

PROJECT MANUAL AND SPECIFICATIONS

EV BUS PARKING, BUS CANOPIES AND ROADWAY

PROJECT

BID NO. P26-030



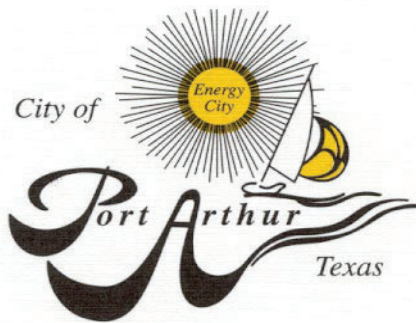
CITY OF PORT ARTHUR
PORT ARTHUR TRANSIT

MARCH 2026



CHARLOTTE M. MOSES, MAYOR
HAROLD L. DOUCET, SR.,
MAYOR PRO TEM

COUNCIL MEMBERS:
WILLIE BAE LEWIS, JR.
TIFFANY L. HAMILTON EVERFIELD
DONEANE BECKCOM
THOMAS KINLAW, III
DONALD FRANK, SR.



RONALD BURTON, CPM
CITY MANAGER

SHERRI BELLARD, TRMC
CITY SECRETARY

ROXANN PAIS COTRONEO
CITY ATTORNEY

APRIL 21, 2026

**INVITATION TO BID
CONSTRUCTION OF EV BUS PARKING, BUS CANOPIES AND ROADWAY**

DEADLINE: Sealed Bid submittals must be received and time stamped by **3:00 p.m., Central Standard Time, Wednesday, May 6, 2026.** (The clock located in the City Secretary's office will be the official time.) All bids received will be read aloud **at 3:15 p.m. on Wednesday, May 6, 2026** in the City Council Chambers, City Hall, 5th Floor, Port Arthur, TX. You are invited to attend.

MARK ENVELOPE: P26-030

DELIVERY ADDRESS: Please submit one (1) original and one (1) copy of your bid to:

CITY OF PORT ARTHUR
CITY SECRETARY
P.O. BOX 1089
PORT ARTHUR, TEXAS 77641

or

CITY OF PORT ARTHUR
CITY SECRETARY
444 4TH STREET, 4th Floor
PORT ARTHUR, TEXAS 77640

POINTS OF CONTACT:

Questions concerning the **Invitation to Bid** or **Scope of Work** should be directed **in writing** to:

City of Port Arthur, TX
Clifton Williams, Purchasing Manager
P.O. Box 1089
Port Arthur, TX 77641
clifton.williams@portarthurtx.gov

The enclosed Invitation to Bid (ITB) and accompanying General Instructions, Conditions and Specifications are for your convenience in submitting bids for the enclosed referenced services for the City of Port Arthur.

Bids must be signed by a person having authority to bind the firm in a contract. Bids shall be placed in a sealed envelope, with the Vendor's name and address in the upper left-hand corner of the envelope.

ALL BIDS MUST BE RECEIVED IN THE CITY SECRETARY'S OFFICE BEFORE OPENING DATE AND TIME. It is the sole responsibility of the firm to ensure that the sealed ITB submittal arrives at the above location by specified deadline regardless of delivery method chosen by the firm. Faxed or electronically transmitted ITB submittals will not be accepted.

A handwritten signature in cursive script that reads "Clifton Williams".

Clifton Williams, CPPB
Purchasing Manager

MANDATORY PRE-BID CONFERENCE

A **Non Mandatory** Pre-Bid Conference between Representatives of the City of Port Arthur, Texas and prospective bidders for **Construction of EV Bus Parking, Bus Canopies and Roadway on April 23, 2026 at 10:00 am at Transit Admin Building, 344 Proctor Street, Port Arthur, Texas** The purpose of the Pre-Bid Conference is to make certain that the scope of work is fully understood, to answer any questions, to clarify the intent of the Contract Documents, and to resolve any problems that may affect the project construction. No addendum will be issued at this meeting, but subsequent thereto, the Purchasing Manager, if necessary, will issue an addendum(s) to clarify the intent of the Contract Documents.

