances apply, storage shall be provided satisfactory to the Engineer and, in general, not closer than 1,000 feet (300 m) from the Work or from any building, road, or other place of human occupancy.

The Contractor shall notify each property Owner and public utility company having Structures or facilities in proximity to the site of the Work of his/her intention to use explosives. Such notice shall be given sufficiently in advance to enable them to take such steps as they may deem necessary to protect their property from injury.

The use of electrical blasting caps shall not be permitted on or within 1,000 feet (300 m) of Airport property.

70-10 PROTECTION AND RESTORATION OF PROPERTY AND LANDSCAPE. The Contractor shall be responsible for the preservation of all public and private property, and shall protect carefully from disturbance or damage all land monuments and property markers until the Owner has witnessed or otherwise referenced their location and shall not move them until directed.

The Contractor shall be responsible for all damage or injury to property of any character during the prosecution of the Work resulting from any act, omission, neglect, or misconduct in his/her manner or method of executing the Work, or at any time due to defective Work or materials, and said responsibility will not be released until the Work shall have been completed and accepted.

When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the Work, or in consequence of the

nonexecution thereof by the Contractor, he shall restore, at his/her own expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, or otherwise restoring as may be directed, or he shall make good such damage or injury in an acceptable manner.

70-11 RESPONSIBILITY FOR DAMAGE – INDEMNITY AND DEFENSE AGREEMENT.

THE FOLLOWING NOTICE LANGUAGE IS PROVIDED TO ALERT THE READER TO INDEMNITY, DEFENSE, AND HOLD HARMLESS TERMS
THIS NOTICE LANGUAGE, BY ITSELF, DOES NOT CREATE AN INDEPENDENT DUTY

***** NOTICE START *****

THIS AGREEMENT CONTAINS PROVISIONS THAT, WHERE NOT PROHIBITED OR LIMITED BY APPLICABLE LAW, MAY INDEMNIFY, DEFEND, AND/OR HOLD HARMLESS/RELEASE THE OWNER FROM THE CONSEQUENCES OF ITS OWN NEGLIGENCE AND OTHER LEGAL FAULT. ACCORDINGLY AND TO THE EXTENT NOT PROHIBITED OR LIMITED BY APPLICABLE LAW, THESE INDEMNIFICATION, DEFENSE, AND HOLD HARMLESS/RELEASE PROVISIONS SHALL BE ENFORCEABLE (UNLESS SPECIFICALLY EXCEPTED HEREIN) REGARDLESS OF WHETHER THE LIABILITY IS BASED ON PAST, PRESENT, OR FUTURE ACTS, CLAIMS OR LEGAL REQUIREMENTS (INCLUDING ANY PAST, PRESENT OR FUTURE LAWS, ENVIRONMENTAL LAW, OCCUPATIONAL SAFETY AND HEALTH LAW, OR PRODUCTS LIABILITY, OR OTHER LEGAL REQUIREMENT), AND REGARDLESS OF WHETHER ANY PERSON/ENTITY (INCLUDING THE PERSON/ENTITY FROM WHOM INDEMNIFICATION IS SOUGHT) ALLEGES OR PROVES THE SOLE, CONCURRENT, CONTRIBUTORY, OR COMPARATIVE NEGLIGENCE OR STRICT LIABILITY OF THE PERSON/ENTITY SEEKING INDEMNIFICATION, OR SOLE, CONCURRENT, CONTRIBUTORY, OR COMPARATIVE NEGLIGENCE OR STRICT LIABILITY IS IMPOSED ON THE PERSON/ENTITY SEEKING INDEMNIFICATION.

***** NOTICE END *****

(A) TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW AND SUBJECT TO THE LIMITATIONS HEREIN (SEE SUBSECTION [C]), THE CONTRACTOR AGREES TO INDEMNIFY, DEFEND, PROTECT AND HOLD HARMLESS, THE OWNER, ITS OFFICERS, DIRECTORS, EMPLOYEES, SERVANTS, AGENTS, AFFILIATES, SUBCONTRACTORS, SUCCESSORS AND ASSIGNS (COLLECTIVELY, THE "INDEMNIFIED PERSONS"), FROM AND AGAINST ANY AND ALL CLAIMS, CAUSES OF ACTION, SUITS, DEMANDS, PROCEEDINGS, DAMAGES, LOSSES, JUDGMENTS, DAMAGES, PENALTIES, FINES, LIABILITIES, COSTS AND EXPENSES (INCLUDING, WITHOUT LIMITATION, REASONABLE AND NECESSARY ATTORNEYS' FEES, CONSULTANTS' FEES, COURT COSTS AND EXPENSES) (COLLECTIVELY REFERRED TO IN THIS SUBSECTION 70-11 AS "CLAIMS"), ARISING OUT OF, INCIDENT TO, OR RESULTING FROM, IN WHOLE OR IN PART, THE FOLLOWING:

(1) THE ACTS, ERRORS, OMISSIONS, NEGLIGENCE, GROSS NEGLIGENCE, FRAUD, WILLFUL MISCONDUCT, STRICT LIABILITY IN TORT, OR BREACH OF ANY WARRANTY, EXPRESS OR IMPLIED, OF THE CONTRACTOR, ITS EMPLOYEES, AGENTS, SERVANTS, CONTRACTORS AND CONSULTANTS OF ALL TIERS, OR ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY IT/THEM, OR ANYONE IT/THEY CONTROL OR EXERCISE CONTROL OVER;
(2) THE FAILURE TO COMPLY WITH APPLICABLE LAWS, REGULATIONS, ORDINANCES, OR ORDER OF ANY PUBLIC AUTHORITY HAVING JURISDICTION OVER THE WORK OF THE CONTRACTOR, ITS EMPLOYEES, AGENTS, SERVANTS, CONTRACTORS AND CONSULTANTS OF ALL TIERS, OR ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY IT/THEM, OR ANYONE IT/THEY CONTROL OR EXERCISE CONTROL OVER; AND/OR
(3) THE BREACH OF THE TERMS AND CONDITIONS OF THE CONTRACT BY THE CONTRACTOR, ITS EMPLOYEES, AGENTS, SERVANTS, CONTRACTORS AND CONSULTANTS OF ALL TIERS, OR ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY IT/THEM, OR ANYONE IT/THEY CONTROL OR EXERCISE CONTROL OVER (COLLECTIVELY, THE "LIABILITIES").

THE FOREGOING DOES NOT REQUIRE THE CONTRACTOR TO INDEMNIFY, HOLD HARMLESS, OR DEFEND THE INDEMNIFIED PERSONS FOR THOSE CLAIMS OR LIABILITIES TO THE EXTENT RESULTING FROM THE NEGLIGENT ACTS OR OMISSIONS OR GROSS NEGLIGENCE OF THE INDEMNIFIED PERSONS.

(B) ADDITIONAL INSURED. NOTWITHSTANDING ANY TERM OR CONDITION TO THE CONTRARY IN THIS SUBSECTION OR ELSEWHERE, TO THE EXTENT PERMITTED BY LAW, THE CONTRACTOR SHALL NAME THE OWNER AS AN ADDITIONAL INSURED UNDER THE CONTRACTOR'S GENERAL LIABILITY POLICY AND PROVIDE ANY DEFENSE PROVIDED BY THE POLICY THAT IS REQUIRED BY THE CONTRACT.

(C) LIMITATIONS. NOTWITHSTANDING ANY TERM OR CONDITION TO THE CONTRARY, IF APPLICABLE FEDERAL, STATE, AND/OR LOCAL STATUTES AND LAWS (INCLUDING, IF AND TO THE EXTENT APPLICABLE, SECTION 2254.0031 OF THE TEXAS GOVERNMENT CODE AND SECTION 271.904 OF THE TEXAS LOCAL GOVERNMENT CODE), PROHIBIT OR OTHERWISE LIMIT THE INDEMNIFY, HOLD HARMLESS, OR DEFENSE TERMS HEREIN, (I) THE CONTRACTOR SHALL NOT BE REQUIRED TO INDEMNIFY, HOLD HARMLESS, OR DEFEND AN INDEMNIFIED PERSON FOR CLAIMS TO THE EXTENT CAUSED BY THE NEGLIGENT ACTS OR OMISSIONS OF THE OWNER OR ITS EMPLOYEES, AND/OR (II) THE DEFENSE, INDEMNITY, AND HOLD HARMLESS OBLIGATIONS IN THIS AGREEMENT SHALL BE REFORMED IF NECESSARY TO COMPLY WITH APPLICABLE LAWS. IF, HOWEVER, THERE IS A DETERMINATION THAT THE CONTRACTOR IS AT FAULT, IN PART OR IN WHOLE, BY FINAL ADJUDICATION OR SETTLEMENT OF A CLAIM OR BY MUTUAL AGREEMENT BY THE PARTIES, THE CONTRACTOR SHALL PAY THE INDEMNIFIED PERSON(S) ITS/THEIR DEFENSE COSTS (INCLUDING, BUT

NOT LIMITED TO, ITS/THEIR REASONABLE AND NECESSARY ATTORNEYS' FEES, CONSULTANTS' FEES, COURT COSTS, AND EXPENSES) EQUAL TO THE CONTRACTOR'S PROPORTIONATE RESPONSIBILITY FOR THE CLAIM.

SUBJECT TO THE ABOVE LIMITATIONS OF THIS SUBSECTION AND APPLICABLE LAWS, THE CONTRACTOR'S OBLIGATIONS UNDER THIS SUBSECTION APPLY TO ALL LIABILITIES, EVEN IF SUCH LIABILITIES ARE ALLEGED TO HAVE BEEN CAUSED OR CONTRIBUTED TO, IN PART, BY THE NEGLIGENCE, GROSS NEGLIGENCE, STRICT LIABILITY, BREACH OR VIOLATION OF A STATUTE, ORDINANCE, GOVERNMENTAL REGULATION, STANDARD OR RULE, BREACH OF CONTRACT, OR OTHER LEGAL FAULT OF ANY INDEMNIFIED PERSON.

(D) Process for Indemnity/Defense Claims. Whenever a claim arises or is subject to any proceeding for which an indemnity may be sought, the Indemnified Person will (1) give the Contractor notice of the claim, (2) permit, at the Indemnified Person's sole option, the Contractor to defend, and control the defense of, the claim, and (3) give the Contractor information, assistance and authority, at the Contractor's expense, reasonably necessary for the Contractor to defend the claim. In addition, each Party will provide to the other written notification and copies of communication from third parties received or made by such parties relating to the claim. Promptly after receipt of the notice described in this paragraph, the Contractor shall in good faith evaluate the claim and notify the Indemnified Person of whether it will undertake the defense of the claim. The Indemnified Person will be entitled to participate in (but not control) the defense of any such action, with counsel of its choosing and at its own expense. However, if at any time the Indemnified Person believes that its potential proportionate responsibility with respect to a claim is greater than the Contractor's potential proportionate responsibility or reasonably believes that the Contractor's control of the defense will prejudice the Indemnified Person's rights, the Indemnified Person may, at its option, assume control of the defense, through counsel of its choice and at its own expense. The Contractor will not, without the Indemnified Person's prior written consent, settle or compromise any claim that assigns to any Indemnified Person liability for all or a portion of the claim or that does not provide for a complete and irrevocable release of all claims against the Indemnified Persons.

(E) Failure to Defend. If the Contractor refuses to undertake the defense of a claim, then if, upon final adjudication or settlement of the claim or mutual agreement by the parties, it is determined that the Contractor is responsible for the claim in part or in whole, the Contractor will promptly reimburse the Indemnified Person for that portion of the costs incurred by or imposed upon the Indemnified Person in connection with the defense of the claim (including reasonable and necessary attorneys' fees, consultants' fees, court costs and expenses) equal to the Contractor's proportionate responsibility, and will pay to the Indemnified Person the portion of damages attributed to the Contractor.

(F) Effect of Workers' Compensation and Other Acts, Insurance, *etc*. The indemnification obligations under this Agreement shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for Contractor, Architect, a Consultant, a Contractor, or anyone directly or indirectly employed by them, under workers' compensation acts, disability benefit acts, insurance, or other employee benefit acts.

(G) Final Payment/Acceptance Not a Waiver. Neither final payment nor acceptance of the Work by the Owner will constitute a waiver of the Contractor's indemnity, hold harmless, and defense obligations.

(H) Survival. The Contractor's indemnity, defense, and hold harmless obligations will survive the termination or expiration of the Contract.

(I) No Effect on Other Obligations. The Contractor's obligations hereunder should not be construed to negate or otherwise reduce other rights or obligations of indemnity, hold harmless, or defense which would otherwise exist as to a party or person described in the Contract Documents.

(J) Flow-Down. **THE CONTRACTOR WILL REQUIRE ALL OF THOSE WITH WHOM IT CONTRACTS FOR THE WORK TO INCORPORATE THE SAME TERMS AND CONDITIONS AS SET FORTH IN THIS SUBSECTION 70-11.**

70-12 THIRD PARTY BENEFICIARY CLAUSE. It is specifically agreed between the parties executing the Contract that it is not intended by any of the provisions of any part of the Contract to create the public or any member thereof a third party beneficiary or create any contract rights as against the Owner or to authorize anyone not a party to the Contract to maintain a suit for personal injuries or property damage or other cause of action against the Owner pursuant to the terms or provisions of the Contract. The foregoing, however, does not limit Owner's rights, *e.g.*, Owner's right to assert Contractor's rights against Subcontractors and Suppliers.

70-13 OPENING SECTIONS OF THE WORK TO TRAFFIC. Should it be necessary for the Contractor to complete portions of the Work for the occupancy or use of the Owner prior to completion of the entire Contract, such "phasing" of the Work shall be specified herein and indicated in the Contract Documents. When so specified, the Contractor shall complete such portions of the Work on or before the date specified or as otherwise specified. The Contractor shall make his/her own estimate of the difficulties involved in arranging his/her Work to permit such occupancy or use by the Owner as described in the special conditions, or on the Plans.

Such portion of the Work listed above, may be occupied by the Owner in accordance with the subsection titled PARTIAL OCCUPANCY of Section 50.

No portion of the Work may be opened by the Contractor for public use until ordered by the Engineer in writing. Should it become necessary to open a portion of the Work to public traffic on a temporary or intermittent basis, such openings shall be made when, in the opinion of the Engineer, such portion of the Work is in an acceptable condition to support the intended traffic. Temporary or intermittent openings are considered to be inherent in the Work and shall not constitute either acceptance of the portion of the Work so opened or a waiver of any provision of the Contract Documents. Any damage to the portion of the Work so opened that is not attributable to traffic which is permitted by the Owner shall be repaired by the Contractor at his/her expense.

The Contractor shall make his/her own estimate of the inherent difficulties involved in completing the Work under the conditions herein described and shall not claim any added compensation by reason of delay or increased cost due to opening a portion of the Work.

70-14 CONTRACTOR'S RESPONSIBILITY FOR WORK. Until the Owner's final written acceptance of the entire completed Work, or a designated portion thereof, the Contractor shall have the charge and care thereof and shall take every precaution against injury or damage to any part due to the action of the elements or from any other cause, whether arising from the execution or from the nonexecution of the Work. The Contractor shall rebuild, repair, restore, and make good all injuries or damages to any portion of the Work occasioned by any of the above causes before final acceptance and shall bear the expense thereof except damage to the Work due to unforeseeable causes beyond the control of and without the fault or negligence of the Contractor, including but not restricted to acts of God such as earthquake, tidal wave, tornado, hurricane or other cataclysmic phenomenon of nature, or acts of the public enemy or of Government authorities.

If the Work is suspended for any cause whatever, the Contractor shall be responsible for the Work and shall take such precautions necessary to prevent damage to the Work. The Contractor shall provide for normal drainage and shall erect necessary temporary structures, signs, or other facilities at his/her expense. During such period of suspension of Work, the Contractor shall properly and continuously maintain in an acceptable growing condition all living material in newly established planting, seedings, and soddings furnished under his/her Contract, and shall take adequate precautions to protect new tree growth and other important vegetative growth against injury.

Neither the final certificate of payment nor any provision in the Contract nor partial or entire use of the Work embraced in this Contract by the Owner, sponsor, or the public shall constitute an acceptance of Work not done in accordance with the Contract Documents or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship.

70-15 CONTRACTOR'S RESPONSIBILITY FOR UTILITY SERVICE AND FACILITIES OF OTHERS. As provided in the subsection titled RESTORATION OF SURFACES DISTURBED BY OTHERS of this Section, the Contractor shall cooperate with the provider of any public or private utility service to construct, reconstruct or maintain its utility services, facilities or structures during the progress of the Work. In addition, the Contractor shall control their operations to prevent the unscheduled interruption of such utility services or damage to such facilities or structures.

To the extent that such public or private utility services, facilities or structures are known to exist within the limits of the Work, the approximate locations have been indicated in the Contract Documents and the owners are indicated in the special conditions, or in the Contract Documents.

It is understood and agreed that the Owner does not guarantee the accuracy or the completeness of the location information relating to existing utility services, facilities, or structures that may be shown in the Contract Documents or encountered in the Work. Any inaccuracy or omission in such information shall not relieve the Contractor of the responsibility to locate and protect such existing facilities and structures from damage or the service from unscheduled interruption.

It is further understood and agreed that the Contractor shall, upon execution of the Contract, notify the providers of all identified utility services, facilities or structures of the Contractor’s plan of operations. Such notification shall be in writing addressed to the PERSON TO CONTACT as provided in the appropriate Contract Documents. A copy of each notification shall be given to the Owner prior to commencement of the Work. Should additional utility services, facilities or structures be discovered during the course of the Work, the Contractor shall notify the Owner within 24 hours and the providers within two business days of the discovery.

In addition to the general written notification, it shall be the responsibility of the Contractor to keep such individual providers advised of changes in the Contractor’s plan of operations that would affect such providers.

Prior to commencing the Work in the general vicinity of an existing utility service, facility or structure, the Contractor shall again notify each such provider of the Contractor’s plan of operation. If, in the Contractor's opinion, the provider's assistance is needed to locate the utility service, facility or structure or if the presence of a representative of the provider is desirable to observe the Work, such advice should be included in the notification. Such notification shall be given by the most expeditious means to reach the utility provider's PERSON TO CONTACT no later than two business days prior to the Contractor's commencement of operations in such general vicinity. The Contractor shall simultaneously, and likewise in the most expeditious manner, furnish a copy of such notice or a written summary of it to the Owner

The Contractor's failure to give the two days’ notice hereinabove provided shall be cause for the Owner to suspend the Contractor's operations in the general vicinity of a utility service, facility or structure until proper, timely notice can first be provided as required above.

Where the outside limits of an underground utility service, facility or structure have been located and staked on the ground, or otherwise identified, the Contractor shall be required to use manual, non-destructive daylighting to locate the utility visually and with certainty within twenty feet (vertically and horizontally) of such outside limits or other identification, prior to commencement of automated (heavy equipment) excavation.

Should the Contractor damage a provider's facility or structure or interrupt the operation of a utility service, by accident or otherwise, the Contractor shall immediately notify the proper authorities, including the Airport Operations Center (AOC), the Owner's Project Manager, and the utility service provider, and the Contractor

shall take all reasonable measures to prevent further damage or interruption of service and to protect the general public. The Contractor, in such events, shall cooperate with the utility service, facility or structure provider, and the Owner continuously until such damage has been repaired and service restored to the satisfaction of the utility service, facility or structure provider.

The Contractor shall bear all costs of repair of damage to utility facilities or structures and of restoration of interrupted utility service, including, without limitation, operational impacts and costs incurred by the Owner for response and mitigation of the incident, due to the Contractor's operations whether or not due to negligence or accident. The Owner reserves the right to deduct such costs from any monies due or which may become due the Contractor under the Contract or under any other contract between Contractor and Owner, or his/her Surety hereunder.

70-16 FURNISHING RIGHTS-OF-WAY. The Owner will be responsible for furnishing all rights-of-way upon which the Work is to be constructed in advance of the Contractor's operations.

70-17 NO WAIVER OF LEGAL RIGHTS. Upon completion of the Work, the Owner will make a final inspection and notify the Contractor of final acceptance. Such final acceptance, however, shall not preclude or stop the Owner from correcting any measurement, estimate, or certificate made before or after completion of the Work, nor shall the Owner be precluded or stopped from recovering from the Contractor or his/her Surety, or both, such overpayment as may be sustained, or by failure on the part of the Contractor to fulfill his/her obligations under the Contract Documents. A waiver on the part of the Owner of any breach of any part of the Contract or the failure to enforce any of the provisions of the Contract shall not be held to be a waiver of any other or subsequent breach and shall not in any way affect, limit or waive the Owner's right thereafter to enforce and compel strict compliance with the terms thereof.

In all cases, the Contractor, without prejudice to the terms of the Contract, shall be liable to the Owner for latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the Owner's rights under any warranty and guaranty.

70-18 ARCHAEOLOGICAL AND HISTORICAL FINDINGS. Unless otherwise specified in this subsection, the Contractor is advised that the site of the Work is not within any property, district, or site, and does not contain any building, structure, or object listed in the current National Register of Historic Places published by the United States Department of Interior.

Should the Contractor encounter, during his/her operations, any building, part of a building, structure, or object which is incongruous with its surroundings, he shall immediately cease operations in that location and notify the Owner. The Owner will investigate the Contractor's finding and will direct the Contractor to either resume his/her operations or to suspend operations as directed.

Should the Owner order suspension or a change to of the Contractor's operations in order to protect an archaeological or historical finding, such shall be covered by an appropriate Contract modification. If appropriate as determined by the Owner, the Contract modification shall include an extension of Contract Time in accordance with the subsection titled DETERMINATION AND EXTENSION OF CONTRACT TIME of Section 80.

70-19 PERSONAL LIABILITY OF PUBLIC OFFICIALS. In carrying out any of the Contract provisions or in exercising any power or authority granted to it by this Contract, there shall be no liability upon any officer or employee of the Owner or the Cities of Dallas and Fort Worth (Cities), either personally or as an official

or employee of the Owner or the Cities. It is understood that in such matters they act solely as agents and representatives of the Owner or the Cities.

70-20 COMPOSITION OF CONTRACTOR. If the Contractor hereunder is comprised of more than one legal entity, each such entity shall be jointly and severally liable hereunder.

70-21 BINDING EFFECT. The Contract shall inure to the benefit of and be binding upon the Contractor and the Owner and their respective legal representatives, successors, and assigns.

END OF SECTION 70

SECTION 80 - PROSECUTION AND PROGRESS

80-1 PRIVITY OF CONTRACT & ASSIGNMENT OF RIGHTS. The Owner will not recognize any Subcontractor or Supplier on the Work. The Contractor shall at all times when Work is in progress be represented either in person, by a qualified Superintendent, or by other designated, qualified representative who is duly authorized to receive and execute orders of the Owner.

The Contractor may not assign the Contract or any of its rights or obligations without the prior written consent of the Owner and, even then, the Contractor may only assign the Contract on the condition that said assignment shall be concurred in by the Surety, shall be presented for the consideration and approval of the Owner before execution, and shall be consummated only on the written final approval of the Owner, which may be withheld for any reason. In case of approval, the Contractor shall file copies of all subcontracts with the Owner. The Owner may also request copies of all subcontracts at any time. The Owner and the Cities of Dallas and Fort Worth reserve the right to transfer their interests herein to any other governmental body set up to or authorized by law to operate the Airport.

Notwithstanding the foregoing, each agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that assignment is effective only for those agreements that the Owner accepts by written notification to the Contractor and/or those architects, consultants, and/or contractors whose agreements the Owner has accepted for assignment. When the Owner accepts the assignment of an agreement, the Owner assumes the Contractor's rights under the agreement. The Contractor agrees to execute whatever instruments the Owner may reasonably request to confirm all applicable assignments. On request, the Contractor further agrees to provide the Owner with a copy of its agreements related to the Work. Upon such assignment to the Owner under this subsection, the Owner may further assign the agreement to a successor contractor or other entity.

80-2 NOTICE TO PROCEED. The Notice to Proceed or Limited Notice to Proceed, as applicable, shall state the date on which it is expected the Contractor will begin the Work and from which date Contract Time will be charged. The Contractor shall begin the Work within 10 days of the date set by the Owner in the written Notice to Proceed or Limited Notice to Proceed, as applicable, but in any event, the Contractor shall notify the Owner at least 24 hours in advance of the time actual construction operations will begin.

The Contractor shall not commence any construction prior to the date on which the Notice to Proceed is issued by the Owner.

80-3 PROJECT PROGRESS SCHEDULE. The Contractor shall submit a coordinated construction schedule for all Work activities. The schedule shall be prepared as a network diagram in Critical Path Method (CPM), Primavera P3 or P6 format. At a minimum, it shall provide information on the sequence of Work activities, interdependence of activities, milestone dates, and activity duration.

The Contractor shall submit an interim schedule followed by a baseline schedule, or only a baseline schedule, depending on when the Contractor starts work. Generate the baseline schedule using Primavera P3 or P6 format. The Contractor shall submit a baseline schedule within 30 days of the execution of the Contract or within 10 days after the effective date of the Notice to Proceed, whichever is sooner. Any revisions shall be submitted within 10 days after the initial review.

The Contractor shall maintain the Work schedule and provide an update and analysis of the progress schedule on a monthly basis, or as otherwise specified in the Contract. A monthly update schedule is a schedule in which only progress is updated from the prior data date to the current data date. Submission of the Work schedule shall not relieve the Contractor of overall responsibility for scheduling, sequencing, and coordinating all Work to comply with the requirements of the Contract.

The Contractor shall be responsible for assuring all Work, including all Subcontractor work, is included in the schedule. The Contractor shall be responsible for assuring that all Work sequences are logical and that the schedule indicates a coordinated plan.

80-4 PROGRAM MANAGEMENT SOFTWARE. The Owner utilizes Program Management Software on its computer system, to efficiently and effectively manage construction projects. This system allows many project management functions to be conducted electronically. The Contractor may be directed by the Owner to enter specific project related information directly into the Owner's Program Management Software in the Owner's computer system on a day-to-day basis. Some project management functions that are executed within the system the Contractor may be responsible for include (but are not limited to) Potential Change Order information, Meeting Minutes, Requests for Information (RFIs), Submittal Register, Submittal Packages, Daily Details, and Daily Work Journals.

Unless otherwise specified, the Contractor will use Owner supplied software licenses when using the Owner's system.

80-5 PROSECUTION AND PROGRESS. Unless otherwise specified, the Contractor shall submit his/her progress schedule for the Owner's approval within 10 days after the effective date of the Notice to Proceed. The Contractor's progress schedule, when approved by the Owner, may be used to establish major construction operations and to check on the progress of the Work. The Contractor shall provide sufficient materials, equipment, and labor to guarantee the completion of the Work in accordance with the Contract Documents within the Contract Time.

If the Contractor falls significantly behind the submitted schedule, the Contractor shall, upon the Owner's request, submit a revised schedule for completion of the Work within the Contract Time and modify his/her operations to provide such additional materials, equipment, and labor necessary to meet the revised schedule. Should the prosecution of the Work be discontinued for any reason, the Contractor shall notify the Owner at least 24 hours in advance of resuming operations.

80-6 LIMITATION OF OPERATIONS. When the Work requires the Contractor to conduct his/her operations within an Air Operations Area of the Airport, the Contractor shall control his/her operations and the operations of his/her Subcontractors and all Suppliers so as to provide for the free and unobstructed movement of aircraft in the Air Operations Areas of the Airport.

When the Work requires the Contractor to conduct his/her operations within an Air Operations Area, the Work shall be coordinated with Airport management (through the Engineer) at least 48 hours prior to commencement of such Work. The Contractor shall not close an Air Operations Area until so authorized by the Engineer and until the necessary temporary marking and associated Lighting is in place as provided in the subsection titled BARRICADES, WARNING SIGNS, AND HAZARD MARKINGS of Section 70.

When the Work requires the Contractor to perform within an Air Operations Area on an intermittent basis (intermittent opening and closing of the Air Operations Area), the Contractor shall maintain constant communications as hereinafter specified; immediately obey all instructions to vacate the Air Operations Area; immediately obey all instructions to resume Work in such Air Operations Area. Failure to maintain the specified communications or to obey instructions shall be cause for suspension of the Contractor's operations in the Air Operations Area until the satisfactory conditions are provided. The Air Operations Area (AOA) cannot be closed to operating aircraft to permit the Contractor's operations on a continuous basis and will therefore be closed to aircraft operations intermittently as described in the Contract Documents.

80-7 CHARACTER OF WORKERS, METHODS, AND EQUIPMENT. The Contractor shall, at all times, employ sufficient labor and equipment for prosecuting the Work to full completion in the manner and time required by the Contract Documents.

All workers shall have sufficient skill and experience to perform properly the Work assigned to them. Workers engaged in special Work or skilled Work shall have sufficient experience in such Work and in the operation of the equipment required to perform the Work satisfactorily.

All equipment which is proposed to be used on the Work shall be of sufficient size and in such mechanical condition as to meet requirements of the Work and to produce a satisfactory quality of work. Equipment

used on any portion of the Work shall be such that no injury to previously completed work, adjacent property, or existing Airport facilities will result from its use.

When the methods and equipment to be used by the Contractor in accomplishing the Work are not prescribed in the Contract Documents, the Contractor is free to use any methods or equipment that will accomplish the Work in conformity with the requirements of the Contract Documents.

When the Contract Documents specify the use of certain methods and equipment, such methods and equipment shall be used unless others are authorized by the Owner. If the Contractor desires to use a method or type of equipment other than specified in the contract, he may request authority from the Owner to do so. The request shall be in writing and shall include a full description of the methods and equipment proposed and of the reasons for desiring to make the change. If approval is given, it will be on the condition that the Contractor will be fully responsible for producing Work in conformity with Contract Documents. If, after trial use of the substituted methods or equipment, the Owner determines that the Work produced does not meet the requirements of the Contract Documents, the Contractor shall discontinue the use of the substitute method or equipment and shall complete the remaining Work with the specified methods and equipment. The Contractor shall remove any deficient Work and replace it with Work of specified quality, or take such other corrective action as the Owner may direct. No change will be made in basis of payment for the Contract Items involved nor in Contract Time as a result of authorizing a change in methods or equipment under this subsection.

80-8 TEMPORARY SUSPENSION OF THE WORK. The Owner shall have the authority to suspend the Work wholly, or in part, for such period or periods as it may deem necessary, due to unsuitable weather, or any other conditions that the Owner deems, in its sole discretion, unfavorable for the prosecution of the Work, or for such time as is necessary due to the failure on the part of the Contractor to carry out orders given or perform any or all provisions of the Contract. The Owner’s suspension shall not be grounds for termination by the Contractor.

In the event that the Contractor is ordered by the Owner to suspend Work, the Contractor may only be reimbursed for actual money expended on the Work that it performs by agreement of the Owner during the period of shutdown. No allowance will be made for anticipated profits. The period of shutdown shall be computed from the effective date of the Owner 's order to suspend Work to the effective date of the Owner 's order to resume the Work. Claims for such compensation shall be filed with the Owner within the time period stated in the Owner's order to resume Work. The Contractor shall forward his/her claim information substantiating the amount shown on the claim to the Owner for consideration in accordance with local laws or ordinances. No provision of this subsection shall be construed as entitling the Contractor to compensation for delays due to inclement weather, for suspensions made at the request of the Contractor, or for any other delay provided for in the Contract Documents.

If it should become necessary to suspend Work for an indefinite period, the Contractor shall store all materials in such manner that they will not become an obstruction nor become damaged in any way. The Contractor shall take every precaution to prevent damage or deterioration of the Work performed and provide for normal drainage of the Work. The Contractor shall erect temporary structures where necessary to provide for traffic on, to, or from the Airport.

80-9 DETERMINATION AND EXTENSION OF CONTRACT TIME/ADDITIONAL COMPENSATION. The number of calendar or working days allowed for completion of the Work shall be stated in the Contract and shall be known as the CONTRACT TIME.

1. PERFORMANCE OF CIVIL WORK.
    a. CONTRACT TIME based on CALENDAR DAYS shall consist of the number of Calendar Days stated in the Contract counting from the date of the Notice to Proceed and including all Saturdays, Sundays, holidays, and nonworking days. All Calendar Days elapsing between the effective dates of the Owner’s orders to suspend and resume all Work, due to causes not the fault of the Contractor, shall be excluded.

b. If the Contractor is delayed in the commencement, prosecution or completion of the Work that is caused solely by (i) an Owner delay, (ii) an Owner directed change, addition, deletion or modification in the Work, or (iii) by an event beyond the Contractor's reasonable control, provided that none of the foregoing are due to any fault, neglect, act, error, or omission on Contractor's part, then the Contractor may submit a claim for an extension of time and/or additional compensation. Events considered to be beyond the reasonable control of the Contractor are limited to acts of God, acts of the public enemy, fires, floods, earthquakes, epidemics, quarantine restrictions, labor strikes at the job site, freight embargoes, or Weather Days as described below, provided that the listed causes were not foreseeable and did not result from the fault or negligence of the Contractor, and provided further that the Contractor has taken reasonable precautions to prevent further delays owing to such causes.

c. In the event that Contractor's performance of its Work is delayed by an event beyond the reasonable control of the Contractor, the phase/milestone of the Project, the Substantial Completion Date or the Contract Time may be extended by the Owner to reflect the extent of such delay. Consideration of a time extension for events beyond the reasonable control of the Contractor will only be made if the delay directly impacts critical path activities based on the latest accepted Monthly Update Schedule.

d. Delays That Do Not Qualify For Time Extensions or Additional Compensation: Notwithstanding anything to the contrary, an extension of time and/or additional compensation will not be granted for any delay: (1) if the delay was caused by the action and/or inaction of the Contractor, including but not limited to the fault or negligence of the Contractor or its Subcontractors; or (2) for which any remedies are provided for or excluded by any other provision of the Contract; or (3) when the Work is delayed by both an excused delay and a non-excused delay; or (4) which has not been requested in strict accordance with the Contract.

e. Permitting the Contractor to proceed with its Work, or any part thereof, after any extension will in no way operate as a waiver of any other rights on the part of the Owner.

f. Any claim for extension of time (except for claims for Weather Days, which are addressed below) or additional compensation (including, but not limited to, compensation for extended overhead or general conditions costs) shall be made as soon as possible in writing to the Engineer but not later than ten calendar days after the occurrence of the event giving rise to the claim or within ten (10) calendar days after the Contractor first recognizes the condition giving rise to such claim, whichever comes first, and, in all cases, the Contractor shall also notify the Engineer in writing of its intention to claim any additional compensation before beginning the Work on which the claim is based. In case of a continuing event, only one claim notice per calendar month is necessary. The Contractor shall provide an estimate of the probable effect of such delay on the progress of the Work. Furthermore, within ten (10) business days after the end of each calendar month for which the Contractor (or a Subcontractor at any level) will seek additional compensation from the Owner, the Contractor shall submit to the Engineer a detailed and fully-supported document listing the costs claimed for the preceding calendar month by the Contractor and any impacted Subcontractors. It is understood (and the Contractor shall ensure) that these same provisions flow down to Subcontractors working under the Contract. In the event that the Contractor does not strictly comply with the requirements of the Contract Documents, including this subsection, the Contractor shall not be entitled to any an extension of time or additional compensation of any kind for such claim. For the avoidance of doubt, failure to provide the written notice required herein will invalidate any claim. Pending final resolution of a claim and the Owner’s determination, which determination shall be final and binding on the Contractor, the Contractor shall proceed diligently with performance of the Contract. No such extension of time or additional compensation shall release the Contractor or its surety on its performance bond, which obligations shall remain in full force and effect until the discharge of the Contract.

i. No additional time will be granted for weather days associated with this Contract. All Work must be completed by the specified Contract dates, including the dates for each phase and milestone. However, weather events that are exceptionally irregular are excluded. An exceptional weather event shall be defined as an event that prevents work on one (1) or more critical path activities within the baseline schedule for ten (10) or more consecutive planned workdays. The eleventh (11^{th}) consecutive planned workday prevented from occurring by an exceptional irregular weather event shall be grounds for requesting a time extension.

ii. For each exceptional weather event the Contractor encounters that prevents Work on critical path activities on Work Days in the latest accepted Monthly Update Schedule, the Contractor must provide written notice to the Engineer within two work days. The notice to the Engineer will be entitled Notice of Weather Day and must state: 1) the date the weather occurred; 2) the type of weather (including the NOAA weather data); and 3) the critical path activity of the latest accepted Monthly Update Schedule that could not be worked on because of the weather.

iii. The Engineer will review each request for each Weather Day as submitted by the Contractor. The Engineer will notify the Contractor of its decision in writing. If the Owner denies the Weather Day request, the Contractor may appeal the decision to the Owner within ten (10) days of receipt of the denial from the Engineer.

iv. The Owner will grant or deny the request for each Weather Day based upon the facts stated in the request and the actual weather conditions that day as they affected the Contractor's scheduled activities. The Owner will notify the Contractor of that final decision in writing. If the Owner denies the request, the Contractor will not be entitled to a Weather Day for the date requested. The decision of the Owner is final.

g. Any extension of time and/or additional compensation shall release and discharge the Owner, its employees, agents, and representatives from any and all claims for damages of whatever character, including but not limited to disruption, changes in sequence, interference, inefficiency, field or home office costs claimed by the Contractor on account of the aforesaid or any other causes of delay.

h. **FOR THE AVOIDANCE OF DOUBT AND NOTWITHSTANDING ANY TERM OR CONDITION TO THE CONTRARY HEREIN OR IN THE CONTRACT DOCUMENTS, THE OWNER SHALL NOT BE LIABLE FOR ANY MONETARY DAMAGES OR BE OBLIGATED TO PAY THE CONTRACTOR ANY COMPENSATION OF ANY KIND RESULTING FROM DELAYS, DISRUPTIONS, OR HINDERANCES TO THE WORK OF ANY KIND OR NATURE OR FROM ANY CAUSE, WHETHER OR NOT CAUSED BY THE OWNER OR OTHER PARTIES UNDER THE OWNER'S SUPERVISION OR CONTROL EXCEPT A STRICTLY PERMITTED IN THIS SUBSECTION. FUTHER, IN ACCORDANCE WITH SUBSECTION 50-19, IN NO EVENT SHALL THE CONTRACTOR BE ENTITLED TO SPECIAL, INDIRECT, AND CONSEQUENTIAL DAMAGES.**

i. The Contractor's failure to follow the requirements of this subsection constitutes a waiver of the right to file a claim.