**INVITATION TO BID
CONSTRUCTION OF EV BUS PARKING, BUS CANOPIES AND ROADWAY**

(To be Completed ONLY IF YOU DO NOT BID)

FAILURE TO RESPOND TO BID SOLICITATIONS FOR TWO (2) BID PERIODS MAY RESULT IN REMOVAL FROM THE VENDOR'S LIST. However, if you are removed you will be reinstated upon request.

In the event you desire not to submit a bid, we would appreciate your response regarding the reason(s). Your assistance in completing and returning this form in an envelope marked with the enclosed bid would be appreciated.

NO BID is submitted: ____ this time only ____ not this commodity/service only

	Yes	No
Does your company provide this product or services?		
Were the specifications clear?		
Were the specifications too restrictive?		
Does the City pay its bills on time?		
Do you desire to remain on the bid list for this product or service?		
Does your present work load permit additional work?		
Comments/Other Suggestions:		

Company Name:	
Person Completing Form:	Telephone:
Mailing Address:	Email:
City, State, Zip Code:	Date:

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K.	HOUSE BILL 89 VERIFICATION	YES
L.	NON-COLLUSION AFFIDAVIT	YES
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SECTION A

CONTRACT FOR CONSTRUCTION OF EV BUS PARKING, BUS CANOPIES AND ROADWAY

THIS AGREEMENT, made this ____ day of _____, 2026, by and between the
City of Port Arthur, a municipal corporation organized under the laws of the State of Texas, and
_____ a(n) Corporation herein after called "CONTRACTOR".

WITNESSETH: That for and in consideration of the payment terms, conditions and agreements set forth herein, OWNER and CONTRACTOR agree as follows:

1. The term of this Contract shall be ____ days after the start date on Notice to Proceed.
2. During the term of this Contract, the Contractor will furnish at his own expense all of the materials, supplies, tools, equipment, labor and other services necessary to connection therewith, excepting those supplies specifically not required of Contractor in the Specifications.
3. The CONTRACTOR agrees to perform all the work described in the specifications and contract documents and to comply with the terms in the amounts stated in bid document.
4. The term "Contract Documents" means and includes the following:
 - A. Agreement
 - B. Invitation to Bid
 - C. General Information
 - D. Specification
 - E. Bid
 - F. Bid Bond
 - G. Insurance
 - H. Notice of Award
 - I. Notice to Proceed
 - J. Federal Forms
5. This Agreement shall be binding upon all parties hereto and their respective heirs, executors, administrators, successors and assigns.
6. IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, this Agreement in (2 copies) each of which shall be deemed an original on the date first written above.

Signed on the ____ day of _____, 2026.

CITY OF PORT ARTHUR

BY: _____
Ron Burton, City Manager

ATTEST:

Sherri Bellard, City Secretary

Signed on the _____ day of _____, 2024.

CONTRACTOR

BY: _____

PRINT NAME: _____

TITLE: _____

WITNESS:

PRINT NAME: _____

SECTION B

**CITY OF PORT ARTHUR, TEXAS
ADVERTISEMENT FOR BIDS**

Notice is hereby given that sealed bids, addressed to the City of Port Arthur, will be received at the Office of the City Secretary, City Hall 444 4th Street or P. O. Box 1089, Port Arthur, Texas 77641 no later than **3:00 p.m., Wednesday, May 6 2026** and all bids received will thereafter be opened and read aloud at **3:15 p.m., on Wednesday, May 6, 2026** in the City Council Chambers, 5th Floor, City Hall, Port Arthur, Texas for certain services briefly described as:

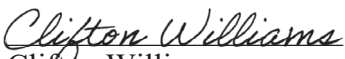
CONSTRUCTION OF EV BUS PARKING, BUS CANOPIES AND ROADWAY

Bids received after the deadline stated above, regardless of method of delivery, will not be considered and returned unopened.