2. PERFORMANCE OF FACILITIES WORK.

a. CONTRACT TIME based on CALENDAR DAYS shall consist of the number of calendar days stated in the Contract counting from the date of the notice to proceed and including all Saturdays, Sundays, holidays, and nonworking days. All calendar days elapsing between the effective dates of the OWNER's orders to suspend and resume all work, due to causes not the fault of the Contractor, shall be excluded.

b. Any claim for extension of time or additional compensation for delay (including, but not limited to, compensation for extended overhead or general conditions costs) shall be made as soon as possible in writing to the OWNER but not more than ten days after the commencement of the delay. In case of continuing delay, only one claim notice per calendar month is necessary. The Contractor shall provide an estimate of the probable effect of such delay on the progress of the Work. Furthermore, within ten (10) business days after the end of each calendar month for which the Contractor (or a Subcontractor at any level) has claimed a delay for which the Contractor will ultimately seek additional compensation from the OWNER, the Contractor shall submit to the OWNER a detailed and fully-supported document listing the costs claimed for the preceding calendar month by the Contractor and any impacted Subcontractors, pursuant to the delay. It is understood (and the Contractor shall ensure) that these same provisions flow down to Subcontractors working under the Contract. In the event that the Contractor does not comply with the requirements of this section, the Contractor shall not be entitled to any mark-up for fee (profit) on any compensation ultimately approved by the OWNER for the delay.
c. Seasonal weather conditions shall be considered and included in the planning and scheduling of all Work influenced by high or low ambient temperatures, precipitation and/or saturated soil to ensure completion of all Work within the Contract time. Average historical climatic conditions for the proceeding ten (10) years are published by the National Oceanographic and Atmospheric Administration (NOAA) and entitled “Local Climatological Data-Dallas/Fort Worth, Texas.”
d. For planning purposes, the following shall be considered average workdays lost per month due to weather conditions:

Month	Lost Time in Workdays
January	5
February	4
March	5
April	6
May	6
June	4
July	4
August	4
September	5
October	4
November	4
December	4

e. Contract time extensions (for calendar-day-based Contracts) for abnormal weather conditions will be granted on a day for day basis only to the extent the actual time lost during a particular month exceeds the average lost time indicated in the above table. Days on which no activity has been planned or scheduled are not considered workdays.
f. A time extension to the Contract will extend the Contract Time as referenced here.

80-10 FAILURE TO COMPLETE ON TIME. For each Calendar Day or working day, as specified in the Contract, that any Work remains uncompleted after the Contract Time and/or milestone dates, if any, (including all extensions and adjustments as provided in the subsection titled DETERMINATION AND EXTENSION OF CONTRACT TIME of this Section) the sum specified in the Special Provisions or other Contract Documents as liquidated damages will be deducted from any money due or to become due the Contractor or his/her Surety. Such deducted sums shall not be deducted as a penalty but shall be considered as liquidation of a reasonable portion of damages that will be incurred by the Owner should the Contractor fail to complete the Work in the time provided in his/her Contract.

Permitting the Contractor to continue and finish the Work or any part of it after the time fixed for its completion, or after the date to which the time for completion may have been extended, will in no way operate as a waiver on the part of the Owner of any of its rights under the Contract.

The liquidated damages potentially assessable against Contractor apply only to Contractor's failure to meet the Substantial Completion Date and do not apply to any other breaches of the Contract Documents by Contractor, all such breaches being the subject of separate, independent remedies under the Contract Documents and Applicable Law. If any liquidated damages are found to be unenforceable, in part or in whole, notwithstanding any term or condition to the contrary, the Owner shall be entitled to recover all of its damages, including all actual, direct, special, indirect, and consequential damages resulting therefrom.

80-11 DEFAULT AND TERMINATION OF CONTRACT. The Contractor shall be considered in default of his/her Contract and such default will be considered as cause for the Owner to terminate or suspend the Contract for any of the following reasons if the Contractor:

a. fails to begin the Work within the time specified in the "Notice to Proceed;"
b. fails to perform the Work or fails to provide sufficient workers, equipment or materials to assure completion of Work in accordance with the terms of the Contract Documents;
c. performs the Work unsuitably or neglects or refuses to remove materials or to perform anew such Work as may be rejected as unacceptable and unsuitable;
d. discontinues the prosecution of or abandons the Work;
e. fails to make payment to persons or entities performing portions of the Work in accordance with their respective agreements with the Contractor;
f. repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority;
g. is in breach of a provision of the Contract Documents;
h. submits an Application for Payment, sworn statement, waiver of lien, affidavit or document of any nature whatsoever which is false;
i. engages in behavior that is dishonest, fraudulent, or constitutes a conflict of interest with the Contractor’s obligations;
j. demonstrates that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;
k. demonstrates that the Work cannot be completed for the unpaid balance of the Contract Sum;
l. fails to resume Work which has been discontinued within a reasonable time after notice to do so;
m. becomes insolvent or is declared bankrupt, or commits any act of bankruptcy or insolvency;
n. allows any final judgment to stand against it unsatisfied for a period of 10 days;
o. makes an assignment for the benefit of creditors; or
p. for any other cause whatsoever, fails to carry on the Work in an acceptable manner.

Should the Owner consider the Contractor in default of the Contract for any reason hereinbefore, it may, but is not obligated to, give written notice to the Contractor, and/or the Contractor's Surety as to the reasons for considering the Contractor in default and the Owner's intentions to terminate or suspend the Contract.

If the Contractor or Surety, within a period of 10 days after such notice, does not proceed in accordance therewith in a manner acceptable to the Owner, then the Owner will have full power and authority, without violating the Contract, to take the prosecution of the Work out of the hands of the Contractor, accept assignment of the Contractor’s subcontracts as provided herein, and/or direct the Contractor to take other action acceptable to the Owner. The Owner may appropriate or use any or all materials and equipment that have been mobilized for use in the Work and are acceptable and may enter into an agreement for the completion of said Contract according to the terms and provisions thereof, or use such other methods as in the opinion of the Owner will be required for the completion of said Contract in a manner deemed acceptable by the Owner.

All costs and charges incurred by the Owner, together with the cost of completing the Work, will be deducted from any monies due or which may become due the Contractor. If such expense exceeds the sum which would have been payable under the Contract, then the Contractor and the Surety shall be liable and shall

pay to the Owner the amount of such excess. If the Owner terminates the Contract for one of the reasons stated herein, the Contractor shall not be entitled to receive further payment, if any, until the Work if finished. This subsection does not preclude recovery of other damages, including damages for delay, by the Owner under other provisions of the Contract Documents.

80-12 TERMINATION FOR NATIONAL EMERGENCIES OR OTHER GOVERNMENT ORDER. The Owner may, but is not obligated to, terminate the Contract or portion thereof by written notice when the Contractor is prevented from proceeding with the Work as a direct result of an Executive Order of the President with respect to the prosecution of war or in the interest of national defense. The Owner may, but is not obligated to, terminate the Contract or portion thereof by written notice or as a result of a government order preventing the prosecution of the Work or portion thereof or as a result of another government order that renders the Owner's continued performance of the Contract impracticable.

When the Contract, or any portion thereof, is terminated as provided in this subsection 80-12 before completion of all items of Work, payment will be made for the actual number of units or items of Work properly completed at the stated price in the Contract or as mutually agreed for items of Work partially completed or not started. No claims or loss of anticipated profits shall be considered.

Reimbursement for organization of the Work, and other overhead expenses (when not otherwise included in the Contract), and moving Equipment and Materials to and from the job will be considered, the intent being that an equitable settlement will be made with the Contractor.

Acceptable Materials, obtained or ordered by the Contractor for the Work and that are not incorporated in the Work may, at the option of the Owner, be purchased from the Contractor at actual cost as shown by receipted bills and actual cost records at such points of delivery as may be designated by the Owner.

Termination of the Contract or a portion thereof shall neither relieve the Contractor of his/her responsibilities for the Work nor shall it relieve the Surety of its obligation for and concerning any just claim arising out of the Work.

80-13 TERMINATION FOR CONVENIENCE. The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause. Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall (1) cease operations as directed by the Owner in the notice; (2) take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and, (3) except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing Project agreements, including all purchase orders, and enter into no further Project agreements and purchase orders. In case of such termination for the Owner's convenience, the Contractor, as its sole and exclusive remedy and the Owner's sole liability, shall be entitled to receive payment for Work executed in accordance with the Contract Documents. The Contractor shall not be entitled to lost profits or consequential, special, or indirect damages.

END OF SECTION 80

SECTION 90 – CHANGES IN THE WORK

90-1 CHANGES IN THE WORK AND OF QUANTITIES. The Owner reserves and shall have the right to make such changes in the Work as it deems necessary or desirable to complete the Work. Accordingly, the Owner shall be and is hereby authorized to make such changes in the Work as may increase or decrease the Work, the Contract quantities, or to omit from the Work any Contract Item. Changes in the Work shall be covered by Change Order, or, in the absence of agreement on the terms of a Change Order, the Owner may order a change in the Work by Force Account and the provisions regarding Force Account shall apply. Such changes shall not invalidate any other Contract provision or requirement. The Contractor shall proceed promptly with the changed Work unless otherwise provided in the Change Order or the Owner's directive to perform the Work by Force Account. The Contractor agrees to accept payment for such changes as if the altered Work had been a part of the original Contract.

90-2 CHANGE ORDERS. Change Orders may include a change in the Contract Sum or an extension of Contract Time where, in the Owner's opinion, such extensions are commensurate with the amount and difficulty of added Work. The Contractor's execution of a Change Order is its agreement that it represents and is the full and final settlement and accord and satisfaction of all known and unknown changes necessary in compensation and time with respect to the event(s), occurrence(s), or matter(s) arising out of or related to the changes set forth in this Change Order and all related claims whatsoever, known or unknown, including without limitation, claims for delays, acceleration, loss of productivity, scope changes, design changes, force majeure, disruption, hinderance, interference, inefficiencies, extra work, equitable adjustment, impact, direct costs, indirect costs, overhead costs (of any type and concerning any location), general conditions costs and expenses, general and administrative costs and expenses, general requirements, bonds/insurance costs, profits, fees, all effects (direct, indirect and consequential, including all impacts and ripple effects) and for any other reason whatsoever that the Contractor and/or any of the Contractor's personnel, subcontractors, or suppliers of any tier have, may have, or had, or could have asserted with respect to the event(s), occurrence(s), or matter(s) arising out of or related to the changes set forth in this Change Order. Notwithstanding the foregoing, it is expressly agreed and understood that Contractor's rights and remedies available under the Contract to seek additional time and compensation for future schedule or cost impacts to the extent permitted by General Provisions SECTION 90 – CHANGES IN THE WORK shall remain unchanged

Any claim for payment of a change in the Work that is not covered by a Change Order or an Owner's directive to perform Work by Force Account shall be rejected by the Owner. Accordingly, the Contractor must notify the Owner in writing before proceeding to perform any Work that it believes will add additional cost or require additional time, except in an emergency endangering life or property. Failure to provide the requisite notice will invalidate and waives any subsequent claim for an increase in the Contract Sum or the Contract Time.

90-3 CHANGE ORDER DOCUMENTATION. Change Orders will be processed using the Owner's Project management software. The Contractor shall respond to a Request for Proposal (generated by the Project management software), within 7 Calendar Days of the date of the request. The Contractor's response shall include, at a minimum, the following in order to expedite the review, validation and approval process, and all Contractor proposals shall be prepared in the categories listed below (additional requirements may be requested by the Owner to complete cost validation):

1. Cover Letter.
2. Primary and Subcontractor pricing breakdown.
3. Schedule of line items reflecting existing line item adjustments and establishment of new line items, if warranted.
4. Labor Breakdown. All field labor shall be priced in compliance with Construction Wage Rate Requirements for the Project. If Construction Wage Rate Requirements are not included or not applicable for the Project, the Contractor shall state the hourly rate in the Standard Contractor Proposal Form Template. Certified payroll is required on federally funded Project Change Orders and may be requested by the Owner to validate proposed labor rates on other Change Orders. Additional information required includes, but may not be limited to, name, classification, date, daily hours, total hours, rate and extension for each laborer. In order for the Owner to consider estimated labor costs for inclusion in the

Work, the Contractor shall base the estimated labor costs on the actual costs per hour paid by the Contractor for those workers or crews of workers whom the Contractor reasonably anticipates will perform the Change Order Work, and estimated labor hours shall include hours only for those workmen and working foremen directly involved in performing the Change Order Work. Supervision above the level of working foremen (such as general foremen, non-working foremen, superintendent, project manager, *etc*.) is considered to be included in the Markup (Overhead) and will not be paid separately. The Contractor is required to provide the Owner with all documentation requested in connection with such estimated labor costs (in addition to any other documentation already required by the Contract) in order for the Owner to consider and verify such labor costs.

5. Backup for Equipment Cost. In all cases, the most favorable rental rates will be used (hourly, daily, monthly, yearly, etc.) based on the total time the equipment is required. Additional vehicles will be compensable only if required by additional staff needed to complete Change Order-related work. Additional information required includes, but may not be limited to, designation, dates, daily hours, total hours, rental rate, and extension.
6. Contractor-Owned Equipment, Machinery, and Vehicles in addition to those already specified in the Contract Documents. Rates not defined in the Contract will be paid at the lower of the two following rates taking into account owner rate, equipment age, and geographic region: (a) local EquipmentWatch Blue Book rate found at www.equipmentwatch.com; or (b) actual quotes or invoices from a local lease/rental company. Contractor shall submit to the Owner for review, rates from (a) local EquipmentWatch Blue Book found at www.equipmentwatch.com, and (b) actual quotes or invoices from a local lease/rental company. When the applicable EquipmentWatch rate is the lower of the two, it will be calculated as hourly, daily, weekly, or monthly rate plus the hourly fuel cost. FHWA rates are not applicable. The applicable rate will be full compensation for the use of vehicles, machinery and equipment including fuel, lubricants, water, depreciation and similar operating expenses. Any equipment or vehicles already in use on the Project or already specified in the Contract Documents are not compensable as part of a Change Order unless additional equipment or vehicles are approved by the Owner in its sole discretion. DFW encourages the use of alternate fuels and low-emission vehicles. All vehicles leased or rented or purchased for use on this project, after the award of this contract must be compliant with Hybrid LEV standards. Non-hybrid vehicles leased or purchased on or after the award of this contract, will be ineligible for vehicle cost reimbursements, unless the contractor can prove such vehicles are unavailable Non-hybrid vehicles are those vehicles which are powered solely by internal combustion engines utilizing fossil fuels and flex-fuel vehicles or bi-fuel vehicles powered by petroleum-based fuels and other alternative fuels, such as ethanol. In order to support DFW's movement toward Zero Carbon Emissions, any newly requested and authorized vehicles must be compliant with Hybrid LEV standards. To be eligible for vehicle cost reimbursement, vehicles newly leased or purchased (after award) shall be hybrid Low Emission Vehicles (LEVs) and at a minimum hybrid alternate fuel vehicles (AFVs). AFVs are vehicles that use both an internal combustion engine (ICE) and an electric motor for propulsion. Pure Zero Emissions Vehicles (ZEVs) and Plug-in Hybrid ZEVs are also allowable. The contractor may continue to utilize their own pre-existing vehicles (both leased and purchased before the award of this Contract) and be reimbursed as described above.
7. Leased/Rented Equipment and Vehicles in addition to those already specified in the Contract Documents. These will be validated using actual invoices/quotes from a local lease/rental company. Contractor shall use the rental time frame that provides the best pricing option for the estimated use time of the equipment or vehicle required to accomplish the construction task(s). Any equipment or vehicles already in use on the Project or already specified in the Contract Documents are not compensable a part of a Change Order unless additional equipment or vehicles are approved by the Owner in its sole discretion. DFW encourages the use of alternate fuels and low-emission vehicles. All vehicles leased or rented or purchased for use on this project, after the award of this contract must be compliant with Hybrid LEV standards. Non-hybrid vehicles leased or purchased on or after the award of this contract, will be ineligible for vehicle cost reimbursements, unless

the contractor can prove such vehicles are unavailable Non-hybrid vehicles are those vehicles which are powered solely by internal combustion engines utilizing fossil fuels and flex-fuel vehicles or bi-fuel vehicles powered by petroleum-based fuels and other alternative fuels, such as ethanol. In order to support DFW's movement toward Zero Carbon Emissions, any newly requested and authorized vehicles must be compliant with Hybrid LEV standards. To be eligible for vehicle cost reimbursement, vehicles newly leased or purchased (after award) shall be hybrid Low Emission Vehicles (LEVs) and at a minimum hybrid alternate fuel vehicles (AFVs). AFVs are vehicles that use both an internal combustion engine (ICE) and an electric motor for propulsion. Pure Zero Emissions Vehicles (ZEVs) and Plug-in Hybrid ZEVs are also allowable. The contractor may continue to utilize their own pre-existing vehicles (both leased and purchased before the award of this Contract) and be reimbursed as described above.

8. Backup for Material Cost. Materials costs shall include all materials required by the Contractor and incorporated into the proposal, showing costs, quantities, or unit prices of all items, and transportation costs, as appropriate. Supporting documentation shall include invoices and/or quotes from Suppliers and distributors and receipted invoices for all Materials used and transportation charges. Reimbursement of materials costs shall only be allowed in the amount of the Contractor's actual cost including any and all discounts, rebates or related credits. However, if Materials used on any changed Work are not specifically purchased for such Work but are taken from the Contractor's stock, then in lieu of the invoices the Contractor shall furnish an affidavit certifying that such Materials were taken from his/her stock, that the quantity claimed was actually used, and that the price and transportation claimed represent the actual cost to the Contractor.
9. Related correspondence.
10. Time Impact Analysis. See 01 32 16 Schedules Specification and all supplements and amendments thereto.

The Contractor's Labor Burden is defined as its actual costs that it is legally obligated to pay or actually pays its employees for the Work and the allowable Labor Burden components are limited to: (i) FICA (FICA and Medicare are usually shown as one percent at 7.65%), (ii) FUTA, (iii) SUTA, (iv) workers compensation insurance unless provided under a DFW sponsored ROCIP/PCIP/OCIP or other DFW insurance program, (v) general liability insurance unless provided under a DFW sponsored ROCIP/PCIP/OCIP or other DFW insurance program, (vi) 401(k), retirement, pension, (vii) long-term disability and/or short-term disability insurance, (viii) group medical insurance, (ix) group life insurance, and (x) paid time off, *e.g.*, vacation, holiday, and sick leave for eligible employees. The labor burden rate for overtime will be less than the normal rate as the overtime rate should only consider those expenses tied to wages, *i.e.*, health insurance and paid time off are generally excluded. Labor burden is not applied to personnel that are paid via 1099 or who do not receive the benefits; costs that are incurred for these workers, such as workers compensation insurance and general liability insurance, are allowable. Labor burden is calculated as a percentage of base salary. Labor burden does not include any other insurance coverage (such as, but not limited to, Umbrella, Pollution, Professional Liability) nor does it include cell phones, consumables/incidentals/small tools, bonuses, or safety/PPE/safety supplies/training. Labor Burden shall not include any profit, markup, bonus, or expenses unrelated to the Work, as determined by the Owner. The Contractor shall substantiate the foregoing by payroll and accounting data requested by the Owner. DFW provides and from time to time updates additional Labor Burden Guidelines that the Contractor shall follow in addition to the foregoing.

The Contractor shall provide the Owner, for its review and approval, with its Labor Burden and all actual costs used to calculate its Labor Burden for the Contractor and all the Contractor's Subcontractors, within 21 days of the notification of award of the Contract or no later than the date of the execution of the Contract, whichever is earliest; should Contractor fail to do so such that Owner cannot approve Contractor's Labor Burden and all actual costs used to calculate its Labor Burden within 21 days of the notification of award of the Contract or no later than the date of the execution of the Contract, whichever is earliest, then the Owner may, at its discretion require the Contractor to perform all Work by Force Account, and its payment shall be as provided in the subsection titled PAYMENT FOR FORCE ACCOUNT WORK. Upon the Owner's approval, an expiration date will be established. The approved Labor Burden and Labor Burden Rate will be used for all changed Work, including Force Account Work, until the expiration date. The Contractor shall

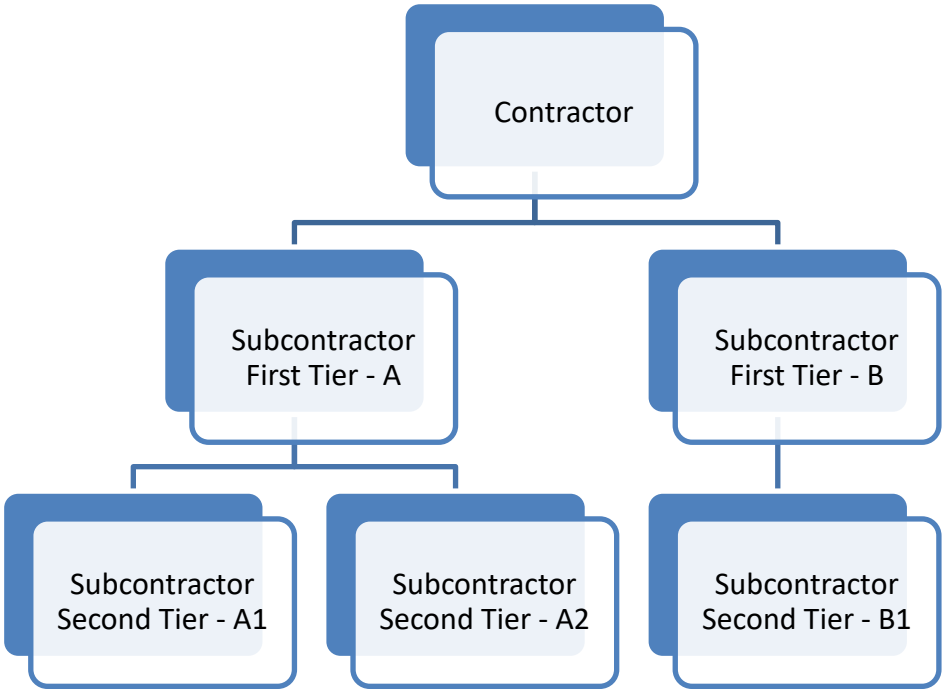
provide the Owner with revised/updated Labor Burden, including all actual costs used to calculate its Labor Burden, 30 days prior to the aforementioned expiration date for approval by the Owner. The Owner's approval of the Contractor's Labor Burden is a material condition precedent to the submission and the Contractor and the Owner's execution of a Change Order, except that the Owner has the right, but not the obligation, to waive application of a Labor Burden. The Contractor is aware that incompleteness of its Labor Burden information may cause delays in the review, processing, and execution of Change Orders. Further, if the Contractor fails to provide the Owner with revised/updated Labor Burden rates 30 days prior to the applicable expiration date, the Owner may, in its discretion, apply the prior approved Labor Burden or waive the Labor Burden.

Markup Percentages (Overhead and Fee/Profit) are inclusive of and are full and complete compensation for the Contractor's profit and all direct costs and indirect costs associated with the Change Order Work. Items included in Overhead include, but are not limited to: home office expenses, branch office and field office overhead expense of any kind; project management, superintendents, general foremen, non-working foremen, estimating, engineering, coordinating expediting, purchasing, detailing, legal, accounting, data processing or other administrative expenses, shop drawings, permits (except those paid by DFW), auto and umbrella insurance, pick-up truck costs, use of small tools, ESOP related costs, and warranty expense.

Notwithstanding any term of condition to the contrary, to the extent there is any adjustment in the Contract Sum, it shall be limited as follows:

a. Miscellaneous. No additional allowance will be made for general superintendence, the use of small tools, or other costs for which no specific allowance is herein provided.
b. Contractor-Owned Equipment, Machinery and Vehicles in addition to those already specified in the Contract Documents. *See* subsection 90-3 titled CHANGE ORDER DOCUMENTATION.
c. Leased/Rented Equipment and Vehicles in addition to those already specified in the Contract Documents. *See* subsection 90-3 titled CHANGE ORDER DOCUMENTATION.
d. Labor, Overhead, and Profit. Costs of labor will be determined at the fixed labor rates per hour for the labor classifications set forth in the Contract with no additional compensation for Labor Burden, overhead, and profit, except that if fixed labor rates are not designated in the Contract, labor costs will be compensated in an amount no greater than the actual direct net cost (which shall not exceed 20%) of (i) the Contractor's labor, (ii) the Contractor's Labor Burden; and (iii) the Contractor's overhead and profit calculated as (1) 10% of the actual net direct labor, labor burden, and Equipment/Materials plus 5% profit for Work performed by the Contractor and (2) 5% of the actual net direct labor, labor burden, and Equipment/Materials for Work performed by Subcontractors. Notwithstanding the foregoing, in the event the Change Order Work is accomplished solely by a Subcontractor, the Contractor shall be limited to five percent (5%) profit of the net direct labor, labor burden, and Equipment/Materials for Work accomplished by a Subcontractor as total markup to cover and compensate the Contractor.

The following chart illustrates how the foregoing is applied.



TOTAL OF ALL PERCENTAGES PAID CONTRACTOR SHALL NOT EXCEED 20%

Who Does Work?	What Percentage?
Contractor only	10% plus 5%
Contractor & First Tier Sub A	10% plus 5% for Contractor Work, plus 5% on all Sub Work 10% plus 5% for First Tier Sub A work
Contractor & First Tier Subs A & B	10% plus 5% for Contractor Work, plus 5% on all Sub Work 10% plus 5% for First Tier Sub A 10% plus 5% for First Tier Sub B
First Tier Sub A (or B) only	5% to Contractor on all Sub Work 10% plus 5% for First Tier Sub A (or B) Work
Contractor & Second Tier Sub A1	10% plus 5% for Contractor Work, plus 5% on all Sub Work 10% plus 5% for Second Tier Sub A1
First Tier Sub A & Second Tier Sub A1	5% to Contractor on all Sub Work 10% plus 5% for First Tier Sub A 10% plus 5% for Second Tier Sub A1
Contractor & Second Tier Sub A1 & Second Tier Sub B1	10% plus 5% for Contractor Work, plus 5% on all Sub Work 10% plus 5% for Second Tier Sub A1 Work 10% plus 5% for Second Tier Sub B1 Work
First Tier Sub A & Second Tier Sub B1	5% to Contractor on all Sub Work 10% plus 5% for First Tier Sub A 10% plus 5% for Second Tier Sub B1

In order for the Owner to consider estimated labor costs for inclusion in the Work, the Contractor shall base the estimated labor costs on the actual costs per hour paid by the Contractor for those workers or crews of workers whom the Contractor reasonably anticipates will perform the Change Order Work, and estimated labor hours shall include hours only for those workmen and working foremen directly involved in performing the Change Order Work. Supervision above the level of working foremen (such as general foremen, non-working foremen, superintendent, project manager, *etc.*) is considered to be included in the Markup (Overhead). Markup Percentages (Overhead and Fee/Profit) are inclusive of and are full and complete compensation for the Contractor's profit and all direct costs and indirect costs associated with the Change Order Work. Items included in Overhead include, but are not limited to: home office expenses, branch office and field office overhead expense of any kind; project management, superintendents, general foremen, non-working foremen, safety manager, quality assurance/quality control, estimating, engineering, coordinating expediting, purchasing, detailing, legal, accounting, data processing or other administrative expenses, shop drawings, permits (except those paid by DFW), auto and umbrella insurance and general liability, pick-up truck costs for superintendent, general and non-working foremen, use of small tools, ESOP related costs, and warranty expense. The Contractor is required to provide the Owner with all documentation requested in connection with its labor costs (in addition to any other documentation already required by the Contract) in order for the Owner to consider and verify all labor costs, estimated or otherwise.

e. Comparison of Record. The Contractor and the Engineer shall compare records of the cost of all Change order Work at the end of each day. Agreement shall be indicated by signature of the Contractor and the Engineer or their duly authorized representatives.

f. Statements Required. No payment will be made for Work performed until the Contractor has furnished the Engineer with duplicate itemized statements of the cost of such Work detailed as follows:

    1. Name, classification, date, daily hours, total hours, rate and extension for each laborer and foreman.
    2. Designation, dates, daily hours, total hours, rental rate, and extension for each unit of machinery and Equipment.
    3. Quantities of Materials, prices, and extensions.
    4. Transportation of Materials.
    5. Cost of property damage, liability and workman's compensation insurance premiums, unemployment insurance contributions, and social security tax.

Statements shall be accompanied and supported by a receipted invoice for all Materials used and transportation charges. However, if Materials used on the Change Order Work are not specifically purchased for such Work but are taken from the Contractor's stock, then in lieu of the invoices the Contractor shall furnish an affidavit certifying that such Materials were taken from his/her stock, that the quantity claimed was actually used, and that the price and transportation claimed represent the actual cost to the Contractor.

90-4 FORCE ACCOUNT. The Owner may, in the absence of agreement on the terms of a Change Order, or if the Contractor fails to provide the Owner, for its review and approval, its Labor Burden and all actual costs used to calculate its Labor Burden for the Contractor and all the Contractor's Subcontractors, within 21 days of the notification of award of the Contract or no later than the date of the execution of the Contract, whichever is earliest, order the Contractor to proceed with a change in the Work by Force Account, and its payment shall be as provided in the subsection titled PAYMENT FOR FORCE ACCOUNT WORK. On receipt of the Owner's directive to proceed with a change in the Work by Force Account, the Contractor shall promptly proceed with the changed Work. If the Owner and the Contractor agree on any adjustments in the Contract Sum and/or Contract Time, such written agreement will be effective immediately and the parties shall execute a Change Order for such changes. If for any reason the Contractor disagrees with the adjustment in the Contract Sum or Contract Time, the Contractor shall submit its claim in strict accordance with the Contract Documents, including the subsections titled CLAIMS FOR ADJUSTMENT AND DISPUTES and/or DETERMINATION AND EXTENSION OF CONTRACT TIME/ADDITIONAL

COMPENSATION, as applicable. Failure to do so shall be a waiver of Contractor's right to dispute any such adjustment in the Contract Sum or Contract Time.

90-5 PAYMENT FOR FORCE ACCOUNT WORK. If the Work to be performed by Force Account provides for an adjustment in the Contract Sum, such Work shall be measured and paid for by unit prices stated in the Contract Documents or, if there are no unit prices in the Contract Documents, then by (i) mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation by the Owner; (ii) costs to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or, in the absence of one of the foregoing agreements, (iii) any adjustment in the Contract Sum shall be limited as follows:

a. Miscellaneous. No additional allowance will be made for general superintendence, the use of small tools, or other costs for which no specific allowance is herein provided.
b. Contractor-Owned Equipment, Machinery, and Vehicles in addition to those already specified in the Contract Documents. Rates not defined in the Contract will be paid at the lower of the two following rates taking into account owner rate, equipment age, and geographic region: (a) local EquipmentWatch Blue Book rate found at www.equipmentwatch.com; or (b) actual quotes or invoices from a local lease/rental company. Contractor shall submit to the Owner for review, rates from (a) local EquipmentWatch Blue Book found at www.equipmentwatch.com, and (b) actual quotes or invoices from a local lease/rental company. When the applicable EquipmentWatch rate is the lower of the two, it will be calculated as hourly, daily, weekly, or monthly rate plus the hourly fuel cost. FHWA rates are not applicable. Such payment will be only for the time actually used on such changed Work and will be full compensation for the use of the trucks, machinery and Equipment including fuel, lubricants, water, depreciation and similar operating expenses. Any equipment or vehicles already in use on the Project or already specified in the Contract Documents are not compensable as part of Force Account Work unless additional equipment or vehicles are approved by the Owner in its sole discretion. DFW encourages the use of alternate fuels and low-emission vehicles. All vehicles leased or rented or purchased for use on this project, after the award of this contract must be compliant with Hybrid LEV standards. Non-hybrid vehicles leased or purchased on or after the award of this contract, will be ineligible for vehicle cost reimbursements, unless the contractor can prove such vehicles are unavailable Non-hybrid vehicles are those vehicles which are powered solely by internal combustion engines utilizing fossil fuels and flex-fuel vehicles or bi-fuel vehicles powered by petroleum-based fuels and other alternative fuels, such as ethanol. In order to support DFW's movement toward Zero Carbon Emissions, any newly requested and authorized vehicles must be compliant with Hybrid LEV standards. To be eligible for vehicle cost reimbursement, vehicles newly leased or purchased (after award) shall be hybrid Low Emission Vehicles (LEVs) and at a minimum hybrid alternate fuel vehicles (AFVs). AFVs are vehicles that use both an internal combustion engine (ICE) and an electric motor for propulsion. Pure Zero Emissions Vehicles (ZEVs) and Plug-in Hybrid ZEVs are also allowable. The contractor may continue to utilize their own pre-existing vehicles (both leased and purchased before the award of this Contract) and be reimbursed as described above.
c. Leased/Rented Equipment and Vehicles in addition to those already specified in the Contract Documents. Lease/Rental operating costs will be determined and paid using actual invoices/quotes paid by the Contractor for equipment rental, fuel/maintenance, delivery, removal and other direct expenses provided the Contractor can substantiate the costs as representative of the most favorable rates for the Dallas/Fort Worth metropolitan area. Contractor shall use the rental time frame that provides the best pricing option for the estimated use time of the equipment or vehicle required to accomplish the construction task(s). Any equipment or vehicles already in use on the Project or already specified in the Contract Documents are not compensable as part of Force Account Work unless additional equipment or vehicles are approved by the Owner in its sole discretion. DFW encourages the use of alternate fuels and low-emission vehicles. All vehicles leased or rented or purchased for use on this project, after the award of this contract must be compliant with Hybrid LEV standards. Non-hybrid vehicles leased or purchased on or after the award of this contract, will be ineligible for vehicle cost reimbursements, unless the contractor can prove such vehicles are unavailable Non-hybrid vehicles are those vehicles which are powered solely by internal combustion

engines utilizing fossil fuels and flex-fuel vehicles or bi-fuel vehicles powered by petroleum-based fuels and other alternative fuels, such as ethanol. In order to support DFW's movement toward Zero Carbon Emissions, any newly requested and authorized vehicles must be compliant with Hybrid LEV standards. To be eligible for vehicle cost reimbursement, vehicles newly leased or purchased (after award) shall be hybrid Low Emission Vehicles (LEVs) and at a minimum hybrid alternate fuel vehicles (AFVs). AFVs are vehicles that use both an internal combustion engine (ICE) and an electric motor for propulsion. Pure Zero Emissions Vehicles (ZEVs) and Plug-in Hybrid ZEVs are also allowable. The contractor may continue to utilize their own pre-existing vehicles (both leased and purchased before the award of this Contract) and be reimbursed as described above.

d. Labor, Overhead, and Profit. Costs of labor will be determined at the fixed labor rates per hour for the labor classifications set forth in the Contract with no additional compensation for Labor Burden, overhead, and profit, except that if fixed labor rates are not designated in the Contract, labor costs will be compensated in an amount no greater than the actual direct net cost (which shall not exceed 20%) of (i) the Contractor's labor, (ii) the Contractor's Labor Burden; and (iii) the Contractor's overhead and profit calculated as (1) 10% of the actual net direct labor labor burden, and Equipment/Materials plus 5% profit for Work performed by the Contractor and (2) 5% of the actual net direct labor, labor burden, and Equipment/Materials for Work performed by Subcontractor. Notwithstanding the foregoing, in the event the Force Account Work is accomplished solely by a Subcontractor, the Contractor shall be limited to five percent (5%) profit of the net direct labor, labor burden, and Equipment/Materials for Work accomplished by a Subcontractor as total markup to cover and compensate the Contractor. *See* subsection 90-3 titled CHANGE ORDER DOCUMENTATION, at (d) for illustrative chart. In order for the Owner to consider estimated labor costs for inclusion in the Work, the Contractor shall base the estimated labor costs on the actual costs per hour paid by the Contractor for those workers or crews of workers whom the Contractor reasonably anticipates will perform the Force Account Work, and estimated labor hours shall include hours only for those workmen and working foremen directly involved in performing the Force Account Work. Supervision above the level of working foremen (such as general foremen, non-working foremen, superintendent, project manager, *etc*.) is considered to be included in the Markup (Overhead). Markup Percentages (Overhead and Fee/Profit) are inclusive of and are full and complete compensation for the Contractor's profit and all direct costs and indirect costs associated with the Force Account Work. Items included in Overhead include, but are not limited to: home office expenses, branch office and field office overhead expense of any kind; project management, superintendents, general foremen, non-working foremen, safety manager, quality assurance/quality control, estimating, engineering, coordinating expediting, purchasing, detailing, legal, accounting, data processing or other administrative expenses, shop drawings, permits (except those paid by DFW), auto and umbrella insurance and general liability, pick-up truck costs for superintendent, general and non-working foremen, use of small tools, ESOP related costs, and warranty expense. The Contractor is required to provide the Owner with all documentation requested in connection with its labor costs (in addition to any other documentation already required by the Contract) in order for the Owner to consider and verify all labor costs, estimated or otherwise.

e. Comparison of Record. The Contractor and the Engineer shall compare records of the cost of Force Account Work at the end of each day. Agreement shall be indicated by signature of the Contractor and the Engineer or their duly authorized representatives.

f. Statements Required. No payment will be made for Work performed on a Force Account basis until the Contractor has furnished the Engineer with duplicate itemized statements of the cost of such Force Account Work detailed as follows:

    1. Name, classification, date, daily hours, total hours, rate and extension for each laborer and foreman.
    2. Designation, dates, daily hours, total hours, rental rate, and extension for each unit of machinery and Equipment.
    3. Quantities of Materials, prices, and extensions.
    4. Transportation of Materials.
    5. Cost of property damage, liability and workman's compensation insurance premiums, unemployment insurance contributions, and social security tax.

Statements shall be accompanied and supported by a receipted invoice for all Materials used and transportation charges. However, if Materials used on the Force Account Work are not specifically purchased for such Work but are taken from the Contractor's stock, then in lieu of the invoices the Contractor shall furnish an affidavit certifying that such Materials were taken from his/her stock, that the quantity claimed was actually used, and that the price and transportation claimed represent the actual cost to the Contractor.

END OF SECTION 90

SECTION 100 – MEASUREMENT AND PAYMENT

100-1 MEASUREMENT OF QUANTITIES. All Work will be measured by the Engineer, or his/her authorized representatives, using United States Customary Units of Measurement.

The method of measurement and computations to be used in determination of quantities of material furnished and of Work performed will be those methods generally recognized as conforming to good engineering practice.

Unless otherwise specified, longitudinal measurements for area computations will be made horizontally, and no deductions will be made for individual fixtures (or leave-outs) having an area of 9 square feet or less. Unless otherwise specified, transverse measurements for area computations will be the neat dimensions shown in the Contract Documents or ordered in writing by the Engineer.

Structures will be measured according to neat lines shown in the Contract Documents or as altered to fit field conditions.

Unless otherwise specified, all Contract Items which are measured by the linear foot such as electrical ducts, conduits, pipe culverts, underdrains, and similar items shall be measured parallel to the base or foundation upon which such items are placed.

In computing volumes of excavation the average end area method or other acceptable methods will be used.

The thickness of plates and galvanized sheet used in the manufacture of corrugated metal pipe, metal plate pipe culverts and arches, and metal cribbing will be specified and measured in decimal fraction of inches.

The term "ton" will mean the short ton consisting of 2,000 pounds avoirdupois. All materials which are measured or proportioned by weights shall be weighed on accurate, approved scales by competent, qualified personnel at locations designed by the Engineer. If material is shipped by rail, the car weight may be accepted provided that only the actual weight of material be paid for. However, car weights will not be acceptable for material to be passed through mixing plants. Trucks used to haul material before paid for by weight shall be weighed empty daily at such times as the Engineer directs, and each truck shall bear a plainly legible identification mark.

Materials to be measured by volume in the hauling vehicle shall be hauled in approved vehicles and measured therein at the point of delivery. Vehicles for this purpose may be of any size or type acceptable to the Engineer, provided that the body is of such shape that the actual contents may be readily and accurately determined. All vehicles shall be loaded to at least their water level capacity, and all loads shall be leveled when the vehicles arrive at the point of delivery.

When requested by the Contractor and approved by the Engineer in writing, material specified to be measured by the cubic yard may be weighed, and such weights will be converted to cubic yards for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the Engineer and shall be agreed to by the Contractor before such method of measurement of pay quantities is used.

Bituminous materials will be measured by the gallon or ton. When measured by volume, such volumes will be measured at 60_F (15_C) or will be corrected to the volume at 60_F (15_C) using ASTM D 1250 for asphalts or ASTM D 633 for tars.

Net certified scale weights or weights based on certified volumes in the case of rail shipments will be used as a basis of measurement, subject to correction when bituminous material has been lost from the car or the distributor, wasted, or otherwise not incorporated in the Work.

When bituminous materials are shipped by truck or transport, net certified weights by volume, subject to correction for loss or foaming, may be used for computing quantities.
Cement will be measured by the ton.

Timber will be measured by the thousand feet board measure (M.F.B.M.) actually incorporated in the structure. Measurement will be based on nominal widths and thicknesses and the extreme length of each piece.

The term "lump sum" when used as an item of payment will mean complete payment for the Work described in the Contract Documents.

When a complete structure or structural unit (in effect, "lump sum" Work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.

Rental of Equipment will be measured by time in hours of actual working time and necessary traveling time of the Equipment within the limits of the Work. Special Equipment ordered by the Engineer in connection with Force Account Work will be measured as agreed in the Change Order or as provided in the subsection titled PAYMENT FOR FORCE ACCOUNT WORK of Section 90.

When the standard manufactured items are specified such as fence, wire, plates, rolled shapes, pipe conduit, etc., and these items are identified by gauge, unit weight, section dimensions, etc., such identification will be considered to be nominal weights or dimensions. Unless more stringently controlled by tolerances in cited Specifications, manufacturing tolerances established by the industries involved will be accepted.

Scales for weighing materials which are required to be proportioned or measured and paid for by weight shall be furnished, erected, and maintained by the Contractor, or be certified permanently installed commercial scales.

Scales shall be accurate within 1/2 percent of the correct weight throughout the range of use. The Contractor shall have the scales checked under the observation of the Inspector before beginning Work and at such other times as requested. The intervals shall be uniform in spacing throughout the graduated or marked length of the beam or dial and shall not exceed 1/10 of 1 percent of the nominal rated capacity of the scale, but not less than 1 pound. The use of spring balances will not be permitted.

Beams, dials, platforms, and other scale equipment shall be so arranged that the operator and the Inspector can safely and conveniently view them.

Scale installations shall have available 10 standard 50-pound weights for testing the weighing equipment or suitable weights and devices for other approved equipment.

Scales must be tested for accuracy and serviced before use at a new site. Platform scales shall be installed and maintained with the platform level and rigid bulkheads at each end.

Scales "overweighing" (indicating more than correct weight) will not be permitted to operate, and all materials received subsequent to the last previous correct weighing-accuracy test will be reduced by the percentage of error in excess of 1/2 of 1 percent.

In the event inspection reveals the scales have been "underweighing" (indicating less than correct weight), they shall be adjusted, and no additional payment to the Contractor will be allowed for materials previously weighed and recorded.

All costs in connection with furnishing, installing, certifying, testing, and maintaining scales; for furnishing check weights and scale house; and for all other items specified in this subsection, for the weighing of materials for proportioning or payment, shall be included in the Contract Sum.

When the estimated quantities for a specific portion of the Work are designated as the pay quantities in the Contract, they shall be the final quantities for which payment for such specific portion of the Work will be made, unless the dimensions of said portions of the Work shown on the Plans are revised by the Engineer. If revised dimensions result in an increase or decrease in the quantities of such Work, the final quantities for payment will be revised in the amount represented by the authorized changes in the dimensions.

100-2 SCOPE OF PAYMENT. The Contractor shall accept compensation provided for in the Contract as full payment for furnishing all materials, for performing all Work under the Contract in a complete and acceptable manner, and for all risk, loss, damage, or expense of whatever character arising out of the nature of the Work or the prosecution thereof, subject to the provisions of the subsection titled NO WAIVER OF LEGAL RIGHTS of Section 70.

When the "basis of payment" subsection of a technical specification requires that the Contract Sum (or price bid) include compensation for certain Work or material essential to the item, this same Work or material will not also be measured for payment under any other Contract Item which may appear elsewhere in the Contract Documents.

Without limiting the Contractor's other obligations, Contractor’s pricing for each line item must carry its full share of the cost of Work, plus its share of overhead and profit. Contractor shall avoid nominal pricing for some lines and enhanced pricing for other lines. DFW reserves the right to reject any bid or pricing that is materially unbalanced.

100-3 COMPENSATION FOR ALTERED QUANTITIES. When the accepted quantities of Work vary from the quantities in the Proposal, the Contractor shall accept as payment in full, so far as Contract Items are concerned, at their original price in the Contract for the accepted quantities of Work actually completed and accepted. No payment, except as provided for in Section 90 (Changes in the Work), will be made for any increased expense, loss of expected reimbursement, or loss of anticipated profits suffered or claimed by the Contractor which results directly from such alterations or indirectly from his/her unbalanced allocation of overhead and profit among the Contract Items, or from any other cause.

100-4 PAYMENT FOR OMITTED ITEMS. Should a Contract Item be subsequently omitted or otherwise ordered to be non-performed, the Contractor shall accept payment in full at the Contract prices for any Work actually completed and acceptable prior to the Engineer's order to omit or non-perform such Contract Item, and the Contractor shall be reimbursed for no more than the actual costs incurred for the purpose of performing the omitted Contract Item prior to the date of the Engineer's order. Such additional costs incurred by the Contractor must be directly related to the deleted Contract Item and shall be supported by certified statements by the Contractor as to the nature of the amount of such costs.

Acceptable Materials ordered by the Contractor and stored off the site at a location agreed upon in writing by the Owner or delivered and suitably stored at the site for the Work prior to the date of the Engineer's order will be paid for at the actual cost to the Contractor and shall thereupon become the property of the Owner. Notwithstanding the foregoing, payment for Materials stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner’s title to such Materials or otherwise protect the Owner’s interest.

100-5 PARTIAL PAYMENTS. Partial payments will be made no more than once each month, unless the Owner authorizes additional Requests for Payments, as the Work progresses and must be requested on forms and in a format approved by the Owner, including a Pay Period Activity Report (PPAR) or Compliance Audit Summary from B2Gnow. Requests for Payment will be prepared by the Contractor, based upon the Contractor’s estimate and subject to the Owner’s approval, of the value of Work performed and Materials complete-in-place in accordance with the Contract Documents. The Contractor’s Pay Request will be reviewed by the Owner (and if necessary, adjusted accordingly) based upon the Owner’s estimate of the value of Work performed and Materials complete-in-place in accordance with the Contract Documents. Such partial payments may also include the delivered actual cost of those Materials stockpiled and stored in accordance with the subsection titled PAYMENT FOR MATERIALS ON HAND of this Section.

No payment shall be made for Work or costs incurred more than ninety (90) calendar days prior to the date the invoice is received by the Owner, unless otherwise approved by the Owner, in its sole discretion.

No partial payment will be made when the amount due the Contractor since the last estimate amounts to less than five hundred dollars.

From the total of the amount determined to be payable on a partial payment, five (5) percent of such total amount will be deducted and retained by the Owner until the final payment is made. The balance (95 percent) of the amount payable, less all previous payments, shall be certified for payment.

When approximately 95 percent of the Work has been completed, the Owner may, at its discretion and with the consent of the Surety, prepare an estimate from which will be retained an amount not less than the estimated cost of the Work remaining to be done. The remainder, less all previous payments and deductions, will then be certified for payment to the Contractor.

The Contractor agrees to include in its monthly invoice an amount that represents all invoices/bills for services, labor and costs incurred by its Subcontractors in the current billing period, and the Contractor further agrees to furnish, as requested by the Owner from time to time, verified statements showing the Contractor's total outstanding indebtedness in connection with the Work.

a. If the Owner receives a written payment request from a Contractor in accordance with the Contract Documents and any other written instructions given to by the Owner for an amount that is allowed to the Contractor for properly performed Work or suitably stored Materials, the Owner shall pay the amount to the Contractor, less any statutory offsets, not later than the 45th day after the Owner receives the request or otherwise in accordance with applicable laws.

b. A Contractor who receives a payment under Paragraph a. (including retainage) or otherwise from an Owner shall pay each of its Subcontractors the portion of the Owner's payment, including interest, if any, that is attributable to Work performed or Materials suitably stored by that Subcontractor if payment for stored Materials is provided for in the Contract, to the extent of that Subcontractor's interest in the Owner's payment. The payment required by this must be made not later than the 7th day after the date the Contractor receives the Owner's payment or no later than the period provided by the Texas Prompt Pay Act (Texas Government Code Chapter 2251), whichever term is shorter.

c. A Subcontractor who receives a payment under Paragraph b. or otherwise from a Contractor shall pay each of its Subcontractors the portion of the payment, including interest, if any, that is attributable to Work performed or Materials suitably stored by that Subcontractor if payment for stored Materials is provided for in the Contract, to the extent of that Subcontractor's interest in the payment. The payment required by this subsection must be made not later than the 7th day after the date the Subcontractor receives the Contractor's payment or no later than the period provided by the Texas Prompt Pay Act (Texas Government Code Chapter 2251), whichever term is shorter.

The Contractor shall pay each Subcontractor its retainage within seven (7) days after the date the Contractor receives the applicable retainage payment from the Owner or no later than the period provided by the Texas Prompt Pay Act (Texas Government Code Chapter 2251), whichever term is shorter. Non-payment by the Contractor shall be a material breach of this Contract.

The Owner may withhold progress payments until the Contractor demonstrates timely payment of sums due consultant(s), contractor(s) and/or Supplier(s), or other persons or entities providing services or work for the Contractor. The Owner also reserves the right to exercise other remedies at law or in equity. The presence of a "pay when paid" provision in a subcontract shall not preclude the Owner's inquiry into allegations of non-payment. Without limiting the Owner's rights or remedies, in the event that the Contractor fails to timely and fully pay its Subcontractors or Suppliers for any reason or the Owner withholds payment as permitted in the Contract Documents, the Owner may, in its sole discretion and without obligation, issue joint checks to the Contractor and to the consultant(s), contractor(s) and/or Supplier(s), or other persons or entities providing services or work for the Contractor to whom the Contractor failed to pay for services or

work properly performed or material or equipment suitably delivered to the site. The remedies for non-payment of Subcontractors shall not be employed when the Contractor clearly demonstrates that failure to pay results from a *bona fide* dispute with its Subcontractor or Supplier. The Contractor shall incorporate this provision into all of its subcontracts.

No partial payment shall bind the Owner to the acceptance of any materials or Work as to quality or quantity. All partial payments are subject to correction at the time of final payment as provided in the subsection titled ACCEPTANCE AND FINAL PAYMENT of this section.

100-6 PAYMENT WITHHELD. The Owner may withhold and/or deduct all or part of any payment otherwise due the Contractor, including retainage to the extent not prohibited by applicable laws, if any one of the following conditions exist (withholding of monies will not deem such payment "late," meaning that no interest shall be due on amounts withheld based on the below reasons or otherwise disputed by the Owner):

a. Defective Work or failure to execute the Work in strict accordance with the Contract Documents.
b. Unauthorized deviations from the Contract Documents.
c. Damage to the Owner or to another contractor.
d. Work not fully completed or corrected, whether before or after Substantial or Final Completion.
e. Reasonable doubt that the Work will be completed within the Contract Time and/or that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay.
f. Failure to keep current as-built records, submittals, and other records at the Project site.
g. Unpaid amounts owed to the Owner for fees and charges for services or permits, assessments for damage to Owner property, or use of Owner facilities and services.
h. Failure to comply with minimum wage rate requirements.
i. Failure to comply with the requirements of the Contract Documents regarding the Project schedule.
j. Failure to pay consultants, Subcontractors, and Suppliers, or other persons or entities providing services or work for the Contractor.
k. The Owner's receipt of notice of non-payment or a claim, lien, attachment, or other encumbrance (or reasonable evidence indicating probable filing of such claim, lien, attachment, or other encumbrance) from any consultant, Subcontractor, or Supplier related to the Work and Contractor's failure to dispute, contest, and resolve such notice of nonpayment, claim, lien, attachment, or other encumbrance in an expeditious manner.
l. Failure to comply with any term in the Contract Documents.
m. Errors in an invoice, including errors found in any previous invoice or progress payment.
n. Written request from the Surety to withhold payment(s).
o. Failure to pay or otherwise credit or reimburse the Owner for amounts due the Owner pursuant to the Contract Documents.
p. Any other reason permitted by applicable laws, *e.g.*, Texas Government Code 2252.032(f).

When the above reasons for withholding payment are resolved to the satisfaction of the Owner and in favor of the Contractor, payment will be made for amounts previously withheld in accordance with applicable laws. If, however, the reasons for withholding are resolved in favor of the Owner, the Contractor shall submit a corrected invoice or pay request that the Owner will pay in accordance with the Texas Government Code, Chapter 2251.

Without limiting the foregoing, if the amount of such withheld payment or other monies due Contractor is insufficient to meet costs, damages, or other losses incurred by the Owner, or if any claim against the Contractor is discharged by the Owner, Contractor and its surety or sureties, if any, shall promptly pay the Owner all costs, damages, or other losses incurred thereby regardless of when such claim arose or whether such claim imposed a lien, attachment, or other encumbrance upon the Project or the real property upon which the Project is situated.

The Contractor warrants that all Work covered by progress payments shall, at the time of the payment, become the sole property of the Owner, but this shall not be construed as relieving the Contractor from the sole responsibility for Work upon which payments have been made or the restoration of any damaged Work, or waiving the right of the Owner to require the fulfillment of all the terms of the Contract Documents. The Contractor further warrants that, upon submittal of a payment request, all Work for which payments have been previously received shall be free and clear of claims, liens, attachments, security interests or encumbrances by the Contractor, its consultants, contractors, material Suppliers, or other persons or entities entitled to make a claim by reason of having provided labor, materials and equipment relating to the Work. Without limiting the Contractor's other indemnity and defense obligations in this Contract, the Contractor shall indemnify and hold the Owner harmless from any claims, liens, attachments, security interests, or encumbrances filed by the Contractor, its consultants, contractors, material Suppliers, or other persons or entities entitled to make a claim by reason of having provided labor, materials and equipment relating to the Work. In the event a lien or other encumbrance is filed, the Contractor shall remove the lien, or see that it is removed or shall furnish a bond for the full amount thereof within seven (7) calendar days of filing of such lien, and failure to do so shall constitute grounds for termination of the Contract. Without limiting any other term or condition, the suffering or permitting of any lien, attachment or other encumbrance, whether valid or invalid, by Contractor or its Subcontractors or Suppliers on the property of the Owner shall preclude, until same is removed, any and all claims or demands for payment to Contractor, and if any such encumbrance is not removed immediately by Contractor, the Owner may pay such claim or demand and remove such encumbrance and may deduct the amount so paid, together with all expenses arising therefrom including attorney's fees, from any further payment to Contractor, or at the Owner's election, Contractor shall, upon demand, reimburse the Owner for the amount paid and all expenses incurred in connection therewith. Any such payment made in good faith by the Owner shall be binding upon Contractor.

Following receipt of proper certified pay requests (as may be adjusted by the Engineer or Owner), the Owner shall make monthly progress payments as the Work proceeds and as approved by the Owner. A proper pay request will be submitted on the DFW Pay Request form and have all appropriate blanks filled in and all documents or information substantiating the Contractor's right to payment required by the Owner attached. The Contractor shall sign the Contractor's Certification as outlined on the form. As a condition to payment, the Owner may request the following additional information and/or documents from the Contractor: (1) a notarized application supported by data substantiating the Contractor's right to payment as the Owner may require (and in the format the Owner may require), such as copies of requisitions from the Contractor's consultants, contractors, material Suppliers, or other persons or entities entitled to make a claim by reason of having provided labor, materials and equipment relating to the Work, and shall reflect retainage if provided for in the Contract Documents; (2) a duly executed and acknowledged sworn statement showing for the Contractor's consultants, contractors, Suppliers, or other persons or entities entitled to make a claim by reason of having provided labor, materials and equipment relating to the Work, the amount of each such agreement, the amount requested in the requested progress payment, and the amount to be paid to such Supplier, Subcontractor or subconsultant from such progress payment; and (3) duly executed, unconditional releases and waivers of claims from the Contractor's consultants, contractors, Suppliers, or other persons or entities entitled to make a claim by reason of having provided labor, materials and equipment relating to the Work, establishing receipt of all previous payments made by Owner and satisfaction of all such payment obligations.

If the Owner deems a pay request to be improper or defective, the Owner will return the pay request to the Contractor for correction(s) and resubmission. In the event portions of the pay request are withheld, the balance of the eligible charges will be processed for payment.

100-7 PAYMENT FOR MATERIALS ON HAND. Partial payments may be made to the extent of the delivered cost of Materials to be incorporated in the Work, provided that such Materials meet the requirements of the Contract Documents and are delivered to acceptable sites on the Airport property or at other sites in the vicinity that are acceptable to the Owner. Such delivered costs of stored or stockpiled Materials may be included in the next partial payment after the following conditions are met:

a. The material has been stored or stockpiled in a manner acceptable to the Engineer at or on an approved site.

b. The Contractor has furnished the Engineer with acceptable evidence of the quantity and quality of such stored or stockpiled materials.
c. The Contractor has furnished the Engineer with satisfactory evidence that the material and transportation costs will be paid.
d. The Contractor has furnished the Owner with satisfactory evidence of costs (invoices), photos, and adequate insurance coverage of such stored or stockpiled materials.
e. Title to material so stored or stockpiled shall immediately vest in the Owner upon the Owner's payment to the Contractor for such material.
f. The Contractor has furnished the Owner evidence that the material so stored or stockpiled is insured against loss by damage to or disappearance of such materials at any time prior to use in the Work.

It is understood and agreed that the transfer of title and the Owner's payment for such stored or stockpiled materials shall in no way relieve the Contractor of his/her responsibility for furnishing and placing such materials in accordance with the requirements of the Contract Documents.
In no case will the amount of partial payments for materials on hand exceed the Contract price for such materials or the Contract price for the Contract Item in which the material is intended to be used.

No partial payment will be made for stored or stockpiled living or perishable plant materials.

The Contractor shall bear all costs associated with the partial payment of stored or stockpiled materials in accordance with the provisions of this subsection.

100-8 ACCEPTANCE AND FINAL PAYMENT. When the Work has been fully completed and accepted in accordance with the requirements of the subsection titled FINAL ACCEPTANCE of Section 50, the Engineer will prepare the final estimate of the items of Work actually performed. The Contractor shall approve the Engineer's final estimate or advise the Engineer of his/her objections to the final estimate which are based on disputes in measurements or computations of the final quantities to be paid under the Contract as amended by a Contract Modification. The Contractor and the Engineer shall resolve all disputes (if any) in the measurement and computation of final quantities to be paid within 30 Calendar Days of the Contractor's receipt of the Engineer's final estimate. If, after such 30-day period, a dispute still exists, the Contractor may approve the Engineer's estimate under protest of the quantities in dispute, and such disputed quantities shall be considered by the Owner as a claim in accordance with the subsection titled CLAIMS FOR ADJUSTMENT AND DISPUTES of Section 50.

After the Contractor has approved, or approved under protest, the Engineer's final estimate, final payment will be processed based on the entire sum, or the undisputed sum in case of approval under protest, determined to be due the Contractor less all previous payments and all amounts to be deducted under the provisions of the Contract. All prior partial estimates and payments shall be subject to correction in the final estimate and payment.

If the Contractor has filed a claim for additional compensation under the provisions of the subsection titled CLAIMS FOR ADJUSTMENTS AND DISPUTES of Section 50 or under the provisions of this subsection, such claims will be considered by the Owner in accordance with local laws or ordinances. Upon final adjudication of such claims, any additional payment determined to be due the Contractor will be paid pursuant to a supplemental final estimate.

Neither the final payment nor the remaining retained percentage, including any retainage withheld, shall become due until the Work has been fully completed and accepted in accordance with the requirements of the subsection titled FINAL ACCEPTANCE of Section 50 and the Contractor submits to the Owner:
a. an affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might in any way be responsible, have been paid or otherwise satisfied;
b. consent of Surety, if any, to final payment;

c. other data establishing payment satisfaction of all such obligations, such as receipts, releases, and waivers of all liens arising out of the Contract, to the extent and in such form as may be designated by the Owner;
d. a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, including a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents;
e. manufacturer's warranties, product data, and maintenance and operations manuals and all other warranties from Subcontractors, manufacturers, and Suppliers given in normal commercial practice;
f. a current set of as-built documents, in good order and marked currently indicate field changes and selections made during construction, and one copy of approved submittals, all as a record of the Work as constructed in the media, electronic or other, that the Owner designates; and
g. all original permits, licenses, and certificates.

Contractor shall obtain affidavits and consent from Subcontractors per paragraphs a. and b. above prior to furnishing same to Owner.

Contractor shall require all warranties, *e.g.*, Subcontractor, manufacturer, and Supplier warranties, to be executed, in writing, for the benefit of the Owner, if directed by the Owner, and shall enforce all warranties for the benefit of the Owner, if directed by the Owner. In the event a warranty has expired, the Owner may bring suit to enforce such warranty.

Further and without limiting the foregoing, neither Substantial Completion nor Final Completion and final payment shall occur until final and complete written approval of the Work, if required, has been obtained from the Owner's Building Inspector, the Owner's Fire Marshal, and any applicable Health Departments.

If any Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a release or waiver required by the Owner and a bond satisfactory to the Owner to indemnify the Owner against any such claim. If claims, demands, security interests, or encumbrances remain unsatisfied after payments are made, the Contractor shall pay to the Owner (or the owner may withhold payments in its discretion) all money that the Owner may be compelled to pay in discharging such claims, demands, security interests, or encumbrances, including all costs and reasonable attorneys' fees.

If, after Substantial Completion of the Work, Final Completion thereof is materially delayed through no fault of the Contractor or by the issuance of Change Order(s) affecting Final Completion, the Owner shall, upon application by the Contractor and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than the retainage stipulated in the Contract Documents, and if bonds have been furnished as provided in the Contract, the written consent of the Surety to the payment of the balance due for that portion of the Work fully completed shall be submitted by the Contractor to the Owner prior to certification of such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

The acceptance of final payment shall constitute a waiver of all claims by the Contractor except those previously made in writing and identified by the Contractor as unsettled at the time of the final application for payment.

The making of partial or final payment or the termination or cancellation of the Contract shall not alter the Contractor's obligations or constitute a waiver of the Owner's rights, including, without limitation, claims by the Owner arising from (1) claims, demands, security interests or encumbrances arising out of the Contract and unsettled; (2) failure of the Work to comply with the requirements of the Contract Documents; or (3) terms of warranties, indemnities, and insurance required by the Contract Documents.

100-9 AUDIT AND RECORDS. The Contractor shall keep full and detailed accounts and exercise such= controls as may be necessary for proper financial management under the Contract; the accounting and= control systems shall be satisfactory to the Owner.

The Contractor (and Contractor's Suppliers, vendors, Subcontractors, insurance agents and other agents) shall maintain and the Owner and its representatives shall be afforded full access to and shall have the right to examine books, records, documents, accounting procedures and practices, correspondence, instructions, drawings, receipts, subcontracts, purchase orders, vouchers, memoranda, and any other supporting evidence deemed necessary by the Owner and in the format reasonably requested by the Owner to substantiate compliance with the Contract, including, but not limited to, costs and charges of whatever nature related to, incurred, and/or anticipated to be incurred, in the performance of the Contract. Such right of examination shall include inspection at all reasonable times of the Contractor's office or facilities or such parts thereof as may be engaged in the performance of the Contract, and reasonable access to and cooperation by all Contractor personnel who have worked on or have knowledge related to the performance of the Contract.

Without limiting the foregoing, the Owner and its representatives shall have the right to examine all books, records, documents, and any other data of the Contractor related to the negotiation, pricing, or performance of the Contract, including Modifications for the purpose of evaluating the accuracy, completeness, and currentness of the cost or pricing data submitted. The right of examination shall extend to all documents necessary to permit adequate evaluation of the cost or pricing data submitted, along with computations and projections used therein. Proprietary/trade secret information pertaining to the Contract may not be withheld from Owner or its authorized representative.

The Contractor shall provide adequate and appropriate work space to conduct all inspections audits and reviews. There shall be no charge to the Owner for reasonable use of the Contractor's or Subcontractor's photocopy machine, nor for any cost of retrieving, downloading to diskette, and/or printing any records or transactions stored in magnetic optical, microfilm, or other media. The Contractor, Subcontractor, and related agent and vendor organizations shall provide all records and retrievals requested, within seven (7) calendar days of written notice from the Owner. If requested, the Contractor shall submit a copy of such documents monthly for review by the Owner.

The information and documents described in this Section shall be made available at the office of the Contractor at all reasonable times, for inspection, audit, reproduction, until the expiration of four (4) years from the date of final payment or for such longer period as may be required by law. If the Contract is completely or partially terminated, the records relating to the terminated work shall be made available for a period of four (4) years from the date of final payment or for such longer period as may be required by law. Records which relate to appeals or litigation or settlement of claims arising out of the performance of the Contract shall be made available for the period of four (4) years from the date of final disposition of such appeals, litigation, or claims, or for such longer period as may be required by law.

The Contractor shall insert a section containing all the provisions of this Section, including this paragraph, in all subcontracts hereunder except altered as necessary for the proper identification of the contracting parties and the Owner under this Contract. The Contractor shall submit copies to the Owner of all subcontracts and changes to subcontracts pertaining to the Contract. Failure to submit such written contracts, or to insert this Section in all subcontracts hereunder, shall be reason to exclude some or all of the related payee's costs from amounts payable to the Contractor pursuant to this Contract.

In addition, where projects are funded wholly or in part by federal grants, the FAA, the Secretary of Transportation and the Comptroller General of the United States or any of their duly authorized representatives shall have access, for the purpose of audit and examination, to any books, documents, papers, and records of the recipient that are pertinent to grants received in accordance with CFR 49, Part 18, as it may be amended from time to time.

If an audit or review in accordance with this Section discloses overcharges (of any nature), by the Contractor, more than 3% of the total value audited, the cost of the Owner's audit shall be paid by the Contractor in addition to the amount overcharged.

END OF SECTION 100

SECTION 110 - CONTRACTOR QUALITY CONTROL PROGRAM

110-1 GENERAL. The Contractor shall establish, provide, and maintain an effective Quality Control Program that details the methods and procedures that will be taken to assure that all work conforms to the Contract Documents and other requirements, whether manufactured by the Contractor, or procured from Subcontractors or vendors. Although guidelines are established and certain minimum requirements are specified herein and elsewhere in the Contract Documents, the Contractor shall assume full responsibility for accomplishing the stated purpose.

The intent of this Section is to enable the Contractor to establish a necessary level of control that will adequately provide for the production and installation of acceptable quality materials.

The Contractor's Quality Control Administrator shall be prepared to discuss and present, at the preconstruction conference/meeting, their understanding of the Quality Control requirements. The Contractor shall not begin any construction or production of materials to be incorporated into the work until the Quality Control Program has been approved by the OAR. No partial payment will be made for materials subject to specific Quality Control requirements until the Quality Control Program has been approved.

The Quality Control requirements contained in this section and elsewhere in the Contract Documents are in addition to and separate from the acceptance testing requirements. Acceptance testing requirements are the responsibility of the Owner's lab of record, as may be applicable.

110-2 DESCRIPTION OF PROGRAM.

a. **General Description.** The Contractor shall establish a Quality Control Program to perform inspection and testing of all items of Work, including those performed by Subcontractors. This Quality Control Program shall ensure conformance to applicable Contract Documents with respect to materials, workmanship, construction, finish, and functional performance. The Quality Control Program shall be effective for control of all Work performed under this Contract and shall specifically include surveillance and tests required by the Contract Documents, in addition to other requirements of this Section and any other activities deemed necessary to establish an effective level of Quality Control.

b. **Quality Control Program.** The Contractor shall describe the Quality Control Program in a written document which shall be reviewed and approved by the OAR prior to the start of any production, construction, or off-site fabrication. The written Quality Control Program shall be submitted for approval at least ten (7) Calendar Days before the start of construction.

The Quality Control Program shall be organized to address, as a minimum, the following items:

a. Quality control organization;
b. Project progress schedule;
c. Submittals schedule;
d. Inspection requirements;
e. Quality control testing plan;
f. Documentation of Quality Control activities;
g. Requirements for corrective action when Quality Control and/or acceptance criteria are not met;
h. Provide a preparatory and initial phase meeting schedule;
i. Must conduct weekly QC Meetings at a location approved by the owner.

The noted requirements are not intended to be all-inclusive. Accordingly, the Contractor shall add any additional elements to the Quality Control Program that are reasonably necessary to adequately control all production and/or construction processes required by the Contract Documents.

110-3 QUALITY CONTROL ORGANIZATION. The Contractor's Quality Control Personnel shall be separate from production personnel. An organizational chart shall be developed to show all Quality Control Personnel.

The organizational chart shall identify all Quality Control staff by name, contact information, function and shall indicate the total staff required to implement all elements of the Quality Control Program, including inspection, and testing for each item of Work. If necessary, different inspectors/technicians can be utilized for specific inspection and testing functions for different items of work. If an outside organization or independent testing laboratory and/or technician is used for implementation of all or part of the Quality Control Program, the personnel assigned shall be subject to the qualification requirements of paragraph 110-3a and 110-3b. The organizational chart shall indicate which personnel are Contractor employees and which are provided by a third-party contractor.

The Quality Control organization shall consist of the following minimum personnel:

a. **Federally Funded.** Quality Control Administrator shall be a full-time employee or consultant engaged by the Contractor. The Quality Control Administrator shall have a minimum of 5 years of experience in airport and/or highway construction and shall have had prior quality control experience on a project of comparable size and scope as the Project. Additional qualifications for the Quality Control Administrator shall include at least 1 of the following requirements:

1. Professional engineer with 1 year of airport paving experience acceptable to the OAR.
2. Engineer-in-training with 2 years of airport paving experience acceptable to the OAR.
3. An individual with 3 years of highway and/or airport paving construction experience acceptable to the Engineer, with a Bachelor of Science Degree in Civil Engineering, Civil Engineering Technology or Construction.
4. If applicable, an individual with a minimum of 5 years' experience is acceptable for MEP and building envelope Projects.
5. A NICET certified engineering technician in CIVIL Engineering Technology with five (5) years of highway and/or airport paving experience.

b. **NON-Federally Funded.** Quality Control Administrator. The Quality Control Administrator shall be a full-time employee or consultant engaged by the Contractor. The Quality Control Administrator shall have a minimum of 5 years of experience in the related field of the scope of the work and of comparable size. Additional qualifications for the Quality Control Administrator shall include at least 1 of the following requirements:

1. Professional engineer with 1 year of experience acceptable to the OAR.
2. Engineer-in-training with 2 years of experience acceptable to the OAR.
3. An individual with 3 years of construction experience acceptable to the OAR, with a Bachelor of Science Degree in Civil Engineering, Civil Engineering Technology or Construction.
4. An individual with a Texas License with a minimum of 5 years' experience is acceptable for MEP and building envelope Projects.

The Quality Control Administrator shall have full authority to institute any and all actions necessary for the successful implementation of the Quality Control Program to ensure compliance with the Contract Documents. The Quality Control Administrator shall report directly to a responsible officer of the construction firm and the OAR. For Projects less than $5 million, The Quality Control Administrator may supervise the Quality Control Program on more than one Project provided that person can be at the job site within 30 minutes after being notified of a problem. For Projects $5 million and over, the Program Administrator during construction shall be located on DFW Airport property for the project duration.

The Quality Control Administrator shall schedule and conduct weekly quality control meetings with the OAR.

a. **Quality Control Technicians.** Each Quality Control Technician shall monitor (1) DFOW activity at all times to implement the Quality Control Program unless otherwise approved by the OAR. The Quality Control Technicians include Quality Control Inspectors, whom the Contractor will employ to conduct quality control inspections and enforce the quality control manual in its entirety. These personnel shall be either engineers or engineering technicians with a degree in a relevant field, and/or experienced craftsman with qualifications in an appropriate field and shall have a minimum of 5 years of experience in their area of expertise. The Quality Control technicians shall report

directly to the Quality Control Administrator and OAR. The Quality Control Technician shall perform the following functions:

1. Inspection of all materials, construction, plant, and equipment for conformance to the Contract Documents, and as required by subsection 110-6.
2. Performance of all Quality Control tests as required by the Contract Documents and subsection 110-7.

b. **Staffing Levels**. The Contractor shall provide a minimum of (1) qualified Quality Control personnel to monitor each work activity at all times. Where material is being produced in a plant for incorporation into the Work, separate plant and field technicians shall be provided at each plant and field placement location. The scheduling and coordinating of all inspection and testing must match the type and pace of Work activity. The Quality Control Program shall state where different technicians will be required for different work elements.

The Quality Control Administrator shall provide the following daily:

1. Technical specification item number and description;
2. Log of approved submittals for monitored DFOW specific to each QC tech;
3. Proper storage of materials and equipment;
4. Proper operation of all equipment;
5. Adherence to the Contract Documents;
6. Review of Quality Control tests; and
7. Safety inspection.
8. Provide corrective action, date of correction, and response to issues within (24) hours in DFW approved software; and
9. All corrective action must be completed within 14 business days.
10. List of re-work items and date of re-work.
11. Provide immediate notification directly to the OAR of any cancellations.
12. Submit a weekly schedule utilizing DFW Quality Control Activity Form (QCAF). Schedule shall be submitted to QA Department each Thursday by COB the week prior. All information on the provided document will be updated immediately upon changes.
13. Material testing results attached to contractor's daily report specific to sample date.
14. RFI's shall be documented within Unifier.
15. Must schedule the delivery to the owner's laboratory for all approved concrete mix designs for establishing maturity curves. Min 3 yds (mix)
16. All documentation requested and required by the OAR will be provided on a DFW approved software.

110-4 SUBMITTALS/SCHEDULE. The Contractor shall submit a detailed listing of all submittals, *e.g.*, mix designs, material certifications, and shop drawings required by the Contract Documents. The listing can be developed in a spreadsheet format and shall include:

a. Specification item number;
b. Item description;
c. Description of submittal;
d. Specification paragraph requiring submittal; and
e. Scheduled date of submittal.

Submittals shall include Shop Drawings, Product Data and Samples as defined below:

a. Shop Drawings: Drawings submitted to the Owner by the Contractor, pursuant to the Contract, showing in detail (1) the proposed fabrication and assembly of structural elements and (2) the installation, *i.e.*, form, fit, and attachment details, of Materials or Equipment. These include drawings, diagrams, layouts, schematics, illustrations, and similar materials furnished by the Contractor to explain in detail specific portions of the Work. The Owner may duplicate, use, and disclose in any manner and for any purpose Shop Drawings delivered under the Contract.

b. Product Data: Illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate a material, product or system for some portion of the Work.
c. Samples: Physical examples which illustrate materials, equipment and workmanship and establish standards by which the Work will be judged.

When certificates of compliance are provided for brand name items specified, a submittal will not be required.

Submissions shall be made in a timely manner and in an orderly sequence so as to cause no delay to the Work. Accordingly, the Contractor shall coordinate all such submittals and review them for accuracy, completeness, and compliance with the requirements of the Contract Documents and shall indicate its approval thereon as evidence of such coordination and review. Submissions to the Owner without evidence of the Contractor approval may be returned for re-submission. By providing submittals the Contractor represents to the Owner that it has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents. If any submittal or resubmittal shows variations from the brand name specified, the Contractor shall describe such variations in writing on a separate transmittal letter at the time of submission.

The Contractor shall perform no portion of the Work for which the Contract Documents require submittals until the Owner has approved the respective submittal. No Shop Drawing, Product Data or Sample shall be issued for construction without the Owner's Review Stamp affixed thereto. Any Work done before Owner approval shall be at the Contractor's risk. Approval by the Owner shall not relieve the Contractor from responsibility for any errors of omissions in such submittal or from responsibility for complying with the requirements of the Contract Documents.

The work shall be in accordance with approved submittals except that the Contractor shall not be relieved of its responsibility to perform the Work consistent with the requirements of the Contract Documents. The Work may deviate from the Contract Documents only if the Contractor has notified the Owner in writing of a deviation from the Contract Documents at the time of the submittal and a Modification is executed authorizing the identified deviation.

All professional design services or certifications to be provided by the Contractor, including all drawings, calculations, specifications, certifications, shop drawings and other submittals, shall contain the signature and seal of the licensed design professional preparing them. Submittals related to the Work designed or certified by the licensed design professionals, if prepared by others, shall bear the licensed design professional's written approval. The Owner and its consultants shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals. The Contractor will promptly correct all defective designs, drawings, and other information provided by it at no cost to the Owner, and the Contractor will reimburse the Owner for all damages, losses, fines, penalties, costs, and expenses resulting from such defective designs, drawings, or information.

Contractor shall keep adequate records of submittals and approvals so that an accurate up-to date record file is maintained in its field office at all times.

110-5 INSPECTION REQUIREMENTS. Quality Control inspection functions shall be organized to provide inspections for all definable features of Work, as detailed below. All inspections shall be documented by the Contractor as specified by subsection 110-7.

Inspections shall be performed daily to ensure continuing compliance with Contract requirements until completion of the particular feature of Work. These shall include the following minimum requirements:

a. During plant operation for material production, Quality Control test results and periodic inspections shall be utilized to ensure the quality of aggregates and other mix components,

and to adjust and control mix proportioning to meet the approved mix design and other requirements of the Contract Documents. All equipment utilized in proportioning and mixing shall be inspected to ensure its proper operating condition. The Quality Control Program shall detail how these, and other Quality Control functions will be accomplished and utilized.

b. During field operations, Quality Control test results and periodic inspections shall be utilized to ensure the quality of all materials and workmanship. All equipment utilized in placing, finishing, and compacting shall be inspected to ensure its proper operating condition and to ensure that all such operations are in conformance to the Contract Documents and are within the plan dimensions, lines, grades, and tolerances specified. The Program shall document how these, and other Quality Control functions will be accomplished and utilized.

110-6 QUALITY CONTROL TESTING PLAN. As a part of the overall Quality Control Program, the Contractor shall implement a Quality Control testing plan, as required by the Contract Documents. The Contractor shall be responsible for providing passing test results for all materials incorporated into the Project. The testing plan shall include the minimum tests and test frequencies required by each technical specification Item, as well as any additional Quality Control tests that the Contractor deems necessary to adequately control production and/or construction processes. The testing plan can be developed in a spreadsheet fashion and shall, as a minimum, include the following:

1. Specification item number, *e.g.*, P-401.
2. Item description, *e.g.*, Plant Mix Bituminous Pavements.
3. Test type, *e.g.*, gradation, grade, asphalt content.
4. Test standard, *e.g.*, ASTM or AASHTO test number, as applicable.
5. Test frequency, *e.g.*, as required by technical Specifications or minimum frequency when requirements are not stated.
6. Responsibility, *e.g.*, plant technician; and
7. Control requirements, *e.g.*, target, permissible deviations.

The testing plan shall contain a statistically based procedure of random sampling for acquiring test samples in accordance with ASTM D 3665. The OAR shall have the opportunity to witness Quality Control sampling and testing at any time.

All Quality Control test results shall be documented by the Contractor as required by subsection 110-07.

110-7 DOCUMENTATION. The Contractor shall maintain current Quality Control records of all inspections and tests performed. These records shall include factual evidence that the required inspections and tests have been performed, including type and number of inspections and tests involved, results of inspections and tests, nature of defects, deviations, causes for rejection, *etc.*, proposed remedial action, and corrective actions taken.

These records must cover both conforming and defective or deficient features and must include a statement that all supplies and materials incorporated in the Work are in full compliance with the Contract Documents. Legible copies of these records shall be furnished to the OAR daily. The records shall cover all work placed subsequent to the previously furnished records and shall be verified and signed by the Contractor's Quality Control Administrator. The Contractor shall keep all records chronologically in a binder and submit them to the owner on request.

Specific Contractor Quality Control records shall include, but are not necessarily limited to, the following records:

a. Daily QC Reports. Each Quality Control technician shall maintain a daily report of all DFOW's performed for both contractor and Subcontractor operations on a form acceptable to the OAR. The daily reports shall provide factual evidence that continuous Quality Control has been performed and shall, at a minimum, include the following for each DFOW per day, per technician:

1. Technical specification item number and description.
2. Log of approved submittals for monitored DFOW specific to each QC tech.
3. Proper storage of materials and equipment.
4. Preparatory meeting documentation for each DFOW daily including meeting minutes.
5. Proper operation of all equipment.
6. Adherence to the plans and specifications.
7. Upon request by the OAR, QC shall provide documentation, photos and/or videos for verification and acceptance of each DFOW.
8. Identified re-work items and re-work documentation.
9. All safety incidents must be reported to OAR immediately upon occurrence.
10. Results of Quality Control tests; and
11. Safety inspection.
12. Immediately Provide OAR/QA Staff requested project status/Updates information upon request.
13. Any of the above requested will be provided upon request to the OAR/QA staff.
14. All documentation requested and required by the OAR will be provided on a DFW approved software.

The daily inspection reports shall identify inspections conducted, results of inspections, location and nature of defects found, causes for rejection, and remedial or corrective actions taken or proposed.

The daily inspection reports shall be signed by the responsible Quality Control Technician and the Quality Control Administrator. The QC technician shall provide all documentation immediately upon request to the OAR. The OAR shall be provided at least one copy of each daily inspection report on the workday following the day of record.

b. Daily Test Reports. The Contractor shall be responsible for establishing a system which will record all Quality Control test results. Daily test reports shall document the following information:

1. Technical specification item number and description.
2. Location.
3. Date of test.
4. Control requirements.
5. Test results.
6. Causes for rejection.
7. Recommended remedial actions; and
8. Retests.

Test results from each day's work period shall be submitted to the OAR prior to the start of the next day's work period. When required by the Contract Documents, the Contractor shall maintain statistical Quality Control charts. The daily test reports shall be signed by the responsible Quality Control Technician and the Quality Control Administrator.

110-8 CONSTRUCTION RECORDS/DRAWINGS. The Contractor shall keep a complete and accurate record of all changes or deviations from the Contract Documents. A record set of prints of the Contract drawings, Plans, shop drawings, and Specifications shall be kept on site. The Owner or its authorized representative shall at all times have access to review record drawings for completeness and accuracy.

The Contractor shall provide to the Owner in electronic format as prescribed by the DFW CADD Standards, one (1) complete draft record set of as-built Contract Documents. The Contractor shall provide to the Owner one (1) complete set of record documents of Contract drawings and one (1) updated set of Plans and Specifications modified to reflect all changes made by Addenda, Modification, and all other modifications, including any field modifications, on or before the date of Substantial Completion. The Owner or its authorized representative shall review the changes for completeness. The Contractor shall then produce a

final record set of as-built Contract Documents, in electronic format as prescribed by the DFW CADD standards, within fifteen (15) calendar days of receipt of comments from the Owner or its authorized representative on which the Contractor shall certify the completeness and accuracy of the Construction Record Drawings and shop drawings by endorsing each drawing sheet with the following statement:

"To the best of [*Name of Contractor*]'s belief and knowledge the as-built conditions shown on this drawing constitute an accurate and complete depiction of the manner in which this portion of the Work was actually installed during performance of Contract No. _____.
[*Name of Contractor*]
[*Signature of Contractor's representative and date*]

Prior to application for Final Payment, the Contractor shall deliver certified as-built Specifications, Plans, and shop drawings to the Owner. The as-built set shall be arranged according to the Contract Drawing and Specification numbering system used in the Contract Documents. The Contractor shall provide an index and cross-referenced listing of each drawing sheet in the as-built set.

For a period of four years from the date of Final Acceptance, the Contractor shall be fully responsible for the accuracy and completeness of Construction Record Drawings and shall bear all costs of damages incurred by the Owner of any nature whatsoever due to inaccuracies or incompleteness of said as-built records, except to the extent that conditions are disturbed by subsequent construction.

The Owner may withhold fifty percent (50%) of progress payments or other amounts deemed appropriate by the Owner if the Contractor fails to comply with the requirements of this Section.

110- 9 NCR DOLLAR ASSIGNMENTS. The objective is to establish and validate the costs associated with NCR money held scenarios.

1. The DFW Staff produces a Non-conformance Report (NCR).
2. The NCR must list a referenced Technical Specification, Contract Line-Item Number, and corresponding Quantity for the item.
3. The CM or QA Manager will assign a dollar value to the NCR using the Line-Item Unit Price and Quantity from the NCR to determine a Non-conformance contract value.
4. The CM will use the information to negotiate an agreement to have the NCR closed.
5. The NCR will not be closed until a copy of such an agreement has been corrected or negotiated by the CM.
6. In addition to the dollar value withheld, the CM with assistance from the QA Manager will negotiate an extended warranty or performance bond, with the Contractor to cover any deficiencies that may arise from the deficient work for a period to be determined by the CM, QC Manager and Contractor.
7. A copy will be attached to the NCR for closure.
8. The CM will be responsible to tracking dollars held on tracking form.

DOLLAR ASSIGNMENT PROCEDURE

Scenario #1 The 50% Penalty is Over $5,000 plus Warranty

A proposed penalty of 50% will be calculated for any deficient item where the total Line-Item Cost of the activity exceeds $5,000.

Example: The structure has developed a crack in it and the Contractor refuses to fix the issue.

- The cost for the Line Item is $1,750,000.
- The proposed penalty will be $1,750,000 x 50% = $875,000
- In addition, the CM will negotiate an additional warranty for a period determined to be fair and equitable.

Scenario #2 Any work below $5000 is The Actual Cost-plus Warranty

The cost for the Line-Item work is below $5,000. The penalty will be for the full amount of the work.

Example: The Contractor forgot to take cylinders on concrete installed for a building footing 30 LF long.

- The Line-Item cost of the footing concrete is $80 / LF.
- The proposed penalty will be $80 x 30LF = $2,400.
- In addition, the CM will negotiate an additional warranty for a period determined to be fair and equitable.

110-10 CORRECTIVE ACTION REQUIREMENTS. The Quality Control Program shall indicate the appropriate action to be taken when a process is deemed, or believed, to be out of control (out of tolerance) and detail what action will be taken to bring the process into control. The requirements for corrective action shall include both general requirements for operation of the Quality Control Program as a whole, and for individual items of Work contained in the Contract Documents.

The Quality Control Program shall detail how the results of Quality Control inspections and tests will be used for determining the need for corrective action and shall contain clear sets of rules to gauge when a process is out of control and the type of correction to be taken to regain process control.

When applicable or required by the Contract Documents, the Contractor shall establish and utilize statistical Quality Control charts for individual Quality Control tests. The requirements for corrective action shall be linked to the control charts.

110-11 SURVEILLANCE BY THE ENGINEER. All items of material and equipment shall be subject to surveillance by the Engineer at the point of production, manufacture or shipment to determine if the Contractor, producer, manufacturer or shipper maintains an adequate Quality Control system in conformance with the requirements detailed herein and the applicable Contract Documents. In addition, all items of materials, equipment and Work in place shall be subject to surveillance by the Engineer at the site for the same purpose.

Surveillance by the Engineer does not relieve the Contractor of performing Quality Control inspections of either on-site or off-site Contractor's or Subcontractor's Work.

110-12 NONCOMPLIANCE.

a. The Engineer has the authority to notify the Contractor of any noncompliance with any of the foregoing requirements. The Contractor shall, after receipt of such notice, immediately take corrective action. Any notice, when delivered by the Engineer or his/her authorized representative to the Contractor or his/her authorized representative at the site of the Work, shall be considered sufficient notice.

b. In cases where Quality Control activities do not comply with either the Contractor's Quality Control Program or the Contract Documents, or where the Contractor fails to properly operate and maintain an effective Quality Control Program, as determined by the Engineer, the Engineer may:
   (1) Order the Contractor to replace ineffective or unqualified Quality Control personnel or Subcontractors.
   (2) Order the Contractor to stop operations until appropriate corrective action is taken.

c. The Contractor’s Quality Control Administrator shall document all issues in Autodesk BIM 360. The Contractor will have 3 days to correct the issue. If the issue is not corrected within the required time, the Contractor will record the issue notice in Unifier. The Contractor’s Quality Control Administrator must maintain, at the Contractor’s expense, access to the BIM document software for the duration of the Project.

END OF SECTION 110

SECTION 120 – ENVIRONMENTAL AND SAFETY PROVISIONS

120-1 ENVIRONMENTAL DEFINITIONS

BEST MANAGEMENT PRACTICES (“BMPs”). Shall mean schedules of activities, prohibition of practices, maintenance procedures, structural controls, compliance with federal and state laws and regulations, and local ordinances, and other management practices to prevent or reduce the Discharge of pollutants to waters in the state of Texas or water of the United States. BMPs also include permit requirements, treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

DISCHARGE. Discharge shall mean an act or omission by which Hazardous Materials, Solid Waste, Process Water, or any substances or materials regulated under Environmental Laws, now or in the future, are leaked, spilled, poured, deposited, or otherwise entered into wetlands, groundwater, waters in the State of Texas, or waters of the United States, or by which those substances are deposited where, unless controlled or removed, they may drain, seep, run, or otherwise enter said waters.

ENVIRONMENTAL IMPACT CLAIM. Shall mean any claim, suit, judgment, penalty, fine, loss, administrative proceeding, request for information, citation, notice, request, inquiry, or expense (including but not limited to any costs of investigation, study, cleanup, removal, response, remediation, transportation, disposal, restoration, monitoring, consultant's fees, contractor's fees, and attorney's fees) which arises out of, is related to, alleges, or is based on the presence, transportation, handling, treatment, storage, or actual or threatened Release, Discharge, dispersal, disposal, escape, or migration of any Hazardous Material, Process Water, or Solid Waste, or any other chemical, material, irritant, pollutant, contaminant, regulated substance, or toxic substance (including but not limited to gasoline, diesel fuel, petroleum hydrocarbons, and any by-product or derivative thereof), whether solid, liquid, or gaseous in nature, or which has any adverse effect on wildlife.

ENVIRONMENTAL LAWS. Shall mean all present and future federal, state, and local laws relating to protection of the environment, public health, and welfare, or safety, including, without limitation, all statutes, regulations, ordinances, permits, Best Management Practices, codes, orders, governmental requirements related to Discharge or Release of Process Water or other pollutants into the environment, waters of the United States, and/or waters in the State of Texas; and protection of areas of particular environmental concern, including, but not limited to, wetlands, areas inhabited by endangered species, and historic sites.

HAZARDOUS MATERIAL. Shall mean any substance:

a. the presence of which requires investigation or remediation under any federal, state or local statute, regulation, ordinance, order, action, policy or common law; or
b. which is or becomes defined as a hazardous waste, hazardous substance, other substance, pollutant or contaminant under any federal, state, or local statute, regulation, rule or ordinance or amendments thereto including, without limitation, the Comprehensive Environmental Response, Compensation and Liability Act, the Resource Conservation and Recovery Act, the Texas Water Code and/or the Texas Health and Safety Code; or
c. the presence of which on the Airport causes or threatens to cause a nuisance upon the Airport or to adjacent properties or poses or threatens to pose a hazard to the health or safety of persons on or about the Airport;
d. without limitation, which contains gasoline, diesel fuel, other petroleum hydrocarbons, natural gas liquids, polychlorinated biphenyls (PCBs), asbestos, perfluorinated compounds, lead paint, or urea formaldehyde foam insulation; or
e. that is defined in Federal Standard No. 313A, in effect on the date of the Contract.

PROCESS WATER. Means water which contains Hazardous Material from any point source subject to permit requirements or subject to the Texas Pollutant Discharge Elimination System, the National Pollutant Discharge Elimination System, the Clean Water Act, or the Texas Water Code, amendments thereto, and regulations promulgated pursuant thereto.

RELEASE. Means any depositing, spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment or threat of release such that a release may or could enter the environment;

SAFETY LAWS. Means any applicable law, regulation, standard, or order of any governmental agency relating to worker safety. The Contractor shall comply with applicable Federal, state, and local laws, codes, ordinances, and regulations (including the obtaining of licenses and permits) in connection with Hazardous Material.

SOLID WASTE. Shall have the same meaning as in the Resource Conservation and Recovery Act, the Texas Health and Safety Code, and the Texas Solid Waste Disposal Act, and shall include sewage.

120-2 ENVIRONMENTAL PROVISIONS, Contractor represents, warrants, and covenants the following:

a. Contractor will obtain and maintain all licenses, permits, exemptions, registrations and other authorizations and provide any notices not obtained or provided by the Owner pursuant to this Contract which are required under Environmental Laws for conducting the Work and Contractor's operations at the Airport.
b. Contractor shall comply and shall cause all its employees, agents, sub-contractors, and other third parties under Contractor's control to comply, and shall include in all subcontracts a provision requiring the sub-contractor to comply and all employees or other third parties under sub-contractor's control to comply with all Environmental Laws. Not by way of limitation, but as emphasis only, Contractor represents, warrants, and covenants that:
    1. Paints and coatings will comply with 30 Texas Administrative Code Section 115.421, and any amendments or successor thereto.
    2. Work involving the use of cut-back asphalt will comply with the 30 Texas Administrative Code Section 115.512, and any amendments or successor thereto. Cut-back asphalt is defined as any asphaltic cement which has been liquefied by blending with petroleum solvents or diluents.
c. Contractor shall comply and shall cause its employees, agents, sub-contractors, and other third parties under Contractor's control to comply with all Owner's policies, rules, regulations, and permits, including, but not limited to, Chapter 6A of the Owner's Code of Rules and Regulations (a copy of which is provided to the Contractor on request), and to conduct the Work consistent with the Owner's commitments under the State Implementation Plan and the National Environmental Policy Act.
d. Contractor shall not cause, contribute to, or permit any Release of any Hazardous Materials, Solid Waste, or Discharge of Process Water by Contractor or its employees, agents, sub-contractors, or other third parties under Contractor's control into the environment or cause, contribute to, or permit any violation of any Environmental Law.
e. Contractor shall dispose of and cause its employees, agents, sub-contractors, or any other third party under Contractor's control to dispose of any Solid Waste or Hazardous Materials generated or located at the Airport in compliance with Environmental Laws, and, if not sooner required by Environmental Laws, Owner's Environmental Rules, or this Contract, at the termination of this Contract shall remove and dispose of all Solid Wastes and Hazardous Materials not incorporated into the Work in accordance with this Contract at its sole expense in a lawful and prompt manner.
f. Contractor shall advise Owner immediately of any potential or actual non-compliance with any Environmental Law or Safety Law on Airport property by any person.
g. Contractor shall, immediately upon receipt, provide Owner with copies of any notice or other document issued to Contractor or its sub-contractors alleging non-compliance or investigating potential non-compliance with any Environmental Law or Safety Law at the Airport.
h. Contractor shall not initiate the Work unless and until it has submitted a Construction Application to Owner and a Construction Permit has been issued for the Project.
i. Contractor shall comply with the Construction Application Review Comments of D/FW Environmental Affairs Department. Contractor shall submit a completed Environmental Close-Out Checklist to D/FW Environmental Affairs Department upon completion of the Work.

j. The Owner will notify the Contractor not to initiate Work beyond the Scope of Work described in the relevant FAA review document issued to Owner pursuant to the National Environmental Policy Act.

k. The Contractor shall use construction equipment which has been designed and equipped to prevent or control air pollution in conformance with the regulations of the federal, state, local and Airport authorities including any applicable State Implementation Plan and revisions thereto as provided by the Owner. Evidence of such design and equipment will be maintained and made available for inspection by the Owner's Authorized Representative.

l. The Contractor shall monitor collected stormwater as required by Owner's Construction Application Review and/or relevant Construction Permit and/or Environmental Close-Out Checklist to insure it meets standards for allowable Discharges set by applicable laws, rules, regulations, ordinances and permits. Records of measurements will be retained by the Contractor for inspection by the Owner's Representative.

m. Contractor shall submit to D/FW Environmental Affairs a completed and signed original Notice of Intent for coverage under the TPDES General Permit for Storm Water Discharges Associated with Construction Activities for submittal to the governing agency by the Owner prior to receiving an approved construction permit.

n. Spills, leaks, or releases of Hazardous Material shall be reported immediately to the Airport Operations Center (AOC).

o. Contractor shall comply with Owner's Spill Reporting Policy, Clean Air Policy, and Hydrocarbon Spill Recovery for Airport Ramp Area.

p. Contractor shall provide a copy of its Storm Water Pollution Prevention Plan (SWPPP) to D/FW Environmental Affairs for review and approval prior to receiving an approved construction permit and the commencement of actual clearing, grading and/or excavation activity.

q. Upon final stabilization of all affected Work areas as defined in accordance with the requirements of the TPDES General Permit for Storm Water Discharges Associated with Construction Activities, the following documents must be submitted to D/FW Environmental Affairs Department:

    1. One copy of the final SWPPP, signed and certified in accordance with 30 Texas Administrative Code (TAC) 305.44, including, at a minimum, the following items: all amendments, maintenance records, and inspection reports.
    2. For sites equal to or greater than 5 acres, a completed original Notice Of Termination (NOT) of Coverage Under the TPDES General Permit for Storm Water Discharges Associated with Construction Activity, signed in accordance with 30 TAC 305.44 for submittal by the Owner to the governing agency.

r. While the Owner may issue instructions to the Contractor concerning the placement and maintenance of erosion and sediment controls, the Contractor shall be solely responsible for complying with all requirements of the SWPPP. The SWPPP shall be reviewed periodically by Contractor for compliance and updated as needed to fit the changing requirements of the Contractor's Work. From time to time, and in Owner's sole discretion, Owner may conduct an inspection, assessment, and/or regulatory compliance audit of the Work and/or Contractor's operations, including operations of Contractor's employees, agents, sub-contractors, or any other third party under Contractor's control. The Owner may perform testing as needed and may conduct interviews of Contractor or its sub-contractors. Contractor will cooperate and will cause its employees, agents, sub-contractors, or any other third party under Contractor's control to fully cooperate in such inspection, assessment, or audit. Contractor remains solely responsible for its environmental compliance, notwithstanding any Owner inspection, audit, or assessment.

s. RESPONSE AND COMPLIANCE ACTIONS

If the Airport or adjacent property is contaminated or otherwise damaged or injured by any Solid Waste or Hazardous Materials released or Discharged by Contractor or its employee, agent, sub-contractor, or any other third party under Contractor's control, Contractor agrees to:

    1. Without limiting the indemnity obligations herein, if during the term of this Contract Contractor or its Subcontractor, agent, employee, licensee, or other parties under

Contractor's direction or control, is the sole cause of a Release, Discharge, or spill of a Hazardous Material (including, but not limited to those which contaminate or pollute any surface water, ground water, infrastructure, or conveyance system), as is reasonably determined by Owner pursuant to Environmental Laws, at any portion of the Airport, in connection with their operations:

(i) orally notify Owner's Airport Operations Center of such Release, Discharge, or spill in accordance with applicable DFW Environmental Rules;

(ii) unless otherwise provided under this Contract, report such Release, Discharge, or spill to appropriate governmental agencies in accordance with applicable Environmental Laws, including, but not limited to, 30 Tx. Admin. Code § 327.3, as it may be amended from time to time, and identify Contractor or, as applicable, its Subcontractor, agent, employee, licensee, or other party under Contractor's direction or control, as a responsible party for such Release, Discharge, or spill; except that Contractor shall have no obligation to report under this subsection s.1.(ii) to the extent such other party has reported such Release, Discharge or spill in accordance with applicable Environmental Laws.

(iii) immediately abate and respond to the Release, Discharge, or spill of a Hazardous Material, as required by applicable Environmental Laws, including but not limited to 30 Tx. Admin. Code § 327.5, as it may be amended from time to time;

(iv) take all further actions necessary or required under Environmental Laws to mitigate any imminent threat to human health or the environment;

(v) undertake any further repairs, remediation, or corrective actions as are required by Environmental Laws or a governmental agency with jurisdiction; and

(vi) undertake any further repairs, remediation, or corrective actions to remediate any such Release, Discharge, or spill of a Hazardous Material, and any resulting pollution or contamination to the extent required to restore the affected property to its condition prior to such Release, Discharge, or spill of Hazardous Material.

2. Without limiting the indemnity obligations herein, if, as is reasonably determined by Owner, the Contractor or its Subcontractor, employee, agent, licensee, or other party under Contractor's direction or control, is the sole cause of a Release, Discharge or spill of a Hazardous Material at the Airport, or one of multiple contributors to a Release, Discharge or spill of a Hazardous Material at the Airport, Contractor shall be responsible for ensuring that the notification and reporting requirements of this Contract are accomplished, and Contractor shall be responsible for abatement, remediation, and other actions required by this Contract. At the time Owner makes a determination pursuant to subsection s.1., Owner shall, at Contractor's request, provide Contractor with all non-privileged records, permits, test results, sample results, written or electronic documentation, studies or other documentation used to support its determination. Nothing in this Contract shall prevent Contractor from seeking to recover its costs from potentially responsible third parties.

3. If, as is reasonably determined by Owner, Contractor:

(i) does not diligently take immediate and all other actions required by applicable Environmental Laws, including, but not limited to, 30 Tx. Admin. Code § 327, in response to a Release, Discharge, or spill for which it is responsible under subsection s.1., within the time(s) prescribed by such Environmental Law(s); or

(ii) does not perform or complete all necessary repairs, corrective actions or remediation for which it is responsible under subsection s.1. within

the time(s) prescribed by applicable Environmental Laws, or within the time reasonably necessary to enable Owner to meet its obligations under Environmental Laws (subject to the condition that Owner must first provide reasonable advance written notice to Contractor of such obligations, except in emergency circumstances in which such advance notice is not possible),

then Owner, in addition to its rights and remedies described elsewhere in this Contract, may, at its election, upon reasonable written notice, enter the affected area, and take whatever action Owner reasonably deems necessary to protect the public health and safety and the environment, or to enable Owner to satisfy the obligations of Contractor under subsection s.1., within the time required under such Environmental Laws, at Contractor's expense, although nothing herein shall prejudice the right of Contractor to contest Owner's determinations made under this subsection s.3.

t. CORRECTION OF ENVIRONMENTAL NON-COMPLIANCE

1. If the operations or activities of Contractor or Contractor's Subcontractors, employees, agents, licensees, or other parties under Contractor's direction or control are in alleged non-compliance with any applicable Environmental Law (as is reasonably determined by Owner or as is determined by any governmental agency with enforcement authority regarding such alleged non-compliance) or DFW Environmental Rule, or result in contamination or pollution at or under the Airport, and provided that the situation or condition in question does not, as determined by Owner in its reasonable discretion, require immediate action pursuant to applicable Environmental Laws and subsection s.3., Owner agrees to notify Contractor in writing of the alleged non-compliance or contamination or pollution and shall require Contractor to take action to address such non-compliance within thirty (30) days of Contractor's receipt of notice, unless compliance is required sooner by a governmental agency or applicable Environmental Law. Within that thirty (30) day period, or such shorter period as is required by applicable Environmental Law or governmental agency, Contractor shall have the opportunity to take whatever action is necessary or required by Environmental Laws or DFW Environmental Rule as a result of such non-compliance under this Section to correct such non-compliance, ensure that it is corrected, or provide Owner a binding commitment to do so within a reasonable time. Contractor shall also have the right during that thirty (30) day period to challenge any Owner determination of non-compliance. Contractor's obligations to Owner under this subsection may be deferred, upon mutual written consent of the parties, until a final resolution of or ruling on such challenge has been issued, unless the time period for compliance with applicable Environmental Laws prohibits such a deferral. Should Contractor prevail in such a challenge, Contractor shall have no further obligation under this subsection with respect to that particular alleged non-compliance.

2. If Contractor does not take such corrective action, challenge Owner's determination of non-compliance, or provide a binding commitment to address the non-compliance within the thirty (30) day period referenced in subsection t.1., Owner or its authorized contractors and consultants may, at Owner's option, enter any part of the Airport and take such measures as Owner may reasonably deem necessary to correct the alleged non-compliance and to investigate and remediate any related contamination in order to satisfy Contractor's obligations in subsection t.1., all at Contractor's expense. All reasonable and documented costs associated with any action by Owner or its contractors or consultants in connection with this subsection, including but not limited to reasonable attorneys' fees and expenses, and Airport staff time and expenses, shall be subject to the reimbursement and indemnification requirements of this Contract.

3. Nothing in this subsection is intended or shall be construed so as to prevent Owner or Contractor from exercising, in their reasonable discretion, any rights granted or available elsewhere in this Contract, in this Contract, or by law.

u. CORRECTIVE ACTION PROCESS

5. Before commencing any investigation, remediation, or corrective action at the Airport required under Section 120, and except for immediate abatement action required under subsection s.1.(iii), Contractor shall provide the related proposed plans for such investigation, remediation or corrective action to Owner for approval, which shall not be unreasonably withheld. The work shall be performed at Contractor's expense, and Owner shall have the right to review and inspect all such work at any time using consultants and representatives of Owner's choice, at Owner's expense. Specific cleanup levels for any environmental remediation work shall comply with applicable Environmental Laws. Contractor shall, at Contractor's own cost and expense, have all tests performed, and reports and studies prepared, and shall provide such information to any governmental agency as may be required by Environmental Laws, with a copy to Owner. This obligation includes but is not limited to any requirements for a site characterization, site assessment, Affected Property Assessment Report, and remedial action plan that may be necessary. In the event deed recordation by one or both of the Cities or Owner is necessary, Contractor shall reimburse Owner and the Cities for all deed recordation fees and reasonable attorneys' fees incurred in connection with such recordation.
6. Any remedial or other activity undertaken by Contractor under this Contract shall not be construed to impair Contractor's rights, if any, to seek contribution or indemnity from any third party.
7. Contractor shall not seek a Municipal Setting Designation for any groundwater underlying the Airport without obtaining Owner's written approval in advance.

v. ENVIRONMENTAL INDEMNIFICATION AND REIMBURSEMENT

1. Notwithstanding any other provision to the contrary, and without limiting any other indemnity in this Contract, Contractor agrees to indemnify, defend, and hold harmless Owner, its past, present or future directors, officers, members, agents and employees, and the Cities and their respective councils, council members, agents, and employees ("Environmental Indemnitees"), from and against any and all claims, demands, penalties, fines, suits, actions, administrative proceedings (including formal and informal enforcement), government orders, judgments, loss, damages, liabilities, costs, and expenses (including but not limited to reasonable and documented attorneys' and consultants' fees and expenses, litigation costs, expert witness fees, and expenses of investigation, removal, remediation, or other required plan, report, or response action) when incurred and whether incurred in defense of actual litigation or in reasonable anticipation of litigation to the extent resulting from:
   (i) the breach by Contractor of any representation or warranty made in this Section 120; or
   (ii) the failure of Contractor to meet its obligations under this Section 120 in a full and timely manner, whether caused by Contractor or any third party under Contractor's direction or control; or
   (iii) documented loss by any Environmental Indemnitee(s) from any Environmental Impact Claim, to the extent caused by the operations, activities, action or inaction of Contractor or its Subcontractors, employees, agents, licensees, or other parties under Contractor's direction or control, at the Airport, or at other property at the Airport used by Contractor but which is not subject to a lease, sublease or other legal agreement governing Contractor's use of such property, during the term of this Contract.
2. In the event Owner undertakes any action, including but not limited to response or corrective action, repairs, or remediation, in the exercise of its rights with

respect to Contractor under this Section 120, Contractor shall reimburse OWNER, upon reasonable written notice by Owner, for all reasonable and documented costs that Owner incurs in association with such action, including but not limited to consultants' fees, contractors' fees, reasonable attorneys' fees and expenses, and expenses of investigation, repair, response or corrective action and remediation.

3. To the extent permitted by law, Contractor agrees to indemnify and hold harmless Owner and its directors, officers, agents and employees from and against any and all claims, demands, penalties, fines, suits, actions, administrative proceedings (including informal proceedings), government orders, judgments, loss, damages, liabilities, costs, and expenses (including but not limited to reasonable and documented attorneys' and consultants' fees and expenses, litigation costs, expert witness fees, and expenses of investigation, removal, remediation, or other required plan or response action) to the extent resulting from (i) failure of Contractor to meet its obligations under this Section 120, or (ii) the documented loss by Owner, its directors, officers, agents or employees to a third party or governmental entity from any Environmental Impact Claim, to the extent resulting from the operations, activities, actions or inaction of Contractor or any other party under Contractor's direction and control.

4. Regardless of the date of termination of this Contract, the Contractor's representations, obligations and liabilities under this Section 120 shall continue as long as the Contractor bears any liability or responsibility under this Contract or the Environmental Laws.

w. Failure by Contractor or its Subcontractors to comply with any Environmental Provision or safety provision shall be considered a default for which Owner may exercise its remedies in accordance with subsection 80-11, Default and Termination of Contract.

120-3 ASBESTOS AND LEAD CONTAINING MATERIALS AND PERFLUORINATED COMPOUNDS

It is the policy of the D/FW Airport BOARD that all architects, engineers, consultants, general contractors, Subcontractors, distributors, Suppliers, and others receiving proceeds from this Contract be bound by the Owner's philosophy toward the use of asbestos, lead, and perfluorinated compounds within the boundaries of the D/FW Airport. Towards this end, Contractor covenants and agrees that it shall not use or install products containing asbestos or lead in any form or any perfluorinated compounds as part of this Contract or subsequent addendum or Change Order.

This provision applies to all materials and/or products placed in service within the boundaries of D/FW Airport under conditions and terms of the Contract. Contractor accepts and assumes all responsibility and liability for asbestos and lead containing products and/or materials and perfluorinated compounds installed or provided in performance of the Work. In addition, the Contractor accepts and assumes responsibility and liability for all expenses related to the removal, replacement and reparation of asbestos or lead containing materials and perfluorinated compounds put in place under terms of the Contract. Should non-compliance of drawings, notations, and other Contract Documents within this prohibition contained herein be discovered by or on behalf of Contractor, the Contractor must promptly notify Owner representatives in writing of the non-compliant notation or specification. The Contractor also certifies that a non-asbestos, lead, or perfluorinated containing material or product of similar kind and quality as the asbestos, lead, or perfluorinated containing material will be substituted with the approval of the Owner.

This provision reflects the mandate of the Owner to promote the health, safety, and welfare of the general public and to establish a standard for response to asbestos, lead, and perfluorinated compounds within the limits of Airport authority. Contractor shall comply with all Environmental and Safety Laws relating to asbestos, lead, and perfluorinated compounds.

This provision supersedes and replaces all other references, specifications, and notations relating to asbestos-containing materials which may appear in this Contract.

If any underground transite pipe or fuel lines are encountered during the course of the Project, the Contractor shall immediately notify the Construction Manager in writing.

Any abatement (asbestos, lead, and/or perfluorinated compounds) performed must be conducted in accordance with applicable Environmental and Safety Laws, as well as Owner standards. Abatement procedures must be submitted to D/FW Environmental Affairs in writing for review and approval prior to beginning any abatement activity. No abatement Work may proceed without written authorization from the Airport Development & Engineering Department posted in the field with the Construction Permit.

If requested, manufacturers of sealants, adhesives, gasket material, piping, curing materials, and similar building materials shall submit letters of certification to Contractor that their products are free of asbestos, lead, and perfluorinated compounds.

120-4 **ENVIRONMENTAL INDEMNITY**. **NOTWITHSTANDING ANY OTHER PROVISION TO THE CONTRARY AND TO THE EXTENT PERMITTED BY LAW, CONTRACTOR AGREES TO INDEMNIFY, DEFEND, AND HOLD HARMLESS OWNER, THE CITIES OF DALLAS AND FORT WORTH, TEXAS, AND THEIR RESPECTIVE PAST, PRESENT, AND FUTURE OFFICERS, DIRECTORS, EMPLOYEES, AGENTS AND COUNCILS FROM AND AGAINST, AND TO REIMBURSE SAME WITH RESPECT TO, ANY AND ALL CLAIMS, DEMANDS, PENALTIES SUITS, ACTIONS, LOSS, DAMAGES, LIABILITIES, COSTS, AND EXPENSES (INCLUDING BUT NOT LIMITED TO REASONABLE ATTORNEYS' FEES, LITIGATION COSTS, EXPERT WITNESS FEES, AND EXPENSES OF INVESTIGATION AND REMEDIATION OR OTHER GOVERNMENT-REQUIRED PLAN, REPORT, OR RESPONSE ACTION) OF ANY AND EVERY KIND OR CHARACTER, KNOWN OR UNKNOWN, FIXED OR CONTINGENT, ASSERTED AGAINST OR INCURRED BY SUCH PARTIES AT ANY TIME BY REASON OF, IN CONNECTION WITH, OR ARISING OUT OF (A) THE BREACH OF ANY REPRESENTATION OR WARRANTY SET FORTH IN THIS SECTION 120 BY CONTRACTOR OR ANY EMPLOYEES, AGENTS, SUB-CONTRACTORS, OR ANY OTHER THIRD PARTY UNDER CONTRACTOR'S CONTROL, (B) THE FAILURE OF CONTRACTOR TO PERFORM ANY OBLIGATION REQUIRED BY THIS SECTION 120 TO BE PERFORMED BY CONTRACTOR, OR (C) LOSS FROM ANY ENVIRONMENTAL IMPACT CLAIM, AS DEFINED HEREIN, CAUSED BY THE ACTS OR OMISSIONS OF CONTRACTOR OR ITS EMPLOYEES, AGENTS, SUB-CONTRACTORS, OR ANY OTHER THIRD PARTY UNDER CONTRACTOR'S CONTROL; OR (D) THE VIOLATION BY CONTRACTOR OR ITS EMPLOYEES, AGENTS, SUB-CONTRACTORS, OR ANY OTHER THIRD PARTY UNDER CONTRACTOR'S CONTROL OF ANY BOARD ENVIRONMENTAL RULE OR REGULATION, BOARD PERMIT, BOARD POLICY, OR ANY ENVIRONMENTAL LAW. THE PARTIES AGREE THAT, IF AND TO THE EXTENT NECESSARY, THIS SECTION SHALL BE REFORMED TO COMPLY WITH APPLICABLE LAWS IN ORDER TO ACCOMPLISH THE OBJECTIVES STATED HEREIN.**

120-5 SAFETY PROVISIONS. The Contractor covenants and agrees:

a. That it shall not cause or permit any hazardous chemical (as defined in 29 C.F.R. 1910.1200) to be brought upon the Airport without the prior written consent of Owner. Consent may be given via the submittal process as long as all such Materials are outlined on the application or submittal, as applicable.

b. That it shall submit to Owner a Material Safety Data Sheet (MSDS) (Department of Labor form OSHA-174), as prescribed in Federal Standard No. 1910-1200, for each hazardous chemical or hazardous material that the Contractor or its sub-contractors, employees, or agents five (5) days prior to delivery of material onto the Airport, whether or not listed in Appendix A of the Standard. This obligation includes all materials delivered under the Contract that will involve exposure to hazardous materials or items containing these materials.

c. That its operations shall at all times remain in compliance with:
    1. Owner's written policies and requirements governing the identification and use of hazardous chemicals;
    2. All Safety Laws.

d. That it shall advise Owner immediately of any potential or actual non-compliance by any person with any Safety Law on Airport property.
e. That it shall immediately upon receipt, provide Owner with copies of any notice, document, or other communication issued to Contractor, its sub-contractors, or agents alleging non-compliance or investigating any potential non-compliance with any Safety Law at the Airport.

Neither the requirements of this clause nor any act or failure to act by the Owner shall relieve the Contractor of responsibility or liability for the safety of the general public or Owner, tenant, contractor, or Subcontractor personnel or property.

120-6 DRUGS, ALCOHOL, AND WEAPONS. The Contractor, its personnel, those acting on its behalf, and any persons performing the Work may not bring onto any other location where Work is being performed: (1) any firearm, knife with a blade exceeding four (4) inches (100 millimeters) in length or any other object which, in the sole judgment of the Owner, is determined to be a potential weapon; (2) alcoholic beverages; and (3) illegal or otherwise prohibited non-prescription drugs. The Contractor must immediately remove from the Work site any individual who has violated this Section.

120-7 RIGHTS TO DATA. The OWNER'S rights in data furnished under the Contract with respect to Hazardous Materials are as follows.

a. To use, duplicate, and disclose any data to which this Section 120 is applicable. The purpose of this right is to:
   i. apprise personnel of the hazards to which they may be exposed in using, handling, packaging, transporting, or disposing of hazardous materials;
   ii. obtain medical treatment for those affected by the material; and
   iii. have others use, duplicate, and disclose the data for the Owner for these purposes.
b. To use, duplicate, and disclose data furnished under this Section 120 in precedence over any other section of the Contract providing for rights in data.
c. To ensure that the Owner is not precluded from using similar or identical data acquired from other sources.
d. To ensure that the Contractor shall not place the legend or any other restrictive legend on any data which the Contractor or any Subcontractor previously delivered to the Owner without limitations.
e. To ensure that the data shall not be duplicated, disclosed, or released outside the Project, in whole or in part for any acquisition or manufacturing purpose, if the following legend is marked on each piece of data to which this clause applies:

"This is furnished under D-FW International Airport BOARD Contract No. _____ and shall not be used, duplicated, or disclosed for any acquisition or manufacturing purpose without the permission of _____.
This legend shall be marked on any reproductions of this data."
[End of legend]

120-8 FLOW DOWN. The Contractor shall insert this Section 120 with appropriate changes in the designation of the parties in subcontracts of all tiers (including purchase designations or purchase orders) under this Contract that involve Hazardous Material.

120-9 SURVIVAL. The provisions of this Section, including the representations, warranties, covenants and indemnities of Contractor, shall expressly survive termination of this Contract.

END OF SECTION 120

SECTION 130 – INTELLECTUAL PROPERTY RIGHTS AND SECURITY

130–1 WORK FOR HIRE. Drawings, specifications, and any other documents or information furnished by the Contractor, including those in electronic form, are Instruments of Service and are the result of a "work for hire." Upon execution of the Contract, the Contractor, and its consultants, contractors, and any other person or entity providing services or work for any of them, assign all rights in and to their respective drawings, specifications, and any other documents or information related to the Project, and Owner shall be deemed the sole owner of such information, and shall have and retain all common law, statutory and other reserved rights, including copyrights. To the extent that all right, title, and interest, including all intellectual property rights, in and to all drawings, specifications, and any other documents or information for the Project are not solely owned by Owner, the Contractor hereby assigns, transfers, grants, and conveys to the Owner a perpetual, worldwide, non-transferable, exclusive, royalty free, fully paid-up, license to make, have made, make or develop derivative works. The Owner may copy, duplicate, reproduce, and use such information on the Project or other projects or uses, in whole or in part, at its sole discretion. Neither the Contractor, nor its consultants, contractors, or any other person or entity providing services or work for any of them, shall own or claim any common law, statutory and other rights, including copyrights in or to any Project drawings, specifications, or other Project documents or information. All copies of all Project drawings, specifications, and other documents or information shall be provided to Owner on request and on Final Completion. To the extent any Contract Documents or other Project drawings, specifications, and other documents or information contains Owner's confidential information, such matters are confidential to the Owner and shall not be disclosed to any third party or used by the Contractor on any other project. The Contractor, and its consultants, contractors, and any other person or entity providing services or work for any of them shall use Project drawings, specifications, and other documents or information solely and exclusively for constructing, maintaining, altering, and adding to the Project, shall not use such drawings, specifications, and other documents or information on other projects or for other uses, and shall not disclose Project drawings, specifications, and other documents or information to any other person or entity without the Owner's advance, written consent. The Contractor shall obtain assignments and exclusive licenses, as applicable, from its consultants and contractors of all tiers that will allow the Contractor to satisfy its obligations to the Owner under this Section. The Contractor will complete any documents necessary to accomplish the objectives of this Section.

130–2 WARRANTY OF RIGHT TO USE. The Contractor warrants that in transmitting drawings, specifications, and other documents or information, it is the copyright, trademark, or patent owner of such information or has permission from the copyright, trademark, or patent owner to transmit such information for its use on the Project.

130–3 INFORMATION SYSTEMS SECURITY. The Contractor agrees that it and all persons acting on its behalf will follow all applicable laws that concern the Owner's information systems security and the Owner's information technology systems and assets. The Contractor agrees that it and all persons acting on its behalf will comply with all applicable laws concerning the protection of Sensitive Security Information, as addressed in 49 C.F.R. Part 1520, and any similar applicable laws.

130–4 OPEN RECORDS. All information, documentation and other material submitted by the Contractor may be subject to public disclosure under the Public Information Act, Texas Government Code Chapter 552.

130–5 PUBLICITY RELEASES. All publicity releases or other published information in any way concerning the Contract or the Work, which the Contractor or any of its Subcontractors desires to make, shall be subject to approval by the Owner prior to release.

130–6 SURVIVAL. This Section shall survive termination of the Contract and Final Completion.

END OF SECTION 130

SECTION 140 – DISPUTE RESOLUTION

140–1 MEDIATION. In the event of any dispute between the parties regarding the Contract, and prior to the commencement of any formal proceedings, including mediation, the parties will attempt in good faith to reach a negotiated resolution. Each Party shall designate a representative with authority to resolve the dispute to enter into discussions within thirty (30) days of a Party's request for negotiation. Should these negotiations fail, claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived if and as provided in the Contract Documents, shall be subject to mediation as a condition precedent to binding dispute resolution. A request for mediation shall be made in writing and delivered to the other Party. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction. For any claim subject to, but not resolved by, mediation, the method of binding dispute resolution shall be litigation.

140–2 RECOVERABLE FEES, COSTS, AND EXPENSES. Should it be necessary for the Owner to enforce its rights or remedies, including its rights provided in the Contract Documents, the Owner shall be entitled to recovery of its reasonable and necessary attorneys'/paralegals' fees and all related fees, costs, and expenses from the Contractor. Without limiting the foregoing, the Owner shall also be entitled to its fees, costs, and expenses (a) if it is awarded a final enforceable judgment in its favor on at least seventy-five percent (75%) of its pleaded damages, or (b) if the Owner is a defendant and it prevails in the defense of the Party plaintiff's claims, even if the Owner does not assert a counterclaim.

Litigation fees recoverable by the Owner include those incurred by any in-house counsel/paralegals and/or outside counsel/paralegals it uses. If the Owner is represented by in-house counsel, fees will be set at: (a) $400/hour for attorneys who have been licensed and actively practicing 10 or more years; (b) $300/hour for attorneys who have been licensed and actively practicing for less than 10 years; and (c) recoverable fees for in-house paralegals will be $150/hour. Fees attributable to each attorney and paralegal will be calculated using the computed hourly billing rate times the number of hours worked on the litigation. If the Owner uses outside counsel/paralegals for the litigation, fees will be calculated at the billing rates of the firm's attorneys/paralegals participating in the litigation, times the number of hours worked. The Owner may recover fees associated with in-house counsel/paralegals and outside counsel/paralegals even if both types of counsel are used in any litigation.

If the Contractor prevails in a dispute with the Owner regarding this Contract, then it shall be entitled to an award of its reasonable and necessary attorney's fees to the extent permitted by Texas Government Code Sections 2252.904 and 2251.043 (formal administrative or judicial action to collect an invoice payment or interest due under Subchapter C) or other applicable law.

IN THE EVENT OF LITIGATION, ANY AWARD OF FEES, COSTS AND EXPENSES SHALL BE DETERMINED BY THE JUDGE, NOT A JURY; THIS CONSTITUTES A JURY WAIVER.

140–3 COOPERATION. The Contractor agrees to make any person involved in providing Work available to the Owner for fact or expert testimony or other similar litigation support in the event the Owner is involved in litigation or anticipates being involved in litigation concerning the Work.

140–4 JURISDICTION AND VENUE. The parties consent to the exclusive jurisdiction of the state courts of Dallas or Tarrant County, Texas, or the United States District Court for the Northern District of Texas, and agree that all actions relating to the Contract will be litigated in such courts.

140–5 GOVERNING LAW. The rights, obligations, and remedies of the parties shall be governed by the laws of the State of Texas. Whenever there is no applicable state statute or decisional precedent governing the interpretation of, or disputes arising under or related to the Contract, then federal common law, including

the law developed by federal board contract appeals, the United States Claims Court (formerly the Court of Claims), and the Comptroller General of the United States, shall govern.

140–6 SEVERABILITY. If a provision of the Contract, or the application thereof to any person or circumstances is rendered or declared illegal for any reason or shall be invalid or unenforceable, the remainder of the Contract and the application of such provision to other persons or circumstances shall not be affected thereby but shall be enforced to the greatest extent permitted by applicable law. The parties agree to negotiate in good faith for a proper amendment to the Contract in the event any provision hereof is declared illegal, invalid or unenforceable.

END OF SECTION 140

SECTION 150 - MEDIA ENGAGEMENT, PUBLICITY, AND COMMUNICATIONS

150–1 GENERAL. Contractor and its agents, employees, representatives, and Subcontractors and subconsultants of all tiers shall comply with media policies as required by the Dallas Fort Worth International Airport ("DFW"), which include but are not limited to the following:

1. **Approval from DFW Communications Team**: All mentions of "approvals" herein must be sought and granted in written form from DFW's Assistant Vice President Communications or Vice President Communications ("DFW Communications").

2. **Media engagement**: Approval from DFW Communications must be sought and granted prior to proactively engaging, responding or committing to any type of media request or participation in media activity.

3. **Approvals of communications and marketing related to project**: DFW Communications must review and approve any of the following in advance:

    a. Public announcements, public-facing communications, including press releases, social media posts and blogs regarding the Project, the Airport, or the Owner.

    b. Marketing brochures, promotional collateral, or photographs regarding the Project, the Airport, or the Owner.

    c. Company participation in speaking engagements that will directly communicate information regarding the Project, the Airport, or the Owner.

4. **Project award submissions**: All award applications related to the project must be reviewed and approved by DFW Communications before submission.

5. **Visual assets**: Visual assets, including those generated by third parties, must be approved by DFW Communications prior to any usage. Visual assets include photography and videography on airport property and construction sites, static and video renderings, and any other visual support created to support or explain the project. If approved, visual assets must be used with proper, agreed upon, attribution. DFW Communications must be notified if firms source photography services from third parties, and any agreements for such services must grant usage rights to DFW Airport for no additional compensation.

6. **Project nomenclature**: All references related to the project must be referred to using the following nomenclature in all public-facing communications:

    a. Dallas Fort Worth International Airport (DFW): Airport name.

    b. DFW Capital Improvement Program: The airport's overarching capital program.

    c. Name of project as provided in Contract Title.

END OF SECTION 150

END OF GENERAL PROVISIONS

EXHIBIT 7 – TECHNICAL SPECIFICATIONS & PLANS (*see Link below*)

SAMPLE

EXHIBIT A

Insurance Requirements

SAMPLE

INSURANCE PROVISIONS

A. DEFINITIONS FOR INSURANCE PROVISIONS

1. "We", "us", or "our" means the Dallas/Fort Worth International Airport Board.
2. "You" or "your" means the vendor, contractor, tenant, consultant, engineer, architect, and their agents, servants, employees, or other party to a contract with us.
3. "Contract" means the contract, purchase order, Invitation for Bid, or similar memorandum or agreement.
4. For purpose of defining Additional Insured and Waiver of Subrogation, the term "Dallas Fort Worth International Airport Board (the Board) and the Cities of Dallas and Fort Worth, Texas" (the Cities) shall also mean the elected officials, boards, officers, employees, agents and representatives of the Board and the Cities.

B. GENERAL REQUIREMENTS

1. You shall, at your own expense, maintain in effect not less than the following coverages and limits of insurance, which you shall maintain with insurers. If your coverage fails to comply with these requirements, you agree to amend, supplement or endorse the existing coverage to comply, at no additional cost to us, and to maintain such insurance through the end of the contract, warranty period, or other specified time period, whichever is longer. ANY deviation from the requirements outlined below requires the prior written approval of the Board's Assistant Vice President of Risk Management.
2. All required policies must be written through a company approved to transact that class of insurance business in the State of Texas, with a minimum rating of 'A -',and 'VII' by A. M. Best Company. If the rating of any insurer should fall below this standard, you shall cause the policy to be replaced promptly by an acceptable insurer.
3. All required policies, except policies for workers' compensation, professional liability and pollution liability, shall designate the below mentioned parties as **"Additional Insureds".**
    a. **"Dallas Fort Worth International Airport Board and the Cities of Dallas and Fort Worth, Texas"**
4. All required policies shall **Waive the insurer's right of Recovery or Subrogation** against the Board and the Cities.
5. If any policy is in excess of a self-insured retention (SIR), the amount of such SIR must be clearly identified. We reserve the right to reject any SIR exceeding $100,000.
6. All required policies must be primary with respect to coverage provided for the Board.
7. All required policies must be non-contributory with other coverage or self-insurance available to the Board.
8. All required Liability policies, except Pollution & Professional, must be written on an "Occurrence Form." Neither "Modified Occurrence" nor "Claims-Made" policies are acceptable, and the Contractor will be in contractual default if your insurance is "Modified Occurrence" or "Claims Made." If the Pollution or Professional Liability policy is Claims-Made, the Retroactive Date must be on or before the contract date or the date of the Contractor's first professional service to the Board, your first exposure to pollutants, or first work that may give rise to a pollution liability claim, related to our contract.
9. All required liability policies must cover cross-suits between insureds.
10. All required liability policies must contain a "severability of interests" provision.

C. REQUIRED COVERAGE LIMITS

1. **Workers' Compensation** — **Texas Statutory Coverage**
2. **Employer's Liability Insurance** — **$500,000** Each Accident
   $500,000 Each Disease, Each Employee
   $500,000 Each Disease Policy Limit
3. All employees, leased or co-employees, independent contractors, and employees of subcontractors and vendors, occupants of the building as tenants, sub-tenants or sub sub-tenants, performing work for the Board, or entering upon the Board's premises, must be covered by Texas Workers' Compensation.
4. If Contractor is a sole proprietorship without employees and which will not be using any subcontractor(s) in the performance of the Contract Work, it may substitute the following for workers compensation insurance: The Contractor must provide the Board's Risk Management Department (Risk Management) with a Hold Harmless and Indemnification Agreement in the form attached in the "Proposal Response Forms" section.
5. **Commercial General Liability (CGL)**

Limit Any One Occurrence	**$1,000,000**
Damage to Rented Premises	**$100,000**
Personal and Advertising Injury	**$1,000,000**
Policy Aggregate	**$2,000,000**
Products and Completed Operations Aggregate	**$2,000,000**

6. CGL coverage applies unless you provide only trucking, (no premises or operations other than driving, loading/unloading), or garage operations, (see below).
7. Aggregate limits of General Contractors or construction contracts General Liability policies shall be "per project" or "per location," as appropriate. If any aggregate limit is reduced by 25% or more by reserved and/or paid claims, the contractor must notify the Board and promptly reinstate the required aggregates.
8. If the contractor's operations involve excavation, grading, filling, backfilling, road or similar construction, General Liability policy shall not contain exclusions for subsidence or earth movement.
9. If the contractor's operations involve any construction, General liability policy shall not contain exclusions for hazards of explosion ("X"), collapse ("C") or underground ("U").
10. If the contractor's operations involve any construction, reconstruction, repair or similar work, General liability policy shall not contain any exclusion for such work.
11. **Business Automobile Liability**
    Combined Single Limit for Each Accident — **$500,000**
    a. Coverage must apply to all vehicles (owned, non-owned, or hired) operating on our site/location, or transporting our people or property off our site, except vehicles operated by you or your employee(s) commuting in personal vehicles to our parking facilities, in which case you must only carry Employer's Non-Ownership coverage, (same limit), and ensure that such vehicle(s) are personally insured.
    b. Auto pollution liability coverage is required on vehicles hauling hazardous cargo.
    c. If your operations are solely a garage (vehicle maintenance and repair), you must carry Garage Liability, instead of Business Auto Liability, but the Garage Liability must not be limited to auto liability only, and the same limit applies.
12. **Excess/Umbrella Liability**: Total limits can be satisfied through any combination of Primary and Excess/Umbrella Liability insurance policies. The Umbrella Liability policy must be maintained at all times during the terms of this Agreement. Policy must be on an "occurrence basis" and coverage must follow form or be at least as broad as the underlying Primary insurance.

D. ADDITIONAL COVERAGE AND LIMITS THAT MAY BE REQUIRED as needed for

specific contracts. Note that additional limits may be required if warranted by exposure.

1. **Pollution Liability Insurance** (if exposure to pollutants) **$1,000,000**
    a. If you have any exposure to asbestos, lead, mold, (including any work which could, if not performed properly, lead to mold or fungal contamination), petroleum products, contaminated soils, or other pollutants, you shall provide appropriate Pollution Liability or Environmental Impairment insurance.
    b. If the Pollution Liability policy is Claims-Made, the Retroactive Date must be on or before the contract date or the date of the contractor's first exposure to pollutants, or first work that may give rise to a pollution liability claim, related to our contract.
2. **Cyber Security Liability Insurance: $1,000,000**
    a. The policy must cover liabilities for financial loss resulting or arising from acts, errors & omissions in rendering professional services; including, but not limited to, Third Party losses due to security failures in connection with technology services, internet professional services, security and privacy liability, technology errors and omissions; and, must include coverage for First Party Expenses including notification, credit monitoring, and credit repair services. The Policy must cover Contractor and all subcontractors / subconsultants of Contractor, individuals or other entities providing professional service concerning this Contract. The insurance coverage will include coverage for claims due to programming errors, software performance, or the failure of Contractor's work to perform according to the Contract and will be renewed or an extended reporting period provided, together totaling two years after work completed or expiration of this contract, whichever is later.

E. ADDITIONAL REQUIREMENTS

1. If you are a crane/rigging operator or will hoist or move property of others in connection with our contract, you must have 'care, custody & control' exclusion deleted from your Commercial General Liability policy, or provide Rigger's Liability coverage at least equal to the highest replacement cost of materials to be hoisted or moved.
2. If your vehicles carry materials belonging to others in connection with our contract, you must carry Cargo Liability coverage, at least equal to the highest value of property to be carried on a single vehicle, with terminal coverage at least equal to the highest value of property at one terminal, owned or controlled by you.
3. If you will store, warehouse, or otherwise have custody of property belonging to others in connection with our contract, you must have Warehousemen's Liability, Bailee's Customers' Goods, Garage-Keeper's Legal Liability or equivalent coverage at least equal to the highest value of property in your custody.
4. If our contract calls for you to construct a structure, you must purchase and maintain "All-Risk" Builders Risk insurance for the full completed value of the structure and contents, including all changes and sufficient limit to fund full and immediate reconstruction under adverse conditions. This policy shall name Dallas Fort Worth International Airport Board as Loss Payee, as their interest may appear.
5. If you transport materials, equipment, machinery or furnishings to, or store such property on, our construction site, you must carry an "All-Risk" Installation Floater with coverage at least equal to the greatest concentration of value, (including the cost of transit, installation labor and testing).
6. If you use rented equipment or tools on our job site or premises, you must carry Rented Equipment coverage sufficient to repair or replace damaged equipment.
7. If your work involves administration of Airport Funds, you must furnish a Third Party Fidelity Bond that must remain in effect for the term of the contract, as

modified and/or extended. The Board shall be named as "Obligee".

8. Should this Contract require the use of Subcontractors, it will be the sole responsibility of the General Contractor to either endeavor to require Subcontractors to provide and maintain the insurance limits and coverages required herein or provide said insurance coverage for the subcontractor by designating the Subcontractor as an additional insured either by a blanket additional insured endorsement, or by specific endorsement.
9. The General Contractor shall endeavor to verify that such Subcontractors are in compliance with all contractual insurance requirements.
10. The General Contractor shall assume all liability for those Subcontractors who do not meet the insurance requirements.
11. Access to the Air Operations Area will not be granted without verification of insurance coverage as required.

F. CERTIFICATION OF INSURANCE

1. Upon execution of the contract or prior to commencement of work, whichever is first, you shall provide your contract administrator with a current insurance certificate by emailing your certificate to dfwcoi@dfwairport.com, with your contract number and business name in the subject line. Please copy your contract administrator on email submissions. You shall cause your insurance data to be kept current with DFW Board for the period of time you are liable for your product or work, but not less than through the warranty period of our contract.
2. Fax or e-mail insurance certificates to the following:
   Email: dfwcoi@dfwairport.com
   FAX: (972) 973-5651
3. You further agree, upon our oral or written request, to furnish copies of certificates of insurance, certified by an authorized representative of the insurer(s), within ten (10) days of request.
4. You shall provide to the Board's Risk Management department, at least thirty (30) days prior to cancellation, except ten (10) days for non-payment of premium of cancellation of any required coverage. You shall then arrange acceptable alternate coverage to comply with our requirements and provide an updated insurance certificate.
5. No policy submitted shall be subject to limitations, conditions or restrictions that are inconsistent with the intent of the Insurance Requirements to be fulfilled by you. The Board's decision thereon shall be final.
6. Approval, disapproval or failure to act by the Board regarding any insurance obtained by you shall not relieve you of full responsibility or liability for damages and accidents as set forth herein. Neither shall the bankruptcy, insolvency or denial of liability by the insurance company exonerate you from liability.
7. No special payment, except when separate line item is provided, shall be made by the Board for any insurance that the Contractor may be required to carry; all are included in the Contract amount and the Contract unit prices.

Request Number: REQ00004440
Contract Number: PA1689
Contract Title: Rental Car Center Bus Roads and Bridge Rehabilitation

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYY)

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER **INSURANCE AGENT'S BUSINESS NAME** **ADDRESS** **CITY, STATE ZIP CODE**	CONTACT NAME: **INSURANCE AGENT'S MAIN CONTACT NAME** PHONE (A/C, No. Ext): **INSURANCE AGENT'S TELEPHONE NO.** FAX **INSURANCE AGENT FAX NO.** (A/C, No): E-MAIL ADDRESS: **INSURANCE AGENT'S EMAIL ADDRESS**
INSURED **YOUR COMPANY NAME** **ADDRESS** **CITY, STATE, ZIP CODE**	INSURER(S) AFFORDING COVERAGE — NAIC# INSURER A: ABC Insurance Company — 11111 INSURER B: DEF Insurance Company — 22222 INSURER C: GHI Insurance Company — 33333 INSURER D: JKL Insurance Company — 44444 INSURER E: MNO Insurance Company — 55555 INSURER F:

COVERAGES CERTIFICATE NUMBER: REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN. THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYY)	POLICY EXP (MM/DD/YYY)	LIMITS	
A	GENERAL LIABILITY [ ] COMMERCIAL GENERAL LIABILITY [ ] CLAIMS-MADE [X] OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: [X] POLICY [ ] PRO-JECT [ ] LOC	Y	Y	Policy Number	MO/DAY/YR	MO/DAY/YR	EACH OCCURRENCE DAMAGES TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS-COMP/OP AGG	$1,000,000 $100,000 $10,000 $1,000,000 $2,000,000 $2,000,000
B	AUTOMOBILE LIABILITY [X] ANY AUTO [X] ALL OWNED AUTOS [ ] SCHEDULED AUTOS [X] HIRED AUTOS [X] NON-OWNED AUTOS	Y	Y	Policy Number	MO/DAY/YR	MO/DAY/YR	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$500,000
	[ ] UMBRELLA LIAB [ ] [ ] EXCESS LIAB [ ] CLAIMS-MADE [ ] DED [ ] RETENTION $						EACH OCCURRENCE AGGREGATE	
C	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? Y/N [ ] **(Mandatory in NH)** If yes, describe under DESCRIPTION OF OPERATIONS below	N/A	Y	Policy Number	MO/DAY/YR	MO/DAY/YR	[X] WC Statutory Limits [ ] OTH-ER E.L. EACH ACCIDENT E.L. DISEASE – EA EMPLOYEE E.L. DISEASE – POLICY LIMIT	 $500,000 $500,000 $500,000
D	POLLUTION LIABILTIY			Policy Number	MO/DAY/YR	MO/DAY/YR	LIMIT	$1,000,000

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

Dallas Fort Worth International Airport Board and the Cities of Dallas and Fort Worth, Texas are included as Additional Insureds with respects to the GENERAL LIABILITY and AUTO LIABILITY. A WAIVER OF SUBROGATION in favor of the Dallas Fort Worth International Airport Board and the Cities of Dallas and Fort Worth, Texas applies with respects to the GENERAL LIABILITY, AUTO LIABILITY, and WORKERS COMPENSATION Policies.

CERTIFICATE HOLDER	CANCELLATION
Dallas Fort Worth International Airport Board **2400 Aviation Drive** **PO Box 619428** **DFW Airport, TX, 75261**	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS. AUTHORIZED REPRESENTATIVE

Date/Time Printed: 4/2/2026, at 11:07 AM
Risk Profile: 107-NSNA

SAMPLE

Request Number: REQ00004440
Contract Number: PA1689
Contract Title: Rental Car Center Bus Roads and Bridge Rehabilitation

ADDITIONAL REMARKS SCHEDULE

Page_____of _____

ACORD	NAMED INSURED YOUR COMPANY NAME ADDRESS CITY, STATE, ZIP CODE
POLICY NUMBER	
CARRIER / NAIC CODE	EFFECTIVE DATE:

ADDITIONAL REMARKS

THIS ADDITIONAL REMARKS FORM IS A SCHEDULE TO ACORD FORM,
FORM NUMBER:_____ FORM TITLE: _____

E	Cyber Lability	Policy Number	MO/DAY/YR	MO/DAY/YR	LIMIT	$1,000,000

SAMPLE

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Date/Time Printed: 4/2/2026, at 11:07 AM
Risk Profile: 107-NSNA

EXHIBIT B

SBE Special Contract Provisions

SAMPLE

EFFECTIVE 11/07/2025

SBE PROGRAM IN EFFECT

Please review all Bids/Proposal Documents CAREFULLY!

FAILURE to comply with the new requirements will deem your Bids/Proposals Non-Responsive with no Further Consideration.

SBE Participation (Not included in Page Count Limit)

SBE Participation Checklist For:

a. *Request for Bids (RFB)* – Goods and Services including Best Value

b. *Request for Bids (RFB)* – Construction

Request for Qualifications (RFQ) – Architectural/Engineering Services, Design & Design Management Services and Program Management/Construction Management Services

c. *Request for Proposal (RFP)* – Goods and Services including Best Value

☐ A. SBE Commitment Form (completed and signed)

☐ B. Final Schedule of Subcontractors with ALL SBE and Non-SBE partners. (completed and signed).

☐ C. Intent to Perform Forms for each SBE (completed and signed by both Prime & Sub)

☐ D. SBEs have a physical place of business in the Airport's Relevant Market Area (Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall, Somervell, Tarrant and Wise counties)

☐ E. Good Faith Effort (GFE) Criteria (If applicable)

☐ F. **SBE Plus** Current Certificates for all SBE firms identified

☐ G. Draft Joint Venture Agreement (if applicable)

☐ H. Please ensure the SBE % listed on the Commitment Form matches the % on the Final Schedule of Subcontractors Form and the aggregate % of all Intent to Performs.

AFFIRMATION

I HEREBY AFFIRM THAT THE ABOVE INFORMATION IS TRUE AND COMPLETE TO THE BEST OF MY KNOWLEDGE AND I HAVE READ THE SBE CONTRACT PROVISIONS.

PRINTED NAME AND TITLE OF AUTHORIZED OFFICIAL:

_____

SIGNATURE: _____

DATE:_____

SMALL BUSINESS ENTERPRISE (SBE) SPECIAL CONTRACT PROVISIONS

Notification is hereby given that an SBE Contract Specific Goal has been established for this Contract. The Contractor/vendor has committed to percent (%) SBE participation of the total dollar value of this Contract including any change orders and/or modifications throughout the term of this Contract/agreement. The commitment is a contractual commitment upon execution of the Contract.

A. GENERAL REQUIREMENTS

1. It is the policy of the Dallas/Fort Worth International Airport Board of Directors ("Airport Board") to support the growth and development of Small Business Enterprises ("SBE") that can successfully compete for Airport prime contracting and subcontracting opportunities.

2. A "Contractor" is defined as one who participates, through a Contract or any other contractual agreement. For purposes of these Provisions, a Contractor is one who seeks to do business with the Airport Board by submission of a bid or proposal on any such contract or subcontract. A Contractor includes but is not limited to a Contractor, consultant, developer or vendors.

3. It is the policy of the Airport Board to ensure non-discrimination in the award and administration of Airport Board Contracts. Consequently, the Contractor must fully comply with the requirements of the Airport Board's Small Business Enterprise Program Policy and Administrative Procedures in proposing and performing hereunder.

4. The Contractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this Contract. The Contractor shall carry out applicable requirements of the Airport Board's SBE Program Policy and Administrative Procedures. Failure by the Contractor to carry out these requirements is a material breach of this Contract, which may result in the termination of this Contract or such other remedy, as the Airport Board deems appropriate. The Contractor shall insert an Article containing all of the provisions of this Section, including this paragraph, in all subcontracts hereunder, except altered as necessary for the proper identification of the contracting parties and the Airport Board under this Contract.

5. The Business Development Department ("BDD") is responsible to ensure compliance with the Airport Board's SBE Program Policy and Administrative Procedures. BDD has the mission to proactively facilitate and maximize business and capacity building opportunities for SBEs by collaborating with internal customers and implementing effective innovative programs and approaches for prime and subcontracting opportunities.

6. The Contractor specifically agrees to comply with all applicable provisions of the Airport Board's SBE Program Policy and Administrative Procedures and any amendments thereto. SBE and Non-SBE subcontractors also agree to comply with all applicable provisions of the Airport Board's SBE Program Policy and Administrative Procedures ("Policies"). BDD and or the Airport Board may make changes to the existing policy, procedures and contract provisions. Any future

changes supersede past policies, procedures, contract provisions. The Contractor and subcontractors are responsible to be aware of future changes.

1. The Contractor shall maintain records showing:

   a. Subcontract/supplier awards, including awards to SBEs;

   b. Specific efforts to identify and award such Contracts to SBEs, such as when requested copies of executed Contracts with SBEs to establish actual SBE project participation.

B. ADMINISTRATIVE REQUIREMENTS

1. All Contractors are charged with knowledge of and are solely responsible for complying with each requirement of the Policies in submitting a bid/proposal and, if awarded a Contract, in performing the work described in the Contract documents. These instructions are intended only to generally assist the Contractor in preparing and submitting a compliant bid/proposal. Should any questions arise regarding specific circumstances, Contractors must consult with the BDD office at 972-973-5500.

2. The Contractor shall appoint a high-level official to administer and coordinate the Contractor's efforts to carry out its SBE contractual commitments.

3. The Contractor agrees to submit monthly reports of payments and subcontract and/or supplier awards to SBEs and Non-SBEs in such form and manner and at such times as the Airport Board shall prescribe.

4. The Contractor shall provide BDD access to all books, records, accounts and personnel. Such access will be used for, among other purposes, determining SBE participation and compliance with the Policies. All Contractors may be subject to interim and post-contract SBE audits. Audit determination(s) regarding Contractor's compliance with the Policies may be considered and have a bearing on consideration of the Contractor for award of future Contracts.

C. GOALS AND GOOD FAITH EFFORTS

1. Determining Responsive, Non-Responsive and Good Faith Efforts (Pre-Award)

   a. Each Contractor must comply with the terms and conditions of the SBE Program Policy and Administrative Procedures in making its bid or proposal and, if awarded the Contract, in performing all work thereunder. A Contractor's failure to comply with any Rules or Regulations promulgated pursuant thereto, or any additional requirements contained herein may render a bid or proposal non-responsive and may constitute cause for rejection.

      i. Responsive; compliance with requirements. If a bid/proposal meets the Contract Specific Goal or shows an adequate good faith effort in accordance with the SBE Program Policy and Administrative Procedures, then BDD shall notify the procuring department to regard the bid/proposal as responsive.

i. Non-Responsive; failure to meet requirements. If a bid/proposal subject to a Contract Specific Goal does not provide the necessary information, documentation or forms outlined in the SBE Program Policy and Administrative Procedures, then BDD shall notify the procuring department to regard the bid/proposal as non-responsive. Such determination shall result in no further consideration of the bid/proposal by the Airport Board and is not appealable.

b. If BDD establishes a Contract Specific Goal, the goal will be stated in the Advertisement and Invitation to Bid. In order to comply with the bid/proposal requirements of the solicitation and the SBE Program Policy and Administrative Procedures, a Contractor must either meet the Contract Specific Goal or demonstrate that the Contractor has made sufficient good faith efforts to meet the Contract Specific Goal. If the Contractor will not meet the SBE goal, it shall nevertheless be eligible for award of the Contract if it can demonstrate to BDD that it has made good faith efforts to meet the goal. This good faith effort documentation must be submitted with the Contractor's bid or proposal.

c. For Contracts that are initially awarded under $50,000.00 with a zero Contract Specific Goal and later increases to greater than $50,000.00, BDD will evaluate whether to establish a Contract Specific Goal. If a Contract Specific Goal is established, the SBE commitment made to meet the Contract Specific Goal will be applicable to future contract value increases and change orders.

d. In evaluating a Contractor's good faith efforts submission, BDD will only consider those documented efforts that occurred prior to the good faith effort submission.

e. The submission of good faith efforts documentation is a matter of responsiveness and shall include a specific response to each of the following criteria with the bid or proposal. The following factors are taken into account when assessing whether a Contractor made good faith efforts to meet the Contract Specific Goal. These factors are minimally considered as good faith efforts and demonstrate specific initiatives made in attempting to achieve the Contract Specific Goal. These factors should not be considered as a template, checklist or some quantitative formula. A Contractor is required to meet all factors outlined below and provide support documentation in order for good faith efforts to be assessed. Mere pro forma efforts are not good faith efforts to meet the Contract Specific Goal. This means that a Contractor must show that it took all necessary and reasonable steps to achieve a Contract Specific Goal, which, by their scope, intensity, and appropriateness to the objective, could reasonably be expected to meet the Contract Specific Goal, even if they were not fully successful. Failure of the Contractor to demonstrate adequate good faith efforts as to any one of the following categories shall render the overall good faith showing insufficient and the bid/proposal non-responsive. BDD will evaluate the good faith efforts on quality, quantity, and intensity of the different kinds of efforts that the Contractor has made based on the regulations and the guidance in 49 C.F.R. part 26. **NOT SUBMITTING PROPER SUPPORT DOCUMENTATION IS NOT EVIDENCE OF A PROPER DEMONSTRATION OF GOOD FAITH EFFORT. SUBMITTAL OF THE CRITERIA, WITH NO ADDITIONAL DOCUMENTATION, WILL NOT BE CONSIDERED ADEQUATE DEMONSTRATION OF GOOD**

FAITH EFFORT. Contractors are not limited to these particular areas and may include other efforts deemed appropriate. Complete the **Commitment to SBE Participation** form and attach support documentation only if the Contract Specific Goal is not achieved. For additional guidance concerning good faith efforts, please refer to the Electronic Code of Federal Regulations (CFR 49 Part 26, Appendix A).

i. Conducting market research to identify small business contractors and suppliers and solicit through all reasonable and available means the interest of all certified SBEs that have the capability to perform the work of the contract. This may include attendance at any pre-bid or pre-proposal meetings to discuss subcontracting and supplier opportunities (acceptable documentation shall include copies of the meeting sign-in sheets with contractor name noted as signed-in) and business matchmaking meetings and events, advertising and/or written notices, posting of Notices of Sources Sought and/or Requests for Proposals, written notices or emails to all SBEs listed in the State and/or Local respective directories of firms that specialize in the areas of work desired (as noted in the SBE directory) and which are located in the area or surrounding areas of the project. *The Contractor should solicit this interest as early in the acquisition process as practicable to allow the SBEs to respond to the solicitation and submit a timely offer for the subcontract. The bidder should determine with certainty if the SBEs are interested in taking appropriate steps to follow up initial solicitations at least three (3) business days prior to bid opening*.

ii. Selecting portions of the work to be performed by SBEs in order to increase the likelihood that the SBE goals will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units (for example, smaller tasks or quantities) to facilitate SBE participation, even when the prime contractor might otherwise prefer to perform these work items with its own forces. This may include, where possible, establishing flexible timeframes for performance and delivery schedules in a manner that encourages and facilitates SBE participation.

iii. Providing interested SBEs with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation with their offer for the subcontract.

iv. Negotiating in good faith with interested SBEs. It is the bidder's responsibility to make a portion of the work available to SBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available SBE subcontractors and suppliers, so as to facilitate SBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of SBEs that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional Agreements could not be reached for SBEs to perform the work. A bidder

using good business judgment would consider a number of factors in negotiating with subcontractors, including SBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using SBEs is not in itself sufficient reason for a bidder's failure to meet the contract SBE goal, as long as such costs are reasonable. Also, the ability or desire of a prime contractor to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Prime contractors are not, however, required to accept higher quotes from SBEs if the price difference is excessive or unreasonable.

i. Not rejecting SBEs as being unqualified without sound reasons based on a thorough investigation of their capabilities. The contractor's standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. non-union status) are not legitimate causes for the rejection or non-solicitation of bids in the contractor's efforts to meet the project goal. Another practice considered an insufficient good faith effort is the rejection of the SBE because its quotation for the work was not the lowest received. However, nothing in this paragraph shall be construed to require the bidder or prime contractor to accept unreasonable quotes to satisfy contract goals*. A prime contractor's inability to find a replacement SBE at the original price is not sufficient to support a finding that good faith efforts have been made to replace the original SBE. The fact that the contractor has the ability and/or desire to perform the contract work with its own forces does not relieve the contractor of the obligation to make good faith efforts to find a replacement SBE, and it is not a sound basis for rejecting a prospective replacement SBE's reasonable quote.*

ii. Making efforts to assist interested SBEs in obtaining bonding, lines of credit, or insurance as required by the recipient or contractor.

iii. Making efforts to assist interested SBEs in obtaining necessary equipment, supplies, materials, or related assistance or services.

iv. Effectively using the services of available Small community organizations; Small contractors' groups; local, State, and Federal Small business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of SBEs.

v. At a minimum, DFW will review the performance of other bidders/proposers in meeting the contract goal. For example, when the apparent successful bidder/proposer fails to meet the contract goal, but others meet it, DFW may reasonably raise the question of whether, with additional efforts, the apparent successful bidder/proposer could have met the goal. As provided in §26.53(b)(2)((vi), the bidder must submit copies of each SBE and non-SBE subcontractor quote submitted to the bidder when a non-SBE subcontractor was selected over an SBE for work on

the contract to review whether SBE prices were substantially higher; and contact the SBEs listed on a contractor's solicitation to inquire as to whether they were contacted by the prime. Pro forma mailings to SBEs requesting bids are not sufficient to satisfy good faith efforts under the rule.

a. BDD will review not only the different kinds of efforts that the Contractor has made but also the quantity and quality of those efforts. Efforts that are merely pro-forma are not good faith efforts to meet the goal, even if they are sincerely motivated. The scope and intensity of the efforts will be considered in determining whether the bidder or proposer has achieved a good faith effort. Whether other Contractors attained a sufficient level of SBE participation to meet the Contract Specific Goal will also be taken into consideration when determining whether the Contractor in question has made a good faith effort. A promise to use SBEs after Contract award is not considered to be responsive to the Contract solicitation or to constitute good faith efforts. BDD will also consider if, given all relevant circumstances, the Contractor's efforts could reasonably be expected to produce a level of SBE participation sufficient to meet the goal.

b. Whether or not the Contract Specific Goal has been met and/or whether there were sufficient good faith efforts is considered a matter of the Contractor's responsiveness. The requirement to submit documentation that the Contract Specific Goal has been met or good faith efforts documentation has been submitted in the manner prescribed by BDD is considered a matter of the Contractor's responsiveness. The Airport Board will only award Contracts to Contractors determined to be responsive. If a Contractor fails to submit good faith efforts documentation with the bid or proposal, it waives the right to appeal the BDD's decision that sufficient good faith efforts were not made. The Vice President of BDD or designee shall determine whether the Contractor made the required good faith efforts and, if not, shall recommend that the Contractor be deemed non-responsive.

c. If a Contractor, that has submitted good faith efforts documentation, desires a review of BDD's decision, it must file a written request for an appeal within two (2) business days after receipt of the written decision to the following Reconsideration Official:

Executive Vice President
Chief Administrative Officer
DFW Airport, 2400 Aviation Drive
P.O. Box 619428
DFW Airport, TX 75261-9428

d. As part of the reconsideration, the Contractor will have the opportunity to meet in person with the Reconsideration Official to discuss the issue of whether it met the goal or made adequate good faith efforts to do so. The Contractor will also have the opportunity to provide written documentation or argument concerning the issue of good faith. Arguments, evidence, and documents supporting the basis for the appeal must be received no later than five (5) business days after the notice of appeal is filed. The Reconsideration Official's decision shall be made based solely on the entire administrative record presented with the original good faith efforts documentation. No new additional information or documentation can be

provided or allowed for review. The Reconsideration Official will issue a final written decision in response to the appeal.

a. Failure of the bidder or proposer to show good faith efforts as to anyone (1) of the criteria listed above shall render its overall good faith effort insufficient and its bid or proposal deemed non-responsive.

2. SBE Commitment Modification Due to Change in Scope of Work (Post Award)

a. The Contractor has a continuing obligation as a covenant of performance to meet the SBE utilization to which it committed at Contract award, inclusive of change orders, amendments, and modifications. If the Contractor during Contract performance cannot meet its original SBE commitment, due to changes to the scope of work made by the Airport Board, the Contractor and User Department must immediately notify BDD of the scope of work changes that impact SBEs for approval. The Contractor has a continuing obligation to meet its original SBE commitment.

b. Such good faith efforts during Contract performance must include, but are not limited to:

i. Solicitation of SBEs that are certified in the applicable area of work or specialty;

ii. Providing interested SBEs with adequate information about the plans, specifications, scope of work and requirements of the Contract;

iii. Fairly investigating and evaluating the interested SBEs' regarding their capabilities, not rejecting SBEs as unqualified without sound reasons based on a thorough investigation, and providing verification, including a statement giving the Contractor's reasons for its conclusion, that it rejected each non-utilized SBE because the SBE was not qualified;

iv. Negotiating in good faith with interested SBEs regarding price, using good business judgment and not rejecting reasonable quotes from interested SBEs and providing written documentation why the Contractor and any of the SBEs contacted failed in negotiating an agreement; and

v. Effectively using the services of available advocacy and business community organizations; chambers and Contractor groups; local, State, and Federal business assistance offices, and other organizations that provide assistance in the identification of SBEs

c. Modified good faith efforts must be demonstrated to be meaningful and not merely for formalistic compliance with this requirement. The scope and intensity of the efforts will be considered in determining whether the bidder or proposer has achieved a good faith effort.

d. A Contractor determined not to have made good faith efforts to meet its SBE contractual commitments may request administrative review and final reconsideration by the Vice President of BDD. The Contractor may elect to meet in person to discuss whether the Contractor made good faith

efforts in accordance with the SBE Program Policy and Administrative Procedures. BDD's determination shall be final.

A. COUNTING SBE PARTICIPATION

1. BDD will evaluate each bid or proposal to determine the responsiveness of the bid or proposal to the SBE Program Policy and Administrative Procedures and contractual requirements. In determining if a Contractor's committed levels of participation meet or exceed the solicitation's or the development agreement's Contract Specific Goal, BDD may base its determination solely on the information provided in the bid or proposal document.

2. If a joint venture is proposed to meet the Contract Specific Goal or any portion thereof, the total value of the distinct and clearly defined portions of the work of the Contract that the SBE will perform with its own workforce will be counted towards the Contract Specific Goal. In addition, the SBEs ownership interest percentage must be commensurate with its capital contribution, control, management, profits and risks.

3. When counting the SBE participation in bids with charged reimbursable expenses, deductive or add alternatives, the responsiveness determination shall be based on the base bid. Contractors, however, are strongly encouraged to include SBE participation on add alternates and charged reimbursable expenses when feasibly possible. Any participation achieved on add alternates and charged reimbursable expenses will be credited towards the SBE goal.

4. When calculating participation levels, percentages and dollar amounts for each SBE, the Contractor cannot round up in determining whether or not the total of these amounts meets or exceeds the Contract Specific Goal.

5. A Contractor cannot require an SBE subcontractor to enter an exclusive arrangement for purposes of submitting its bid or proposal or require the SBE subcontractor to enter into a non-compete arrangement post award

6. Post award, the Contractor may count towards its SBE contractual commitment an SBE in the relevant market area that is certified by an approved entity during the performance of the Contract, if the SBE is added to the Contract or substituted for an SBE pursuant to SBE SUBSTITUTIONS OR TERMINATIONS section herein.

7. The Contractor may not count toward its SBE contractual commitment the dollar value of work performed by an SBE after it has ceased to be certified as an SBE or ceased to satisfy the requirement that the SBE have a physical place of business in the relevant market area.

8. SBE prime Contractors can count their self-performance toward meeting the Contract Specific Goal, but only for the scope of work and at the percentage level they will self- perform.

9. SBE prime Contractors cannot count on their self-performance in lieu of meeting an SBE subcontracting commitment made at the time of contract award.

10. When an SBE participates in a Contract, the Contractor shall count only the value of the work performed by the SBE toward the Contract Specific Goal.

1. All SBE contractors, subcontractors, joint ventures, suppliers, manufacturers, manufacturer's representatives, or brokers listed in the bid or proposal must actually perform a commercially useful function in the work of a contract within the area(s) for which they are certified and must not act as a conduit. In no case, however, shall an SBE act as a conduit, nor shall the participation of an SBE count toward the goal to the extent it fails to perform a commercially useful function or knowingly agrees to pass the scope of work for which it is listed for participation and is scheduled to perform or supply on a contract, to a non-SBE or SBE firm and/or does not carry out the responsibilities required for SBE participation by actually performing, managing, controlling and supervising the work under a contract. In this type of relationship, the SBE has not performed a commercially useful function and the arranged agreement between the two (2) parties is not consistent with standard industry practice. This arrangement does not meet the commercially useful function requirement, and therefore the SBE's participation does not count toward the SBE goal on the contract. Conduit is also referred to as a passthrough.

    a. Conduit means an SBE that knowingly agrees to pass the scope of work for which it is listed for participation and is scheduled to perform or supply on a contract, to a non-SBE or SBE firm and/or does not carry out the responsibilities required for SBE participation by performing, managing, controlling and supervising the work under a contract. In this type of relationship, the SBE has not performed a commercially useful function and the arranged agreement between the two (2) parties is not consistent with standard industry practice. This arrangement does not meet the commercially useful function requirement, and therefore the SBE's participation does not count toward the SBE goal on the contract. Conduit is also referred to as a passthrough.

2. When a Contractor utilizes an SBE staffing service to perform work and the workers are independent contractors, subcontractors, or employees of the staffing firm who do not receive paid benefits (including, at a minimum, healthcare coverage and paid time off), the Contractor shall count only the amount of fees or commissions charged by the staffing service for providing labor force, consistent with normal industry practices.

3. A Contractor cannot count toward the Contract Specific Goal amounts paid to an affiliate, as defined in the SBE Program Policy and Administrative Procedures.

4. The Contractor shall count the entire amount of that portion of a Contract (or other Contract not covered by this section) that is performed by the SBEs own work forces. The Contractor may count the cost of supplies and materials obtained by the SBE for the work of the Contract, including supplies purchased or equipment leased by the SBE (except supplies and equipment the SBE subcontractor purchases or leases from the prime Contractor or its affiliate).

5. When an SBE subcontracts part of the work of its Contract to another firm at any tier, the value of the subcontracted work may be counted towards the SBE goal only if the SBE's subcontractor is itself an SBE. Work that an SBE subcontracts to a non-SBE does not count toward SBE goal.

6. The Contractor will count towards the SBE goal expenditures to an SBE subcontractor, only if the SBE subcontractor is performing a commercially useful function on the Contract.

a. AN SBE performs a commercially useful function when it is responsible for execution of the work of the Contract and is carrying out its responsibilities by performing, managing, and supervising the work involved. To perform a commercially useful function, the SBE must also be responsible, with respect to materials and supplies used on the Contract, for negotiating price, determining quality and quantity, ordering the materials, and installing (where applicable) and paying for the materials itself. To determine whether an SBE is performing a commercially useful function, the Contractor must evaluate the amount of the work subcontracted, industry practices, whether the amount the firm is to be paid under the Contract is commensurate with the work it is performing, the SBE credit claimed for its performance of the work, and other relevant factors.

b. An SBE does not perform a commercially useful function if its role is limited to that of an extra participant in a transaction, Contract, or project through which funds are passed in order to obtain the appearance of SBE participation. In determining whether an SBE is such an extra participant, the Contractor must examine, among other relevant factors, similar transaction, particularly those in which SBEs do not participate.

c. If an SBE does not perform or exercise responsibility for at least 30 percent of the total cost of its Contract with its own work forces, or the SBE subcontracts a greater portion of the work of a Contract than would be expected on the basis of normal industry practice for the type of work involved, the Airport must presume that it is not performing a commercially useful function.

d. When an SBE is presumed not to be performing a commercially useful function as provided in this section, the SBE may present evidence to rebut this presumption. BDD may determine that the firm is performing a commercially useful function given the type of work involved and normal industry practices. BDD in its sole discretion shall determine whether an SBE is performing a commercially useful function.

7. BDD shall use the following factors in determining whether an SBE trucking company is performing a commercially useful function:

a. The SBE must be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular Contract, and there cannot be a contrived arrangement for the purpose of appearing to meet the SBE goal.

b. The SBE must itself own and operate at least one fully licensed, insured and operational truck used on the Contract.

c. The SBE shall receive credit for the total value of the transportation services it provides on the Contract using trucks it owns, insures, and operates using drivers it employs.

d. The SBE may lease trucks from another SBE, including a owner-operator who is certified as an SBE. The SBE who leases trucks from another SBE shall receive credit for the total value of the transportation services the lessee SBE provides on the Contract.

a. The SBE may lease trucks from a non-SBE firm, including from an owner-operator. The SBE that leases trucks equipped with drivers from a non-SBE is entitled to credit for the total value of transportation services provided by non-SBE leased trucks equipped with drivers not to exceed the value of transportation services on the contract provided by SBE-owned trucks or leased trucks with SBE employee drivers. Additional participation by non-SBE owned trucks equipped with drivers receives credit only for the fee or commission it receives as a result of the lease arrangement. If a recipient chooses this approach, it must obtain written consent from BDD.

i. For example: SBE Firm X uses two of its own trucks on a contract. It leases two trucks from SBE Firm Y and six trucks equipped with drivers from non-SBE Firm Z. SBE credit would be awarded for the total value of transportation services provided by Firm X and Firm Y, any may also be awarded for the total value of transportation services provided by four of the six trucks provided by Firm Z. In all, full credit would be allowed for the participation of eight trucks. SBE credit could be awarded only for the fees or commissions pertaining to the remaining trucks Firm X receives as a result of the lease with Firm Z.

b. The SBE may lease trucks without drivers from a non-SBE truck leasing company. If the SBE leases trucks from a non-SBE truck leasing company and uses its own employees as drivers, it is entitled to credit for the total value of these hauling services.

i. For Example: SBE Firm X uses two of its own trucks on a contract. It leases two additional trucks from non-SBE Firm Z. Firm X uses its own employees to drive the trucks leased from Firm Z. SBE credit would be awarded for the total value of the transportation services provided by all four trucks.

c. For purposes of this paragraph, a lease must indicate that the SBE has exclusive use and control over the truck. This does not preclude the leased truck from working for others during the term of the lease with the consent of the SBE, so long as the lease gives the SBE absolute priority for use of the leased truck. Lease trucks must display the name and identification number of the SBE.

8. Suppliers: A supplier may be a regular dealer, manufacturer, manufacturer's representative or broker. The Contractor shall count expenditures to SBEs for materials or supplies towards the SBE goal as follows:

a. On Airport Board contracts of less than five million dollars ($5,000,000.00), at the time of bid openings or proposal selection, one hundred percent (100%) of the value of the commercially useful function performed by an SBE supplier on such contract shall be counted toward the SBE goal. If the materials or supplies are purchased from an SBE regular dealer, BDD will count 100% of the cost of the materials or supplies toward the SBE goal.

b. On Airport Board contracts of five million dollars ($5,000,000.00) or more, at the time of bid opening or proposal selection, sixty percent (60%) of the value of the commercially useful function performed by an SBE supplier on such contract shall be counted toward the SBE goal.

i. If the materials or supplies are obtained from an SBE manufacturer, BDD will count 100 percent of the cost of the materials or supplies toward the SBE goal.

ii. A manufacturer is a firm that operates or maintains a factory or establishment that produces, on the premises, the materials, supplies, articles, or equipment required under the contract and of the general character described by the specifications.

iii. If the materials or supplies are purchased from an SBE regular dealer, BDD will count 60% of the cost of the materials or supplies toward SBE goals.

iv. For purposes of this section, a regular dealer is a firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials, supplies, articles or equipment of the general character described by the specifications and required under the contract are bought and kept in stock in the usual course of business.

A. To be a regular dealer, the firm must be an established, regular business that engages, as its principal business and under its own name, in the purchase and sale or lease of the products in question.

B. A person may be a regular dealer in bulk items such as petroleum products, steel, cement, gravel, stone, or asphalt without owning, operating, or maintaining a place of business if the person both owns and operates distribution equipment for the products. Any supplementing of regular dealers' own distribution equipment shall be by a long-term lease agreement and not on an ad hoc or contract-by-contract basis.

v. Packagers, brokers, manufacturers' representatives, or other persons who arrange or expenditure transactions are not regular dealers.

vi. With respect to materials or supplies purchased from an SBE which is neither a manufacturer nor a regular dealer, BDD will count the entire amount of fees or commissions charged for assistance in the procurement of the materials and supplies, or fees or transportation charges for the delivery of materials or supplies required on a job site, toward SBE goals, provided it has been determined the fees to be reasonable and not excessive as compared with fees customarily allowed for similar services. BDD will not count any portion of the cost of the materials and supplies themselves toward SBE goals, however.

vii. BDD will determine the amount of credit awarded to a firm for the provisions of materials and supplies (e.g., whether a firm is acting as a regular dealer or a transaction expediter) on a contract-by-contract basis.

1. If an SBE subcontractor is not certified at the time of the execution of the Contract, supplemental agreement or subcontract, the Contractor may not count the firm's participation toward the SBE goal until the firm is certified. Counting of participation is not retroactive; only dollars paid to the SBE after certification count toward the SBE goal. Additionally, the Contractor shall not count the dollar value of work performed under a Contract with a firm after it has ceased to be SBE certified.

2. BDD reserves the right to reject the participation of a certified firm for credit towards meeting the Contract Specific Goal, in is sole discretion.

3. The Contractor shall not count the participation of an SBE subcontractor toward the goal until the amount has been actually paid to the SBE.

4. The following expenditures to SBEs may also count toward the SBE goal:

    a. The fees or commissions charged for providing a bona fide service, such as professional, technical, consultant or managerial services, and assistance in the procurement of essential personnel, facilities, equipment, materials or supplies required for performance of the Contract, provided that the fee or commission is determined by BDD to be reasonable and not excessive as compared with fees customarily allowed for similar services.

    b. The fees charged for delivery of material and supplies required on a job site (but not the cost of materials and supplies themselves) when the hauler, trucker or delivery service is not also the manufacturer of or a regular dealer in the materials and supplies, provided that the fee is determined by BDD to be reasonable and not excessive as compared with fees customarily allowed for similar services.

    c. The fees of commission charged for providing any bonds or insurance specifically required for the performance of the Contract, provided that the fee or commission is determined by BDD to be reasonable and not excessive as compared with fees customarily allowed for similar services.

5. Joint Ventures: The Airport Board shall encourage where economically feasible joint ventures to maximize prime contracting opportunities for SBEs on all eligible Contracts, including commercial development agreements.

    a. If a Contractor engages in a joint venture to satisfy its SBE commitment, BDD shall review all contractual agreements or other pertinent documents regarding:

        i. The initial capital investment of each venture partner;

        ii. The proportional allocation of profits, losses and risks to each venture partner;

        iii. The sharing of the right to control the ownership and management of the joint venture;

        iv. Actual participation of the venture partners in the performance of the Contract;

        v. The method of and responsibility for accounting;

i. The methods by which disputes are resolved; and

ii. Other pertinent joint venture factors.

b. A draft of the proposed joint venture agreement must be submitted with the bid or proposal to BDD for its approval in writing. BDD shall determine the degree of SBE participation resulting from the joint venture that may be credited towards the Contract Specific Goal.

c. BDD will count SBE participation where the SBE or joint venture partner performs a portion of work on the Contract and the percentage of ownership or equity of the SBE in a joint venture. BDD will allow the joint venture to count the portion of the total dollar value of the Contract equal to the distinct, clearly defined portion of the work of the Contract that the SBE joint venture partner performs with its own forces toward the SBE commitment and for which it is at risk.

d. If, after the award of a contract to a team, any member of the team believes that the terms and conditions of the agreement as approved by BDD have not been complied with, then such member may seek review and mediation of such agreement before the Vice President of BDD. The request for review must be made in writing.

e. In the event that the mediation with the Vice President, does not resolve all disputes, the Vice President of BDD shall have the option of referring mediation proceedings to a qualified outside mediator, the costs to be borne by the interested parties.

B. CERTIFICATION

1. In order to count the participation of SBEs towards the Contract Specific Goal or Annual Goal, the SBE must be certified by the North Central Texas Regional Certification Agency, DFW Business Council or the Women's Business Council Southwest. Other certifications are not acceptable. In addition to having a valid certification from one of the entities listed above, the SBE must be certified in the NAICS Code applicable to the scope of work it proposes to perform and have a place of business in the Airport Board's relevant market area at the time the bid or proposal is submitted for credit towards meeting the SBE goal. The Airport Board's relevant market area includes Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall, Somervell, Tarrant and Wise counties.

2. The SBE must provide any requested documentation to establish its place of business to the satisfaction of BDD. Using a post office box, private mailbox services, another person's or firm's office space (including Airport Board office space), virtual offices, shared or coworking office spaces, executive suites or staffing services does not satisfy the requirement that the SBE have a physical place of business in the relevant market area. Please reference the Definitions in the Appendix of the SBE Program Policy and Administrative Procedures.

3. An SBE owner or employee living in the relevant market area does not satisfy the requirement that the SBE have a place of business in the relevant market area. However, an SBE majority owner who operates his/her own business solely from his/her own residence in the relevant market area satisfies the requirement that the SBE have a physical place of business in the relevant market area. Please

reference the Definitions in the Appendix of the SBE Program Policy and Administrative Procedures.

1. Affiliate/Affiliation: Regardless of certification by a recognized agency, the SBE must be an independent business and not an affiliate of any other business including non-SBEs. Affiliate means any business entity that is affiliated with an SBE or with owners of such SBE or any other business enterprise. Business enterprises are affiliates of each other when:

    a. Affiliation exists when one business controls or has the power to control another or when a third party (or parties) controls or has the power to control both businesses. Control may arise through ownership, management, or other relationships or interactions between the parties. Control may be affirmative or negative. Negative control includes instances where a minority shareholder has the ability, under the concern's charter, by-laws, or shareholder's agreement, to prevent a quorum or otherwise block action by the board of directors or shareholders.

    b. Other relationships or identity of interests exist between or among parties such that affiliation may be found.

    c. *Affiliation based on identity of interest.* Affiliation may arise among two or more persons with an identity of interest. Individuals or firms that have identical or substantially identical business or economic interests (such as family members, individuals or firms with common investments, or firms that are economically dependent through contractual or other relationships) may be treated as one party with such interests aggregated.

    d. Firms owned or controlled by married couples, parties to a civil union, parents, children, and siblings are presumed to be affiliated with each other if they conduct business with each other, such as subcontracts or joint ventures or share or provide loans, resources, equipment, locations or employees with one another.

2. BDD in its sole discretion shall determine whether an applicant is an independent business.

3. The Contractor must submit to BDD a properly completed SBE Certification Certificate or letter, with all required attachments, for all SBEs proposed to be utilized as subcontractors or suppliers to meet the Contract Specific Goal at the time of bid/proposal submission. The Airport Board reserves the right to reject the participation of a certified firm for credit towards meeting the Contract goal, in its sole discretion. Such rejection shall be in writing and state the reason(s) for the rejection. BDD's decision on the request shall be final.

4. A firm must be certified as an SBE at the time of bid or proposal submission to be counted towards meeting the Contract Specific Goal for purposes of determining Contract award.

5. Dollars paid to a firm prior to obtaining an approved certification do not retroactively apply toward meeting the Contract Specific Goal or Annual Goal.

6. SBE certification does not constitute a representation or warranty as to the qualifications or capabilities of any certified firm.

1. BDD maintains a directory of certified firms that have expressed an interest in doing business with the Airport Board or are currently doing business with the Airport Board. The directory is not a certification database. Certifications listed are provided by third-party service providers. Bidders and proposers may use the directory to assist them in locating SBE firms for the work required on the Contract; however, the certifications should be verified through the approved certification agency. The directory is located at:

   - https://dfw.gob2gnow.com

C. PRE-AWARD COMPLIANCE PROCEDURES

1. SBE Utilization Forms and Related Documentation

   a. Each Contractor must submit for all solicitations, bids or proposals, qualifications completed and signed SBE utilization forms as outlined below to be considered responsive. If the Contract Specific Goal is 0% and no SBE participation is proposed, including no SBE self-performance, the required forms should be noted as "Not Applicable". Note that Requests for Proposals and/or Qualifications include Business Development Evaluation Criteria which must be responded to in the proposal even if the Contract Specific Goal is 0%.

2. Request for Bids (RFB) – Goods and Services

   Forms Required with Bid Submission

   a. ***Commitment to SBE Participation*** must be submitted at the time of bid submission.

   b. ***Final Schedule of Subcontractors*** must be submitted at the time of bid submission.

   c. ***Certification Certificates*** must be submitted at the time of proposal submission if a certified Prime is claiming credit for self-performance or for each certified subcontractor listed on the Final Schedule of Subcontractors.

   d. ***Intent to Perform as a Subcontractor*** must be submitted at the time of bid submission for each certified subcontractor identified on the Final Schedule of Subcontractors.

   e. ***Draft Joint Venture Agreement*** must be submitted at the time of RFP submission if proposing as a joint venture at the Prime level and seeking SBE credit in the Joint Venture.

   f. ***Good Faith Effort Documentation*** must be submitted at the time of bid submission if the Contractor fails to meet the Contract Specific Goal.

3. Request for Bids (RFB) – Construction

   Forms Required with Bid Submission

a. ***Commitment to SBE Participation*** must be submitted at the time of bid submission.

b. ***Final Schedule of Subcontractors*** must be submitted at the time of bid submission.

c. ***Certification Certificates*** must be submitted at the time of proposal submission if a certified Prime is claiming credit for self-performance or for each certified subcontractor listed on the Final Schedule of Subcontractors.

d. ***Intent to Perform as a Subcontractor*** must be submitted at the time of bid submission for each certified subcontractor identified on the Final Schedule of Subcontractors.

e. ***Draft Joint Venture Agreement*** must be submitted at the time of RFP submission if proposing as a joint venture at the Prime level and seeking SBE credit in the Joint Venture.

f. ***Good Faith Effort Documentation*** must be submitted at the time of bid submission if the Contractor fails to meet the Contract Specific Goal.

4. Request for Qualifications (RFQ) – Architectural/Engineering Services, Design & Design Management Services

Forms Required with Proposal Submission

a. ***Commitment to SBE Participation*** must be submitted at the time of proposal submission.

b. ***Final Schedule of Subcontractors*** must be submitted at the time of proposal submission. Contractors need to list only the anticipated percentage of participation of SBEs rather than specific dollar amounts. “To be determined” in lieu of a percentage is not acceptable.

c. ***Certification Certificates*** must be submitted at the time of proposal submission if a certified Prime is claiming credit for self-performance or for each certified subcontractor listed on the Final Schedule of Subcontractors.

d. ***Intent to Perform as a Subcontractor*** must be submitted at the time of proposal submission for each certified subcontractor identified on the Final Schedule of Subcontractors.

e. ***Draft Joint Venture Agreement*** must be submitted at the time of RFP submission if proposing as a joint venture at the Prime level and seeking SBE credit in the Joint Venture.

f. ***Good Faith Effort Documentation*** must be submitted at the time of proposal submission if the Contractor fails to meet the Contract Specific Goal.

5. Request for Proposal (RFP) – Goods and Services including Best Value

Forms Required with Proposal Submission

a. ***Commitment to SBE Participation*** must be submitted at the time of proposal submission.

b. ***Final Schedule of Subcontractors*** must be submitted at the time of proposal submission. Contractors need list only the anticipated percentage of participation of SBEs rather than specific dollar amounts. "To be determined" in lieu of a percentage is not acceptable.

c. ***Certification Certificates*** must be submitted at the time of proposal submission if a certified Prime is claiming credit for self-performance or for each certified subcontractor listed on the Final Schedule of Subcontractors.

d. ***Intent to Perform as a Subcontractor*** must be submitted at the time of proposal submission for each certified subcontractor identified on the Final Schedule of Subcontractors.

e. ***Draft Joint Venture Agreement*** must be submitted at the time of RFP submission if proposing as a joint venture at the Prime level and seeking SBE credit in the Joint Venture.

f. ***Good Faith Effort Documentation*** must be submitted at the time of proposal submission if the Contractor fails to meet the Contract Specific Goal.

6. Request for Proposal (RFP) for Construction-related Services procured through Indefinite Delivery: task/delivery order, Job Order Contracts, Program Management/Construction Management services:

Forms Required with Proposal Submission:

a. ***Commitment to SBE Participation*** must be submitted at the time of proposal submission.

b. ***Final Schedule of Subcontractors*** must be submitted at the time of proposal submission. Contractors need list only the anticipated percentage of participation of SBEs rather than specific dollar amounts. "To be determined" in lieu of a percentage is not acceptable.

c. ***Certification Certificates*** must be submitted at the time of proposal submission if a certified Prime is claiming credit for self-performance or for each certified subcontractor listed on the Final Schedule of Subcontractors.

d. ***Intent to Perform as a Subcontractor*** must be submitted at the time of proposal submission for each certified subcontractor identified on the Final Schedule of Subcontractors.

e. ***Draft Joint Venture Agreement*** must be submitted at the time of RFP submission if proposing as a joint venture at the Prime level and seeking SBE credit in the Joint Venture.

a. ***Good Faith Effort Documentation.*** must be submitted at the time of proposal submission if the Contractor fails to meet the Contract Specific Goal**.**

7. Third Party Commercial Development or Concession Tenant Finish Out

   a. **Commitment to SBE Participation (Design)** must be submitted prior to processing an Official Board Action.

   b. **Commitment to SBE Participation (Construction)** must be submitted prior to processing an Official Board Action.

   c. **Final Schedule of Subcontractors (Design)** must be submitted at the Airport's Initial Project Kick-Off Meeting.

   d. **Final Schedule of Subcontractors (Construction)** must be submitted at the Airport's Pre-Construction Meeting.

   e. **Accounting Reconciliation Statement** for the Contract must be submitted with the application for Certificate of Occupancy. A reconciliation statement shall include the total payments to the Prime Contractor and total payments made to each subcontractor listed on the Final Schedule of Subcontractors.

8. Any commitments to meet the Contract Specific Goal must be detailed on the Commitment ***to Small Business Enterprise (SBE) Participation*** form included with the bid/proposal. Submission of the form shall constitute a representation by the Contractor to the Airport Board that it commits to maintain the SBE participation level to which it committed to overall at the time of Contract award throughout the performance of the Contract. The percentage commitment must match the SBE percentage noted on the ***Final Schedule of Subcontractors*** form. For contracts where the scope of work is defined and SBE subcontractors have been selected to perform a portion of the work, the Contractor also commits to maintain and/or exceed the percentage commitment to each individual SBE subcontractor.

9. The ***Final Schedule of Subcontractors*** form must list the Contractor and all subcontractors and suppliers the Contractor intends to use in performing the work of the project, including non-SBEs, and detail the final percentage and dollar commitment of the Contractor to each subcontractor and supplier. Only certified SBEs identified and the levels of participation listed for each at the time of bid/proposal submission will be considered in determining whether the Contractor has met the Contract Specific Goal. All SBEs must be properly certified under the guidelines of the CERTIFICATION section. The final percentage and dollar commitment of the Contractor to SBE participation must match the percentage commitment on the ***Commitment to SBE Participation*** form. Modifications, substitutions or termination of the SBEs identified must follow the guidelines of the SBE SUBSTITUTIONS OR TERMINATIONS section.

10. Submission of the ***Intent to Perform as a Subcontractor*** form for each SBE shall constitute a representation by the Contractor to the Airport Board that it believes such SBE to be certified as an SBE to perform the work as designated, the SBE has a place of business in the Airport Board's relevant market area and the SBE is not affiliated with the Contractor as defined herein. It shall also represent a commitment by the Contractor that if it is awarded the Contract, it will enter a subcontract with such SBE for the work described at the approximate price and

percentage set forth in the ***Intent to Perform as a Subcontractor*** form. The aggregate SBE percentage of all ***Intent to Perform as a Subcontractor*** forms must match the SBE percentage commitment on the ***Commitment to SBE Participation*** form and the ***Final Schedule of Subcontractors*** form.

1. The Contractor shall enter into formal agreements with the SBE firms for work as indicated on the ***Final Schedule of Subcontractors*** and ***Intent to Perform*** forms within 10 (ten) business days after receipt of the Contract executed by the Airport Board or Notice to Proceed executed by the Airport Board. The Contractor, if requested, shall provide to BDD copies of those agreements within 5 (five) business days of execution. BDD reserves the right to review selected agreements at random.

2. If the information on the ***Final Schedule of Subcontractors*** form changes after all the forms have been submitted but prior to Board Approval, the Contractor must immediately notify BDD of the changes and a written explanation for the change by submitting a ***Request for Approval of Change to Final Schedule of Subcontractors*** form to BDD for approval. No change in SBE participation after bid submission, but prior to Contract award, may change, or be deemed to change, the Contractor's submitted bid amount.

3. Post award, any substitution or termination of SBEs that occur after Contract award, must be processed using the Airport Board's Compliance Management System and follow the SBE Program Policy and Administrative Procedures stated in the SBE SUBSTITUTIONS OR TERMINATIONS section.

4. Contractors must appoint and designate to BDD a high-level official to administer and coordinate its contractual SBE commitments.

5. Alternative **Compliance Plan**

    a. Contracts secured through a competitive selection process rather than a competitive bid process, the Vice President of BDD may require proposers to address the project goal by means of a compliance plan. Such a plan allows a contract to address the project goal by means of commitment to utilize SBEs for Project work or by the demonstration of a good faith effort at the point where the project is sufficiently defined and the process of procuring the subcontractors to perform the work is about to begin.

    b. The development, scope and utilization of such compliance plans will be governed by the following considerations and requirements.

    c. Basis for Determination

        i. Unless otherwise authorized in writing by the Vice President of BDD, a department may only require proposers to address a project goal by means of a compliance plan under the following conditions:

            A. The project solicitation must include the procurement of construction services.

            B. At the time of solicitation, the project design must not be complete or at a level of completeness allowing for final competitive pricing proposal; and

A. The project solicitation must not require a lump sum price proposal or the construction of the project upon which a contract award will be made.

6. Development of Compliance Plan

a. Upon determination that a compliance plan will be required for a project, the compliance plan shall be developed in accordance with the following requirements:

i. The Vice President of BDD will require separate goals for project professional services and project construction services.

ii. The construction goal established for each project shall be expressed as a percentage of either:

A. The total amount of any lump sum construction contract awarded to complete a project

B. Total estimated “cost of work,” as that term is defined in any guaranteed maximum price contract awarded to complete a project, or

C. On a task/work order

b. The contracting department shall provide a good faith estimate of the construction cost upon which a goal shall be set, and the compliance plan proposer shall provide a refined estimate at the time of the submission of a proposed compliance plan, if the amount is not reflected in an executed contract.

c. BDD shall establish a timetable for submittal and reviewing of any proposed compliance plan. During the solicitation process as solicitation submittal requirement; and after the conclusion of the solicitation process as a component of contract negotiations and award.

d. Failure to comply with any submittal timetable established by BDD may result in no further consideration of the proposed compliance plan.

7. Elements of a Compliance Plan. At a minimum, a proposed compliance plan shall address the following elements:

a. To the maximum extent applicable, the proposed compliance plan shall comply with the requirements of the SBE Program Policy and Administrative Procedures.

b. The proposed compliance plan shall set forth a detailed program for community outreach and support calculated to enhance participation opportunities.

c. The proposed compliance plan shall set forth a detailed program describing how the proposer will divide up the anticipated work into economically feasible units calculated to enhance participation opportunities.

a. The proposed compliance plan shall set forth a detailed methodology by which the Contractor shall meet the project goal.

b. The proposed compliance plan may be based upon a phased or packaged buy out of the project construction work and, if that is the case, will describe the process by which the proposer will address the project goal on a phased, package, or cumulative basis.

c. If appropriate, the proposed compliance plan shall address the subcontracting of normally self-performed work to meet the project goal.

d. The proposed compliance plan shall set forth how the proposer will comply with the requirements of the SBE Program Policy and Administrative Procedures, and Contract Provisions as part of the construction work, including use of Commitment forms, Intent to Perform, Schedule of Subcontractors forms or proposal pricing worksheet to adequately document committed participation attained.

e. The proposed compliance plan shall contain a specific acknowledgement of the proposer's continuing duty, pursuant to the SBE Program Policy and Administrative Procedures, and Contract Provisions to maintain, throughout the duration of any project contract, compliance with the level of participation committed to under any approved compliance plan, and such commitment will be the basis for award of any contract. The plan will also detail the methodology the proposer will employ for maintain participation commitments.

f. The proposed compliance plan shall set forth a detailed methodology for tabulation of participation performance and plan administration, as well as monitoring and reporting progress and participation performance to BDD. The plan shall provide for review and reconciliation milestones during the project and for review and audit opportunities for BDD.

g. The proposed compliance plan will recommend methods for supporting BDD administration and oversight of the plan, if approved.

h. The proposed compliance plan will affirm that BDD shall have prompt, full and complete access to all contractor and subcontractor personnel, books and records required to monitor and assure performance of the approved compliance plan. Additionally, the plan will acknowledge BDD's right to impose withholding payment in the event of noncompliance.

i. The proposed compliance plan shall set forth a detailed methodology for issuance of notice(s) of non-compliance with the plan and a reasonable opportunity to cure.

j. The proposed compliance plan shall set forth a detailed methodology for final reconciliation of participation performance, measured against the established goal and plan close out.

8. Approval of Compliance Plan

a. Upon receipt of a proposed compliance plan, BDD shall review and either approve or initially reject, with comments, the proposed plan. In the event of a rejection of the proposed plan, the BDD shall set a date for submission

and if warranted, schedule a meeting to discuss any deficiencies that must be addressed in the re-submittal.

a. In the event the Vice President of BDD formally rejects a proposed compliance plan, the Vice President of BDD shall notify the agency head in writing of its determination and such determination shall result in no further consideration of the contractor's proposal or in termination of the contract for cause, in the event a contract has been awarded. In no event shall a contract to construct a project be executed or continue without a compliance plan approved by the Vice President of BDD.

b. Upon approval, the compliance plan shall be incorporated and made a part of the contract with the plan proposer.

9. Compliance and Enforcement

a. The Contractor shall be subject to the COMPLIANCE AND ENFORCEMENT section of the SBE Program Policy and Administrative Procedures and Contract Provisions. If upon approval, the Contractor acknowledges and accepts any failure to comply with any material term or condition of an approved compliance plan or applicable provision of the SBE Program Policy and Administrative Procedures, and Contract Provisions, including failure to satisfactorily address the project goal, maintain participation commitments or otherwise comply with any applicable requirements.

D. PAYMENT

1. Monitoring Contractual Commitments and Payments to SBEs

a. It is Airport Board policy that all Contractor invoices in compliance with Contract payment terms and conditions be paid within 30 days of receipt.

b. All Contractors must comply with the Texas Prompt Pay Act (Chapter 2251; Texas Government Code) paying all sums, including retainage withheld from subcontractors, to subcontractors, subconsultants, vendors, materialmen, suppliers and similar persons or entities, including paying such persons or entities within seven (7) days of receiving payment from the Airport Board their appropriate share of such payment. No Contractor that has received payment of an undisputed amount from the Airport Board may withhold from any subcontractor its undisputed appropriate share of such payment.

c. Any joint check arrangement must be pre-approved by the Vice President of the Business Development Department (BDD) and follow the Department of Transportation joint check guidance before the arrangement or transaction takes place. By joint check, we mean a check issued by a prime Contractor to an SBE subcontractor and to a material supplier or another third party for items or services to be incorporated into a project.

d. No Contractor may withhold retainage from any subcontractor at a higher percentage rate than retainage is withheld by the Airport Board from Contractor. Except for the Texas Prompt Pay Act requirement that a Contractor release retainage to a subcontractor within seven (7) days of

that subcontractor's invoice for retainage, each Contractor must withhold/release retainage from/to each subcontractor in at least the same manner as retainage is withheld/released by the Airport Board from/to Contractor (and must include provisions in its subcontracts ensuring this), including, but not limited to mirroring the Airport Board's treatment of retainage withheld/released to Contractor concerning the following subjects:

i. the percentage amount of retainage withheld/released;

ii. the schedule for withholding/releasing retainage;

iii. the phased release of retainage according to any phased completion (substantial/final) of portions of the project;

iv. the optional cessation of withholding retainage prior to substantial/final completion of, or final payment for, the project (e.g. optional cessation when 50% of project is substantially complete, with an owner's right to resume withholding retainage upon the occurrence of certain events);

v. the release of retainage prior to final payment, less than an amount withheld to cover a percentage of the value of the punch-list work required before final completion is certified (e.g. retention of 200% of the value of punch-list work pending certification of final completion).

e. Each Contractor must address (and implement) in its subcontracts the retainage provisions so that each subcontractor is treated by the Contractor in the same manner as Airport Board treats the Contractor. Nothing in this provision precludes a Contractor from including in its subcontracts retainage provisions that are more favorable than those contained in the Contract between Airport Board and Contractor, including, but not limited to, provisions withholding retainage at a lesser percentage rate, releasing retainage in part/whole earlier than retainage released by Airport Board and/or withholding less retainage than Airport Board withholds to cover the value of punch-list work required to be completed before final completion certification.

f. DFW encourages all Contractors and their subcontractors, subconsultants, vendors, materialmen, suppliers and similar persons or entities to make payment of invoices submitted to them more expeditiously than required under the Texas Prompt Pay Act.

g. Payment by a Contractor in violation of the terms of the Contract or applicable law will constitute a material breach of this Contract.

h. BDD may withhold progress payments until the Contractor demonstrates compliance with the payment terms of this Contract or applicable law, including withholding progress payments solely relating to monies payable to Contractor for work it self-performs or associated retainage.

i. The Airport Board may also exercise any other rights or remedies available to it under this Contract or applicable law if Contractor fails to comply with the payment terms of this Contract or applicable law.

a. In an effort to remove the race- and gender-neutral barrier of the length of time for subcontractor payments on Airport Board procurements, the Airport Board has an Expedited Payment Policy for eligible Contractors that may elect to voluntarily participate in. This policy is applicable if a Contractor has been awarded a multi-year Contract for construction and/or maintenance services of at least $10,000,000 in Contract value. The Expedited Payment program requires those eligible Contractors that voluntarily participate in the program to pay their subcontractors within seven (7) calendar days after receipt of the subcontractor's invoice. The Airport Board would then pay interest and provide other incentives to the Contractor on eligible expedited payments according to the Expedited Payment Process and Policy. The terms for Expedited Payment will be negotiated prior to the issuance of the Notice to Proceed.

b. To ensure that the Contractor meets its SBE contractual commitment, BDD will review the Contractor's SBE utilization throughout the term of the Contract, including any term extensions from the original Contract period. The SBE commitment is determined by the total SBE utilization in relation to the total dollar value of contract as paid to the Prime Contractor. If a Contract includes an SBE contractual commitment, the Contractor must report all SBE payments using the Airport Board's Compliance Management System and submit verifying information as outlined below, concurrent with the Contractor's submission of each payment request. The information provided will be utilized to provide constant monitoring of the payments made to the SBE as well as non-SBE subcontractors in relation to the percentage of work performed. Failure to submit this information with the payment request will result in the invoice being returned to the Contractor. The Prime Contractor can be determined to be non-compliant, if utilization commitments to individual SBE subcontractors are not achieved, even if the total SBE contractual commitment is being met by disproportionate SBE subcontractor utilization not originally listed by the Prime Contractor's ***Final Schedule of Subcontractors*** and ***Intent to Perform as a Subcontractor*** forms without a sufficient modified Good Faith Effort justification.

    i. Contractors are required to report all payments online utilizing the Airport Board's Compliance Management System (B2Gnow) and submit a Compliance Audit List for the Invoice Period (or Pay Period Activity Report for the invoice period) with each payment application submitted to the Procurement & Materials Management (PMM) Department. The Compliance Audit List for the Invoice Period is a printout or copy of the subcontractor payments entered in the system for the invoice period.

    ii. Contracts prior to 2012 are required to submit the original Pay Period Activity Report form with the payment request, unless they choose to report online, when then defaults to Paragraph j.i.

2. Training for the Airport Board's Compliance Management System: The Contractor is responsible for ensuring its employees who are processing payment requests on its company's behalf are trained on the Airport Board's Compliance Management System (B2Gnow). This includes all subcontractors who the

Contractor will be utilizing on the contract and will be verifying reported sub payments online.

1. Contract Close Out: To ensure that the Contractor meets all its SBE contractual commitments, BDD will review the Contractor's SBE utilization throughout the term of the Contract, including any term extensions of the original Contract period, prior to receiving final payment.

    a. If a Contract includes an SBE contractual commitment, the Contractor must report all SBE payments using the Airport Board's Compliance Management System and submit a Final B2Gnow Compliance Audit List concurrent with the Contractor's submission of final payment request.

    b. Once all sub payments have been verified by the subcontractors in the Airport Board's Compliance Management System, the contract will be reviewed for compliance with the program requirements and the prime Contractor's SBE contractual commitment.

    c. The Contractor 's performance will be reviewed, and a satisfactory/unsatisfactory determination will be provided in writing to the Contractor by BDD.

    d. A Contractor's unsatisfactory determination may result in future bids or proposals being deemed non-responsive. In determining whether a future bid or proposal will be deemed non-responsive, BDD will take into consideration the following: circumstances for non-compliance, the length of the period of non-compliance and the history of previous unsatisfactory determinations.

2. Dispute Resolution: BDD encourages all Contractors that may have a dispute with any subcontractor to attempt to resolve such dispute through appropriate formal or informal alternative dispute resolution procedures, including, but not limited to, negotiation, mediation, collaborative law, arbitration and/or conciliation, prior to seeking BDD's assistance in resolving the dispute. If any Contractor or subcontractor does seek BDD's assistance, it may require them to first attempt to resolve their dispute through appropriate alternative dispute resolution procedures and to provide BDD with evidence of their good faith attempts to resolve the dispute as a condition of further assistance from BDD.

3. On-Site Inspections: Compliance monitoring may also include on-site inspections. The Contractor is responsible for providing BDD, if requested, a project work scheduler together with a list of all subcontractors for the scheduled work.

4. Contractors are required to maintain records and documents of payments to subcontractors, including SBEs for a minimum of three (3) years unless otherwise provided by applicable record retention requirements for the Airport financial assistance agreement whichever is longer. These records shall be made available for inspection upon request by any authorized representative of the Airport Board or Department of Transportation. This reporting requirement extends to all subcontractors, both SBE and non-SBE. All reports of noncompliance will be referred to the contract administrator, and if appropriate, to the Legal Department.

E. SBE SUBSTITUTIONS OR TERMINATIONS

1. If change orders, amendments or any other Contract modifications are issued under the Contract, the Contractor has a continuing obligation to immediately inform BDD in writing of any agreed upon increase or decrease in the scope of work of such Contract that impact the participation of SBEs on the contract.

2. If change orders or other Contract modifications are issued under the Contract that include an increase in the scope of work whether by amendment, change order, force account or otherwise which increases or decreases the dollar value of the Contract, whether or not such change is within the scope of work designated for performance by an SBE at the time of Contract award, then such amendment, change order or other modification must be contemporaneously submitted to BDD. The Contractor must make good faith efforts to meet its SBE contractual commitment with existing SBEs first. If the Contractor is unable to meet its SBE contractual commitment with existing SBEs, the Contractor shall satisfy its commitment, as it relates to changed scope of work, modifications, and or amendments, by soliciting new SBEs and must submit a ***Request for Approval of Change to Final Schedule of Subcontractors***, through the Airport Board's Compliance Management System and must be approved in writing by BDD.

3. The Contractor cannot terminate, substitute or otherwise change the terms of its Final Schedule of Subcontractors prior to or after Contract award without the prior written consent of BDD. This includes, but is not limited to, instances in which the Contractor seeks to perform work originally designated for an SBE subcontractor with its own forces or those of an affiliate, a non-SBE or another SBE.

    a. The Contractor shall utilize the specific SBEs listed in the ***Final Schedule of Subcontractors*** to perform the work and supply the materials for which each is listed unless the Contractor obtains BDD written consent as provided in this section; and

    b. The Contractor shall not be entitled to any payment for work or material unless it is performed or supplied by the listed SBE.

    c. The Contractor shall document good cause to terminate or substitute an SBE. For purposes of this paragraph, good cause includes the following circumstances:

        i. The listed SBE subcontractor fails or refuses to execute a written Contract.

        ii. The listed SBE subcontractor fails or refuses to perform the work of its subcontract in a way consistent with normal industry standards. Provided, however, that god cause does not exist if the failure or refusal of the SBE subcontractor to perform its work on the subcontract results from the bad faith or discriminatory action of the Contractor.

        iii. The listed SBE subcontractor fails or refuses to meet the Contractor's reasonable, nondiscriminatory bond requirements.

        iv. The listed SBE subcontractor becomes bankrupt, insolvent, or exhibits credit unworthiness.

        v. The listed SBE subcontractor is ineligible to work on public works projects because of suspension and applicable state law.

i. It has been determined that the listed SBE subcontractor is not a responsible Contractor.

ii. The listed SBE subcontractor voluntarily withdraws from the project and provides you written notice of its withdrawal.

iii. The listed SBE is ineligible to receive SBE credit for the type of work required.

iv. An SBE owner dies or becomes disabled with the result that the listed SBE contractor is unable to complete its work on the Contract.

v. Other documented good cause that BDD determines compels the termination of the SBE subcontractor. Provided, that good cause does not exist if the Contractor seeks to terminate an SBE it relied upon to obtain the Contract so that the Contractor can self-perform the work for which the SBE subcontractor was engaged or so that the Contractor can substitute another SBE or non-SBE subcontractor after Contract award.

d. Before transmitting to BDD its request to terminate and/or substitute an SBE subcontractor, the Contractor must give notice in writing to the SBE subcontractor, with a copy to BDD, of its intent to request to terminate and/or substitute, and the reason for the request.

e. The Contractor must give the SBE subcontractor five business days to respond to the Contractor's notice. The SBE subcontractor must advise BDD and the Contractor of the reasons, if any, why it objects to the proposed termination of its subcontract and why BDD should not approve the Contractor's action. If required in a particular case as a matter of public necessity (e.g. safety), BDD may provide a respond period shorter than five days.

4. In addition to post-award terminations, the provisions of this section apply to pre-award deletions of or substitutions for SBE firms put forward by bidders/proposals in bids/proposals.

a. When an SBE subcontractor is terminated as provided in this section or fails to complete its work on the contract for any reason, the Contractor shall make good faith efforts to find another SBE subcontractor to substitute for the original SBE. These good faith efforts shall be directed at finding another SBE to perform at least the same amount of work under the contract as the SBE that was terminated, to the extent needed to meet the SBE commitment established for the Contract. The good faith efforts shall be documented by the Contractor. The Contractor shall submit the documentation within 7 days, which may be extended for an additional 7 days if necessary, at the request of the Contractor, and BDD shall provide a written determination to the Contractor stating whether or not good faith efforts have been demonstrated.

5. The Contractor must submit an ***Intent to Perform as a Subcontractor*** form for each proposed new SBE subcontractor. BDD will approve or disapprove the substitution based on the Contractor's documented compliance with these provisions.

1. All changes to the ***Schedule of Subcontractors*** form must be submitted for review and approval through the Airport Board's Compliance Management System utilizing the ***Request for Approval of Change to Final Schedule of Subcontractors*** form when adding, changing, or deleting any subcontractor.

2. Failure by the Contractor to carry out the requirements of this section is a material breach of the Contract and may result in the termination of the Contract or such other remedies set forth in Compliance and Enforcement section.

F. COMPLIANCE AND ENFORCEMENT

1. These provisions address the additional contractual remedies available to the Airport Board as a result of the Contractor's failure to comply with the obligations set forth in the SBE Program Policy and Administrative Procedures. The contractual remedies set forth are also applicable to the Contractor's failure to comply with the Program requirements, as well as any remedies available at law or in equity. These remedies are not intended to apply to the Contractor's failure to comply with other obligations under the Contract unrelated to the Program requirements or preclude Airport Board's recovery of its actual damages for such unrelated breaches.

2. The Contractor must attend and participate in onboarding, progress, non-compliance meetings and site visits upon request. The Contractor must forward all necessary documents and information during performance and to close out the Contract and must cooperate with BDD in providing any information, including the final accounting for SBE participation on the Contract.

3. BDD is empowered to receive and investigate complaints and allegations by SBEs, third parties or Airport Board Staff, or to initiate its own investigations, regarding Contractor's compliance with the Program requirements. If BDD determines that an investigation is warranted, the Contractor must fully cooperate with the investigation and provide complete, truthful information to the Airport Board or its representatives concerning the investigation and Contractor's compliance with the Program requirements.

4. The failure of the Contractor to meet the SBE contractual commitment or comply with any other aspect of the Program requirements will constitute a material breach of the Contract entitling the Airport Board or its representatives to exercise any remedy available in this Contract, the Program requirements or applicable law. In addition, the failure of the Contractor to meet the SBE contractual commitment or comply with any other aspect of the Program requirements may be considered and have a bearing on future contract award considerations.

5. Any suspected false, fraudulent or dishonest conduct relating to the Contractor's performance of the Program requirements may be reported to the Airport Board's Department of Audit Services or to any applicable enforcement agency, including the State Attorney General's Office and appropriate federal law enforcement authorities.

6. If Contractor is in breach of any of the Program requirements, the Airport Board or its representatives may exercise any of following remedies, in addition to any other remedies available to it under this Contract or at law or in equity:

   a. withholding funds payable under this Contract, including, but not limited to, funds payable for work self-performed by the Contractor or applicable retainage;

a. temporarily suspending, at no cost to DFW, Contractor's performance under the Agreement/Contract;

b. termination of the Agreement/Contract;

c. suspension/debarment of Contractor for a period of time from participating in any solicitations issued by DFW for severity of breach of Contract.

7. With respect to a firm not meeting a goal on a previous contract or the underutilization of an SBE (or SBEs, if applicable) on a previous contract, BDD shall regard as non-responsive any bid, proposal or competitive selection process proposal received that includes the Contractor, consultant as a Contractor, consultant, subcontractor, subconsultant, joint venture, supplier, manufacturer's representative, or broker.

8. With respect to SBE firms, a finding of non-compliance could result in a denial of certification or removal of eligibility and/or suspension and debarment.

(End of SBE Special Contract Provisions)

DFW DALLAS FORT WORTH INTERNATIONAL AIRPORT

COMMITMENT TO SMALL BUSINESS ENTERPRISE (SBE) PARTICIPATION FORM

(This form is required as part of the bid/proposal submission.)

The SBE goal for Solicitation/Contract # _____is _____%.

***NOTE**: The BDD will only credit SBE participation that is certified by an approved certification entity at the time of bid/proposal submission. DBE,MBE OR WBE certificates are not accepted for SBE credit. Effective 11-07-2025, in addition to having a valid certification, SBEs must also have a place of business in the Airport's market area[1] at the time of bid/proposal submission for credit towards meeting a contract goal.*

The undersigned Contractor has satisfied the requirements of the bid/proposal specifications in the following manner (Please check (✔) the appropriate space):

☐ Self-Performance: The proposer, a certified SBE firm, is committed to meeting or exceeding the SBE goal through self-performance.

☐ Self-Performance & Percentage Participation: The proposer, a certified SBE firm, is committed to meeting or exceeding the SBE goal, with a minimum of _____% self-performance and a minimum of ____% SBE subcontracting participation on this contract.

☐ Percentage Participation: The proposer is committed to meeting or exceeding the SBE goal, with a minimum of _____% SBE subcontracting participation on this contract.

☐ The Contractor is unable to meet the SBE goal of _____% and is committed to a minimum of ___% SBE utilization on this contract and submits documentation demonstrating good faith efforts.

☐ The Contractor is unable to meet the SBE goal of _____% and submits documentation demonstrating good faith efforts.

Name of Prime Contractor:_____

_____

Signature Title

_____

Printed Name Date

[1] The Airport's market area is defined as Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall, Somervell, Tarrant, and Wise counties.

*I*nstructions for Commitment to Small Business Enterprise (SBE) Participation Form

(Note: this form requires the prime contractor to complete, sign, and date prior to bid/proposal submission.)

Contract Number: Enter the Ref.# or Solicitation No. from Bonfire Portal. **SBE Goal:** Enter the SBE percentage goal noted in the Project Description for the solicitation in the Bonfire Portal.

Select only one option which best describes the SBE commitment detailed in the submission:

- **Self-Performance:** Select this option if the Prime bidder/proposer is SBE certified and will meet the SBE goal through self-performance. Note that an SBE Prime who chooses to self-perform to meet the SBE goal must perform at least 30 percent of the total cost of its Contract with its own work force to satisfy the commercially useful function requirement.
- **Self-Performance & Percentage Participation:** Select this option if the Prime bidder/proposer is SBE certified and will meet the SBE goal through self-performance and a percentage of SBE subcontracting participation. Note that an SBE Prime who chooses to self-perform to meet the SBE goal must perform at least 30 percent of the total cost of its Contract with its own work force to satisfy the commercially useful function requirement. Enter participation percentage for both self-performance and SBE subcontracting participation. The percentages noted must match the percentages noted on the Final Schedule of Subcontractors for Work to be self-performed by the Prime and Work to be completed by SBE Subcontractors.
- **Percentage Participation:** Select this option if the SBE goal will be met through SBE subcontracting participation only. Enter the participation percentage proposed for SBE subcontracting participation. The percentage must match the percentage noted on the Final Schedule of Subcontractors for Work to be completed by SBE Subcontractors.

The following options require Good Faith Effort documentation be submitted at the time of bid/proposal submission. (*Reference to Section C. Goals and Good Faith Efforts in the SBE Special Contract Provisions.)* The submission of good faith efforts documentation is a matter of responsiveness and shall include a specific response to each of the criteria listed. Failure of the Contractor to demonstrate adequate good faith efforts as to any one of the criteria established shall render the overall good faith showing insufficient and the bid/proposal non-responsive.

- The Contractor is unable to meet the SBE goal of ___% and is committed to a minimum of ___ % SBE utilization on this contract and submits documentation demonstrating good faith efforts.
- The Contractor is unable to meet the SBE goal of ___% and submits documentation demonstrating good faith efforts.

Name of Prime Contractor: Enter name of Company bidding or proposing.

Signature: The Prime Contractor's authorized representative must sign this form.

Title: Enter title of Prime Contractor's authorized representative.

Printed Name: Enter the first and last name of the authorized representative. **Date:**

Enter date of executed Prime Contractor signature.

Exhibit B

DALLAS FORT WORTH INTERNATIONAL AIRPORT

SCHEDULE OF SUBCONTRACTORS (FINAL)

Prime Bidder/Contractor:_____

☐ SBE Plus ☐ NON-SBE

Contract Number: _____ **Contract Name**:_____

As part of the procedures for the submission of a completed bid/proposal, all bidders/proposers are required to identify ALL participating subcontractors applicable to the above project and include this completed form as part of the bid. Check all Certification Status categories that apply to each subcontractor. Verify that the proposed SBE subcontractor has a place of business in the Airport's Relevant Market Area[3] (not applicable to DBE goals). **NOTE: Certification certificate(s) MUST be attached to this form or bid/proposal will be deemed non-responsive.** The submission of this information is considered an issue of responsiveness, and the Airport Board will not award a contract to any Contractor who has not supplied this documentation. Use additional sheets if necessary.

Name of Subcontractor(s)	Certification Status[2] (check the applicable)		Relevant Market Area[3]	Description of Material or Service Being Provided or Performed	NAICS Commodity Code	Dollar Amount and Percentage of Work	
	SBE Plus	NON	COUNTY			$$$	%
	Dollar Amount & Percentage: Work to be completed by Non-SBE Plus Subcontractors						
	Dollar Amount & Percentage: Work to be completed by SBE Plus Subcontractors						
	Dollar Amount & Percentage: Work to be self-performed by the Prime						
	Total Dollar Amount & Percentage of Work (The Total Amount shall equal the amount proposed on summary of bid/proposal page).						100%

PRIME CONTRACTOR'S CERTIFICATION

The above information is true and complete to the best of my knowledge and belief. I further understand and agree that if awarded the contract, this certification shall be attached thereto and become a part thereof. Failure to provide accurate and complete information or exercise positive, good faith efforts (as defined by the Board's SBE Program) in support of the Board's small business intent and objective may result in being considered non-responsive to the Board's requirements. Furthermore, it is understood and agreed that, if awarded a contract by the Airport Board, the Contractor will not make additions, deletions or substitutions to this certified list of SBE subcontractors without the consent of the Board's Vice President of Business Development Department (BDD) or designee through the submittal of the *Form 102, Request for Approval of Change to Final Schedule of Subcontractors* if this is determined to be the final schedule. The BDD reserves the right to ensure compliance with the Board's SBE programs as deemed necessary including but not limited to audits of submitted SBE information applicable to the Contractor/subcontractors participating on the contract.

Name and Title of Authorized Representative_____ Date:_____

(Please print or type)

Signature:_____ E-mail Address:_____

Any named person, firm, partnership, corporation, association or joint venture as herein provided identified as providing work, labor, services, supplies, equipment, materials or any combination of the foregoing, under contract to a prime Contractor on an Airport contract at any tier.

[2] In order to credit the participation of small businesses, firms must be certified as SBE Plus by a certification agency approved by the Airport Board as defined in the SBE Policies and Administrative Procedures.

[3] In addition to having a valid certification, the SBE must have a place of business in the Airport's relevant market area at the time the bid/proposal is submitted for credit towards meeting an SBE goal.

Instructions for Schedule of Subcontractors

(Note: This form requires the prime contractor to sign and date prior to bid/proposal submission.)

Name of Prime Bidder/Contractor: Enter name of company bidding or proposing and certification status (SBE or Non-SBE).
Contract Number: Enter the reference number or solicitation number from the Bonfire portal.
Contract Name: Enter the Project name from the Bonfire portal.

List all subcontractors and suppliers the Prime Bidder/Contractor intends to use in performing the work of the project, including non-SBEs. Only certified SBEs identified, and the levels of participation listed for each at the time of bid/proposal submission will be considered in determining whether the Contractor has met the SBE goal.

Name of Subcontractor(s): Enter the name of the proposed subcontractor. This includes subconsultants and suppliers.
Certification status: Select the certification status of the proposed subcontractor. (SBE or NON-SBE)
Relevant Market Area: Enter the name of the county where the SBE subcontractor's physical place of business is located. The Airport's Relevant Market Area consists of Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall, Somervell, Tarrant, and Wise countiesonly.
Description of Material or Service Being Provided or Performed: Provide a brief description of the work that will be performed by the subcontractor.
NAICS Commodity Code: Enter the NAICS code(s) that correspond to the description of material or service being provided or performed by the subcontractor.
Dollar Amount and Percentage of Work:

- **Request for Bids (RFB)**: Enter the subcontractor/supplier dollar amount and associated percentage of work to be performed by the SBE subcontractor/supplier. The percentage should be calculated against the Prime Contractor's total dollar amount bid. The dollar amount and percentage must match the dollar amount and percentage noted on the Intent to Perform as an SBE Subcontractor form, if the Intent to Perform form is applicable).
- **Request for Proposals (RFP)**: Note the Price as Not Applicable or N/A. Enter the percentage of work to be performed by the SBE subcontractor/supplier. The percentage should be calculated against the Prime Contractor's total percentage proposed (100%). The percentage must match the percentage noted on the on the Intent to Perform as an SBE Subcontractor form, if the Intent to Perform form is applicable).

Dollar Amount & Percentage: Work to be completed by Non-SBE: If RFB, enter the subtotal dollar amount and percentage of work to be performed by Non-SBE subcontractors. If RFP, enter percentage only.
Dollar Amount & Percentage: Work to be completed by SBE Subcontractors: If RFB, enter the subtotal dollar amount and percentage of work to be performed by certified SBE subcontractors. If RFP, enter percentage only.
Dollar Amount & Percentage: Work to be self-performed by the Prime: If RFB, enter the subtotal dollar amount and percentage of work to be performed by the prime bidder/ contractor. If RFP, enter percentage only.

Total Dollar Amount & Percentage of Work: Enter the TOTAL dollar amount and percentage of work. The total dollar amount shall equal the amount proposed on the summary of bid/proposal page. The total percentage of work must equal to 100% (% Work to be performed by non-SBE subcontractors + % SBE subcontractors + % prime bidder/contractor self-performance)

Name and Title of the Authorized Representative: Enter the full name and title of the authorized representative signing on behalf of the company.
Date: Enter date of executed Authorized Representative signature.
Signature: The authorized representative must sign this form.
Email Address: Enter the email address for the authorized representative.

INTENT TO PERFORM CONTRACT AS A SBE SUBCONTRACTOR[1]

Submission of the **Intent to Perform as a SBE Subcontractor** form for each SBE firm shall constitute a representation by the Prime Contractor to the Airport Board that it believes such SBE to be certified as a SBE to perform the work as designated, the SBE has a place of business in the Airport Board's market area and the SBE is not affiliated with the Contractor as defined herein. It shall also represent a commitment by the Contractor that if it is awarded the Contract, it will enter in a subcontract with such SBE for the work described at the approximate price and percentage set forth.

PRIME CONTRACTOR / CONSULTANT			
Contract / Solicitation Number:			
Name of Prime Contractor:			
Address, City, State and Zip Code:			
The Prime Contractor designates the following person as their high-level official designated to administer and coordinate the efforts to carry out the SBE policy on behalf of the Prime Contractor.			
Name:		Title:	
E-Mail Address:		Phone Number:	

DECLARATION OF PRIME CONTRACTOR

I HEREBY DECLARE AND AFFIRM that as a duly authorized representative of the Prime Contractor stated above, I have personally reviewed the material and facts set forth in this form. To the best of my knowledge, information and belief, the facts and representations contained in this form are true and the owner or authorized agent of the SBE firm stated above signed this form in the place indicated, and no material facts have been omitted. The undersigned affirms that the Prime Contractor has no ownership or financial interest in the SBE subcontracting firm stated below. Except as authorized by the Vice President of Business Development Department or designee, the undersigned shall enter into a formal agreement (which shall include all audit and records provisions required by the Board) with the listed SBE firm for work as indicated by this form within ten (10) business days after receipt of the contract executed by the Airport. The undersigned will, if requested, provide said Vice President or the designee a copy of that agreement within five (5) business days of the written request. Pursuant to State Law, any person [entity] who makes a false or fraudulent statement in connection with the participation of a SBE in any locally funded project or otherwise violates applicable program requirements may be referred for prosecution.

Signature of Prime Contractor:		Date	

SBE SUBCONTRACTOR / SUBCONSULTANT / SUPPLIER AT ANY TIER			
The Airport requires that minority/women business enterprises be certified as SBEs by an approved certification agency as defined in the SBE Program Policy and Procedures. Effective 11-07-2025, in addition to having a valid certification, SBEs must have a place of business in the Airport's market area[1] at the time of bid/proposal submission for credit towards meeting a contract goal.			
Does the undersigned SBE subcontractor has a place of business in the Airport's market area?		☐ Yes ☐ No	
Is the undersigned SBE subcontractor affiliated with the Prime Contractor as defined in the SBE Program Policies and Procedures?		☐ Yes ☐ No	
Name of SBE Subcontractor:			
Address, City, State and Zip Code:			
Contact Person:			
E-Mail Address:		Phone Number:	
Scope of Work: (where applicable specify "supply" or "install" or both)			
Price and Percentage:	$ (%)		
SBE Certification #:		Certification Agency:	
If the SBE shown above is not a direct first tier subcontractor, subconsultant or supplier to the Prime Contractor shown above, please indicate the name of the subcontractor, subconsultant or supplier and tier level that will be utilizing your participation for SBE credit.			
Percentage (%) of the proposed subcontract described above will be sublet and/or awarded to a Non-SBE subcontractor. ***(Complete this box ONLY if subcontracting to a Non-SBE subcontractor.)***			_____%

DECLARATION OF SBE SUBCONTRACTOR

I HEREBY DECLARE AND AFFIRM that as a duly authorized representative of the Subcontractor stated above, the facts and representations contained in this form are true. The undersigned affirms that the Prime Contractor has no ownership or financial interest in the SBE subcontracting firm stated above. I also agree, for good and valuable consideration (including the opportunity to participate in this solicitation as a proposed subcontractor), the receipt and sufficiency of which is hereby acknowledged, that if the Subcontractor performs any work for the Prime Contractor as the result of a contract awarded to the Prime Contractor for this solicitation, the Subcontractor will maintain and the Board shall have the right to examine and make copies of all records, documents, books, statements, checks, invoices, and any other supporting evidence deemed necessary by the Board to substantiate compliance with the terms of this Contract, including any Change Orders. Such right of examinations shall include, but not be limited to, reasonable access to and cooperation by all Subcontractor personnel. Subcontractor agrees to provide the Board with retrievals of computer-based records or transactions that the Board determines to be necessary to conduct any audits. Subcontractor agrees that there shall be no charge to the Board for Subcontractor's costs of providing records, documents, and assistance for audits, and to provide to the Board within seven (7) calendar days all records, documents, retrievals, and other assistance requested.

Signature of SBE Subcontractor		Date	

1 Any named person, firm, partnership, corporation, association or joint venture as herein provided identified as providing work, labor, services, supplies, equipment, materials or any combination of the foregoing, under contract to a prime contractor on an Airport contract at any tier.

2 The Airport's market area is defined as Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall, Somervell, Tarrant, and Wise counties.

Instructions for Intent to Perform as a SBE Subcontractor Form

(Note: This form requires both the prime contractor and the SBE subcontractor to complete, sign and date prior to bid/proposal submission.)

PRIME CONTRACTOR/CONSULTANT

Contract/Solicitation Number: Enter the Ref. # or Solicitation No. from Bonfire Portal.
Name of Prime Contractor: Enter name of Company bidding or proposing.
Address, City, State and Zip Code: Enter physical address for company.
The Prime Contractor designates the following person as their high-level official designated to administer and coordinate the efforts to carry out the SBE policy on behalf of the Prime Contractor.
Name: Enter the first and last name of the Prime Contractor's designated representative as required above.
Title: Enter title of Prime Contractor's designated representative.
E-Mail Address: Enter the email address for the Prime Contractor's designated representative.
Phone Number: Enter a phone number for the Prime Contractor's designated representative.

DECLARATION OF PRIME CONTRACTOR

Signature of Prime Contractor: The Prime Contractor's designated person must sign this form.
Date: Enter date of executed Prime Contractor signature.

SBE SUBCONTRACTOR / SUBCONSULTANT / SUPPLIER AT ANY TIER

Does the undersigned SBE subcontractor have a physical place of business in the Airport's relevant market area? Select Yes or No
Is the undersigned SBE subcontractor affiliated with the Prime Contractor as defined in the SBE Program Policies and Procedures? Select Yes or No
Name of SBE Subcontractor: Enter the name of the SBE subcontractor or supplier.
Address, City, State and Zip Code: Enter the physical place of business address located in the Airport's relevant market area for the SBE subcontractor/supplier.
Contact Person: Enter the first and last name of the SBE subcontractor/supplier designated representative.
Email Address: Enter email address for the SBE subcontractor/supplier designated representative.
Phone Number: Enter the phone number for the SBE subcontractor/supplier designated representative.
Scope of Work: Provide a brief description of the scope of work or services to be performed by the SBE subcontractor. Where applicable, specify 'supply' or 'install' or both.
Price and Percentage:

- **Request for Bids**: Enter the subcontractor/supplier dollar amount and associated percentage of work to be performed by the SBE subcontractor/supplier. The percentage should be calculated against the Prime Contractor's total dollar amount bid and match the dollar amount and percentage noted on the Final Schedule of Subcontractors.
- **Request for Proposals**: Note the Price as Not Applicable or N/A. Enter the percentage of work to be performed by the SBE subcontractor/supplier. The percentage should be calculated against the Prime Contractor's total percentage proposed (100%) and match the percentage noted on the Final Schedule of Subcontractors.

SBE Certification #: Enter the certification number shown on the SBE subcontractor/supplier certificate.
Certification Agency: Enter the name or abbreviation of the certification agency shown on the SBE subcontractor/supplier certificate.
If the SBE subcontractor identified above is not the direct first tier subcontractor, subconsultant or supplier to the Prime Contractor shown above, please indicate the name of the subcontractor, subconsultant or supplier and tier level that will be utilizing your participation for SBE credit: Enter the subcontractor's name and tier level that will be utilizing the services of the SBE subcontractor.

The percentage (%) of the proposed subcontract described above will be sublet and/or awarded to a Non-SBE subcontractor. (Complete this box ONLY if subcontracting to a Non-SBE subcontractor.): Enter the percentage of work that will be subcontracted to a Non-SBE subcontractor only if applicable.

DECLARATION OF SBE SUBCONTRACTOR

Signature of SBE Subcontractor/Supplier: The SBE Subcontractor/Supplier's designated person must sign this form.
Date: Enter date of executed SBE Subcontractor/Supplier signature.

GOOD FAITH EFFORT (GFE) Criteria

NOTE: Include a response to GFE criteria and support documentation in bid/proposal only if the SBE goal is not achieved.

The following factors are taken into account when assessing a good faith effort response. These factors are minimally considered as good faith efforts and demonstrate specific initiatives made in attempting to achieve the applicable contract-specific Small Business Enterprise (SBE) goal. These factors should not be considered as a template, checklist or some quantitative formula. Proposers are required to meet all factors outlined below and provide support documentation in order for the good faith effort plan to be assessed. Mere pro forma efforts are not good faith efforts to meet the SBE contract requirements. This means that a bidder/proposer must show that it took all necessary and reasonable steps to achieve an SBE goal or other requirement of this GFE which, by their scope, intensity, and appropriateness to the objective, could reasonably be expected to obtain sufficient SBE participation, even if they were not fully successful. DFW will evaluate the GFE on quality, quantity, and intensity of the different kinds of efforts that the bidder/proposer has made, based on the regulations and the guidance in Code of Federal Regulations. **NOT SUBMITTING PROPER SUPPORT DOCUMENTATION IS NOT EVIDENCE OF A PROPER DEMONSTRATION OF GOOD FAITH EFFORT. SUBMITTAL OF THE CRITERIA, WITH NO ADDITIONAL DOCUMENTATION, WILL NOT BE CONSIDERED ADEQUATE DEMONSTRATION OF GOOD FAITH EFFORT.** Proposers are not limited to these particular areas and may include other efforts deemed appropriate. Complete form and attach support documentation only if the SBE goal is not achieved. For additional guidance concerning Good Faith Efforts, please refer to the Electronic Code of Federal Regulations (CFR 49 part 26 Appendix A).

GOOD FAITH EFFORT FACTORS
Conducting market research to identify small business contractors and suppliers and solicit through all reasonable and available means the interest of all certified SBEs that have the capability to perform the work of the contract. This may include attendance at any pre-bid or pre-proposal meetings to discuss subcontracting and supplier opportunities (acceptable documentation shall include copies of the meeting sign-in sheets with contractor name noted as signed-in) and business matchmaking meetings and events, advertising and/or written notices, posting of Notices of Sources Sought and/or Requests for Proposals, written notices or emails to all SBEs listed in the State and/or Local respective directories of firms that specialize in the areas of work desired (as noted in the SBE directory) and which are located in the area or surrounding areas of the project. *The Contractor should solicit this interest as early in the acquisition process as practicable to allow the SBEs to respond to the solicitation and submit a timely offer for the subcontract. The bidder should determine with certainty if the SBEs are interested in taking appropriate steps to follow up initial solicitations at least three (3) business days prior to bid opening.*
Selecting portions of the work to be performed by SBEs in order to increase the likelihood that the SBE goals will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units (for example, smaller tasks or quantities) to facilitate SBE participation, even when the prime contractor might otherwise prefer to perform these work items with its own forces. This may include, where possible, establishing flexible timeframes for performance and delivery schedules in a manner that encourages and facilitates SBE participation.
Providing interested SBEs with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation with their offer for the subcontract.
Negotiating in good faith with interested SBEs. It is the bidder's responsibility to make a portion of the work available to SBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available SBE subcontractors and suppliers, so as to facilitate SBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of SBEs that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional Agreements could not be reached for SBEs to perform the work.
A bidder using good business judgment would consider a number of factors in negotiating with subcontractors, including SBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using SBEs is not in itself sufficient reason for a bidder's failure to meet the contract SBE goal, as long as such costs are reasonable. Also, the ability or desire of a prime contractor to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Prime contractors are not, however, required to accept higher quotes from SBEs if the price difference is excessive or unreasonable.

Not rejecting SBEs as being unqualified without sound reasons based on a thorough investigation of their capabilities. The contractor's standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. non-union status) are not legitimate causes for the rejection or non-solicitation of bids in the contractor's efforts to meet the project goal. Another practice considered an insufficient good faith effort is the rejection of the SBE because its quotation for the work was not the lowest received. However, nothing in this paragraph shall be construed to require the bidder or prime contractor to accept unreasonable quotes in order to satisfy contract goals*. A prime contractor's inability to find a replacement SBE at the original price is not alone sufficient to support a finding that good faith efforts have been made to replace the original SBE. The fact that the contractor has the ability and/or desire to perform the contract work with its own forces does not relieve the contractor of the obligation to make good faith efforts to find a replacement SBE, and it is not a sound basis for rejecting a prospective replacement SBE's reasonable quote.*
Making efforts to assist interested SBEs in obtaining bonding, lines of credit, or insurance as required by the recipient or contractor.
Making efforts to assist interested SBEs in obtaining necessary equipment, supplies, materials, or related assistance or services.
Effectively using the services of available advocacy/business community organizations; contractor associations; local, State, and Federal business assistance centers; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of SBEs.
At a minimum, DFW will review the performance of other bidders/proposers in meeting the contract goal. For example, when the apparent successful bidder/proposer fails to meet the contract goal, but others meet it, DFW may reasonably raise the question of whether, with additional efforts, the apparent successful bidder/proposer could have met the goal. As provided in §26.53(b)(2)((vi), the bidder must submit copies of each SBE and non-SBE subcontractor quote submitted to the bidder when a non-SBE subcontractor was selected over a SBE for work on the contract to review whether SBE prices were substantially higher; and contact the SBEs listed on a contractor's solicitation to inquire as to whether they were contacted by the prime. Pro forma mailings to SBEs requesting bids are not alone sufficient to satisfy good faith efforts under the rule.
A promise to use SBEs after contract award is not considered to be responsive to the contract solicitation or to constitute good faith efforts.

FOR DFW BUSINESS DIVERSITY & DEVELOPMENT USE ONLY:

Plan Reviewed by:_____

Date:_____

Signature of Business Specialist/Manager:_____

Recommendation: Approval:_____Denial:_____

REQUEST FOR APPROVAL TO CHANGE ORIGINAL SCHEDULE OF SUBCONTRACTORS

Contract Number_____

Project Name_____

Contractor Name_____, requests approval of the following addition(s) and/or deletion(s) on the **SCHEDULE OF SUBCONTRACTORS (SBE Form No. 90)**, as originally submitted as part of the bid/proposal on the above-named project.

CHANGE

Check (X) block for each transaction.

ADD	DELETE	COMPANY NAME	TRADE	SBE STATUS	RELEVANT MARKET AREA COUNTY	DOLLAR AMOUNT

JUSTIFICATION

The Contractor must demonstrate good cause to terminate or substitute the SBE and seek BDD approval prior to taking any termination or substitution action. Good cause includes the following circumstances: 1. The listed SBE subcontractor fails or refuses to execute a written contract. 2. The listed SBE subcontractor fails or refuses to meet the Contractor's reasonable, nondiscriminatory bond requirements. 3. The listed SBE subcontractor becomes bankrupt, insolvent or exhibits credit unworthiness. 4. The listed SBE is ineligible to work on Airport projects because of suspension and debarment proceedings pursuant to federal or state law or other applicable laws or regulations. 5. BDD has determined that the listed SBE subcontractor is not a responsible contractor. 6. The listed SBE subcontractor voluntarily withdraws from the project and provides BDD written notice of its withdrawal. 7. The listed SBE subcontractor is ineligible to receive credit for the type of work required. 8. The SBE owner dies or becomes disabled with the result that the listed SBE subcontractor is unable to complete its work on the Contract. 9. Other good cause as determined in BDD's sole discretion. Attach additional sheets as necessary.

CERTIFICATION OF AFFIDAVIT

The above information is true and complete to the best of my knowledge and belief. I further understand and agree that this certification shall become a part of my contract with the Dallas/Fort Worth International Airport Board.

Name of Authorized Representative: _____ E-mail Address: _____

(Please print or type)

Signature_____ Date: _____

Routed To:

_____

(Check One)

_____Design, Code & Construction Dept.

_____Procurement & Materials Management Dept.

Approved by:

_____

Vice President or Designee
Business Development Dept.

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1.0 LIQUIDATED DAMAGES – CONSTRUCTION

A. Contractor agrees to complete the construction of the Project in accordance with the agreed-upon Project Schedule, Substantial Completion Date, and Final Completion Date.

B. If Contractor fails to achieve Substantial Completion of the Work on or before the Substantial Completion Date, Contractor must pay $7,500.00 per Day for each Day that Contractor fails to achieve Substantial Completion.

2.0 SMALL BUSINESS ENTERPRISE (SBE) PROGRAM

Refer to Exhibit B – Small Business Enterprise (SBE) Special Contract Provisions for specific goals and compliance requirements.

3.0 INSURANCE PROVISIONS

Refer to Exhibit A – Insurance Requirements for general requirements, required coverages and sample insurance certificate.

4.0 PROJECT INITIATION

The Mobilization fee shall not exceed eight percent (8%) of the total Contract Amount.

5.0 WORK PERFORMED BY CONTRACTOR'S EMPLOYEES

The value of the Work performed by the Contractor with its own employees shall not be less than twenty percent (20%) of the Contract Sum.

6.0 ACCESS TO WORK

6.1.1 The Owner reserves the right to contract for and perform other or additional work on or near the Work.

6.1.2 The Contractor shall provide the Owner and its separate contractors, suppliers installers, and consultants access to the Work in preparation and during construction on or near the project site. The Contractor shall notify the Owner and its separate contractors regarding Project safety criteria, measures, and programs, which the Owner, and its contractors, installers, and consultants, shall comply with while at site.

6.1.3 The Contractor shall be responsible for the coordination and consistency of its work, its schedules, and its activities with the work, schedules, and activities of the Owner's own forces and of each separate contractor through joint review and mutual agreement Such coordination of schedules shall be collaborative and eliminate potential conflicts.

6.1.4 The Contractor shall afford the Owner and separate contractors' reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities and shall connect and coordinate the Contractor's construction and operations with theirs as required by the project documents.

7.0 INTEREST OF PUBLIC OFFICIALS

The Contractor represents and warrants that no employee, official, or member of the OWNER is or will be pecuniarily interested or benefited directly or indirectly in the Contract. The Contractor further represents and warrants that it has not offered or given gratuities (in the form of entertainment, gifts, or otherwise) to any employee, official, or member of the OWNER with a view toward securing favorable treatment in the awarding, amending, or evaluating the performance of this Contract. For breach of any representation or warranty in this Section, the OWNER shall have the right to annul the Contract without liability and/or have recourse to any other remedy it may have at law.

8.0 CONTRACT PROHIBITIONS

A. Contractor/Consultant verifies and agrees that:
   1. it does not boycott Israel; and
   2. it will not boycott Israel during the Contract term.

B. "Boycott Israel" means refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations specifically with Israel, or with a person or entity doing business in Israel or in an Israeli-controlled territory, but does not include an action made for ordinary business purposes.

C. This Contract will immediately terminate for default if Contractor/Consultant
   1. boycotts Israel, effective upon the first "boycott Israel" action under the definition; or
   2. is placed on any list identifying a company that:
      a. contracts with or provides supplies or services to a foreign terrorist organization;
      b. engages in certain scrutinized business operations in Sudan, Iran or with a designated foreign terrorist organization; or
      c. has been complicit in the Darfur genocide during any preceding 20-month period.[1]

D. Contractor/Consultant warrants to Board that it will not be placed on any of those lists during the Contract term.

E. Verification: Each Bidder must execute and submit with its Bid the Verification of Contracting Prohibitions form. That verification will: [i] form a material part of its Bid; and [ii] will be incorporated into any awarded contract.

F. Pursuant to Section 2274.002, Texas Government Code, enacted by SB 13 in the 2021 Regular Session, the Contractor hereby represents that it (i) does not boycott energy companies; and (ii) will not boycott energy companies.

G. Pursuant to Section 2274.002, Texas Government Code, as enacted by SB 19 in the 2021 Regular Session, the Contractor hereby represents that it (i) does not have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association; and (ii) will not discriminate during the term of the contract against a firearm entity or firearm trade association.

9.0 AIRPORT IMPROVEMENT PROGRAM REQUIRED PROVISIONS

1 FAA Publication: The provisions herein comply with the FAA's required Contract Provisions for Airport Improvement Program and for Obligated Sponsors, which may be found at https://www.faa.gov/airports/aip/procurement/federal_contract_provisions/. If there is a conflict between these provisions and the Contract, the FAA Provisions control. Any new or revised required federal contract provisions issued by the FAA in the future are hereby incorporated by reference.

2 Contractor Obligations: Contractor:
   a. (including all subcontractors) must insert these FAA Provisions in each lower tier contract (e.g. subcontract or sub-agreement);
   b. (including all subcontractors) must incorporate these FAA Provisions by reference for work done under any purchase orders, rental agreements, and other agreements for supplies or services; and
   c. Is responsible for compliance with these FAA Provisions by any subcontractor, lower-tier subcontractor, or service provider.

[1] See Texas Government Code; Chapter 2252; Subchapter F; Prohibition on Contracts with Certain Companies (including Sections 2252.152 and 2252.153); Chapter 2270; Prohibition on Contracts with Companies Boycotting Israel; and Chapter 2270; Prohibition on Investing Public Money in Certain Investments (including Sections 2270.0001, 2270.0052, 2270.0102 and 2270.0152).

3 Conflicts: All federal laws and regulations applicable to this Agreement/Contract take precedence over any conflicting local or state laws.

4 Contractor must comply with the following:

4.1 **GENERAL CIVIL RIGHTS PROVISIONS:**

In all its activities within the scope of its airport program, the Contractor or Consultant (hereinafter referred to as "the contractor") agrees to comply with pertinent statutes, Executive Orders, and such rules as identified in Title VI List of Pertinent Nondiscrimination Acts and Authorities to ensure that no person shall, on the grounds of race, color, national origin, creed, sex, age, or disability be excluded from participating in any activity conducted with or benefiting from Federal assistance.

The above provision binds the Contractor and subcontractors from the bid solicitation period through the completion of the contract.

4.2 **TITLE VI ASSURANCE:**

4.2.1 **Title VI Notice**

As a condition of a grant award, the Sponsor shall demonstrate that it complies with the provisions of Title VI of the Civil Rights Act of 1964 (42 U.S.C. §§ 2000d et seq) and implementing regulations (49 CFR part 21) including amendments thereto, the Airport and Airway Improvement Act of 1982 (49 U.S.C. § 47123), the Age Discrimination Act of 1975 (42 U.S.C. 6101 et seq.), Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. § 794 et seq.), the Americans with Disabilities Act of 1990 (42 U.S.C. § 12101, et seq.), U.S. Department of Transportation and Federal Aviation Administration (FAA) Assurances, and other relevant civil rights statutes, regulations, or authorities, including any amendments or updates thereto.

This may include, as applicable, providing a current Title VI Program Plan to the FAA for approval, in the format and according to the timeline required by the FAA, and other information about the communities that will be benefited and impacted by the project. A completed FAA Title VI Pre-Grant Award Checklist is required for every grant application, unless excused by the FAA. The Sponsor shall affirmatively ensure that when carrying out any project supported by this grant that it complies with all federal nondiscrimination and civil rights laws based on race, color, national origin, sex, creed, age, disability, genetic information, in consideration for federal financial assistance. The Department's and FAA's Office of Civil Rights may provide resources and technical assistance to recipients to ensure full and sustainable compliance with Federal civil rights requirements. Failure to comply with civil rights requirements will be considered a violation of the agreement or contract and be subject to any enforcement action as authorized by law.

4.2.2 **List of Pertinent Nondiscrimination Acts and Authorities**

During the performance of this contract, the Contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "Contractor") agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d et seq., 78 stat. 252) (prohibits discrimination on the basis of race, color, national origin);
- 49 CFR Part 21 (Non-discrimination in Federally-Assisted programs of the Department of Transportation—Effectuation of Title VI of the Civil Rights Act of 1964) including amendments thereto;
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601) (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. § 794 et seq.), as amended (prohibits discrimination on the basis of disability); and 49 CFR part 27

(Nondiscrimination on the Basis of Disability in Programs or Activities Receiving Federal Financial Assistance);

- The Age Discrimination Act of 1975, as amended (42 .U.S.C. § 6101 et seq.) (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982 (49 U.S.C. § 47123), as amended (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987 (P.L. 100-259) (broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, the Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms “programs or activities” to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);
- Titles II and III of the Americans with Disabilities Act of 1990 (42 U.S.C. § 12101, et seq) (prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities) as implemented by U.S. Department of Transportation regulations at 49 CFR Parts 37 and 38;
- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. § 1681, et seq).

4.2.3 **Compliance with Nondiscrimination Requirements**

During the performance of this contract, the Contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the “Contractor”), agrees as follows:

1. Compliance with Regulations: The Contractor (hereinafter includes consultants) will comply with the Title VI List of Pertinent Nondiscrimination Acts and Authorities, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.

2. Nondiscrimination: The Contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, national origin), creed, sex, age, or disability in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The Contractor will not participate directly or indirectly in the discrimination prohibited by the Nondiscrimination Acts and Authorities, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR part 21 including amendments thereto.

3. Solicitations for Subcontracts, including Procurements of Materials and Equipment: In all solicitations, either by competitive bidding or negotiation made by the Contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the Contractor of the contractor’s obligations under this contract and the Nondiscrimination Acts and Authorities on the grounds of race, color, or national origin.

4. Information and Reports: The Contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Sponsor or the Federal Aviation Administration to be pertinent to ascertain compliance with such Nondiscrimination Acts and Authorities and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the Contractor will so certify to the Sponsor or the Federal Aviation Administration, as appropriate, and will set forth what efforts it has made to obtain the information.

5. Sanctions for Noncompliance: In the event of a Contractor’s noncompliance with the non-

discrimination provisions of this contract, the Sponsor will impose such contract sanctions as it or the Federal Aviation Administration may determine to be appropriate, including, but not limited to:

a. Withholding payments to the Contractor under the contract until the Contractor complies; and/or

b. Cancelling, terminating, or suspending a contract, in whole or in part.

6. Incorporation of Provisions: The Contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations, and directives issued pursuant thereto. The Contractor will take action with respect to any subcontract or procurement as the Sponsor or the Federal Aviation Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the Contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the Contractor may request the Sponsor to enter into any litigation to protect the interests of the Sponsor. In addition, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

4.3 OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970:

All contracts and subcontracts that result from this solicitation incorporate by reference the requirements of 29 CFR Part 1910 with the same force and effect as if given in full text. Contractor must provide a work environment that is free from recognized hazards that may cause death or serious physical harm to the employee. The Contractor retains full responsibility to monitor its compliance and their subcontractor's compliance with the applicable requirements of the Occupational Safety and Health Act of 1970 (20 CFR Part 1910). The Contractor must address any claims or disputes that pertain to a referenced requirement directly with the U.S. Department of Labor – Occupational Safety and Health Administration.

4.4 FEDERAL FAIR LABOR STANDARDS ACT (FEDERAL MINIMUM WAGE):

4.4.1 All contracts and subcontracts that result from this solicitation incorporate by reference the provisions of 29 CFR Part 201, the Federal Fair Labor Standards Act (FLSA), with the same force and effect as if given in full text. The FLSA sets minimum wage, overtime pay, recordkeeping, and child labor standards for full and part time workers.

4.4.2 Contractor/Consultant has full responsibility to monitor compliance to the referenced statute or regulation. The Contractor/Consultant must address any claims or disputes that arise from this requirement directly with the U.S. Department of Labor – Wage and Hour Division.

END OF SPECIAL PROVISIONS

VERIFICATION OF CONTRACTING PROHIBITIONS

(ATTACH SIGNED FORM HERE)