Copies of the Specifications and other Contract Documents are on file in the Purchasing Office, 444 4th Street, City of Port Arthur, and are open for public inspection without charge. They can also be retrieved from the City's website at www.portarthurtx.gov/bids.aspx or www.publicpurchase.com.

NON-MANDATORY PRE-BID MEETING IS SCHEDULED FOR THURSDAY, APRIL 23, 2026 AT 10:00 A.M. AT TRANSIT FACILITY, 344 PROCTOR STREET, PORT ARTHUR, TEXAS

Per Chapter 2 Article VI Sec. 2-262(C) of the City's Code of Ordinance, the City Council shall not award a contract to a company that is in arrears in its obligations to the City.


Clifton Williams
Purchasing Manager

FIRST PUBLICATION: APRIL 15, 2026

SECOND PUBLICATION: APRIL 22, 2026

SECTION C

GENERAL INFORMATION:

Bidders are cautioned to read the information contained in this ITB carefully and to submit a complete response to all requirements and questions as directed.

TERMINOLOGY: "Bid" vs. "Proposal"--For the purpose of this ITB, the terms "Bid" and "Proposal" shall be equivalent.

AWARD: The City of Port Arthur will review all bids for responsiveness and compliance with these specifications. The City reserves the right to award on the basis of the **Lowest and Most Responsive Bid** in accordance with the laws of Texas, to waive any formality or irregularity, and/or to reject any or all proposals.

ALTERING BIDS: Bids cannot be altered or amended after submission deadline. Any interlineations, alteration, or erasure made before opening time must be initialed by the signer of the bid, guaranteeing authenticity.

WITHDRAWAL OF BID: The bidder may withdraw its bid by submitting written request, over the signature of an authorized individual, to the Purchasing Division any time prior to the submission deadline. The bidder may thereafter submit a new bid prior to the deadline. Modification or withdrawal of the bid in any manner, oral or written, will not be considered if submitted after the deadline.

CONFLICT OF INTEREST: No public official shall have interest in this contract, in accordance with Vernon's Texas Code Annotated, Local Government Code Title 5, Subtitle C, Chapter 171.

CONFLICT OF INTEREST: Provide a completed copy of the Conflict of Interest Questionnaire (Form CIQ). The Texas legislature recently enacted House Bill 914 which added Chapter 176 to the Texas Local Government Code. Chapter 176 mandates the public disclosure of certain information concerning persons doing business or seeking to do business with the City of Port Arthur, including affiliations and business and financial relationships such persons may have with City of Port Arthur officers. The form can be located at the Texas Ethics Commission website: https://www.ethics.state.tx.us/filinginfo/conflict_forms.htm

By doing business or seeking to do business with the City of Port Arthur including submitting a response to this ITB, you acknowledge that you have been notified of the requirements of Chapter 176 of the Texas Local Government Code and you are representing that you in compliance with them.

Any information provided by the City of Port Arthur is for information purposes only. If you have concerns about whether Chapter 176 of the Texas Local Government Code applies to you or the manner in which you must comply, you should consult an attorney.

The following are the current City Council and City Employees who are anticipated to either recommend or

ETHICS: Public employees must discharge their duties impartially so as to assure fair, competitive access to governmental procurement by responsible contractors. Moreover, they should conduct themselves in such a manner as to foster public confidence in the integrity of the City of Port Arthur's procurement organization.

Any employee that makes purchases for the City is an agent of the City and is required to follow the City's Code of Ethics.

MINIMUM STANDARDS FOR RESPONSIBLE PROSPECTIVE BIDDERS: A prospective bidder must affirmatively demonstrate bidder's responsibility. A prospective bidder must meet the following requirements:

1. Be able to comply with the required or proposed delivery schedule.
2. Have a satisfactory record of performance.
3. Have a satisfactory record of integrity and ethics.
4. Be otherwise qualified and eligible to receive an award.
5. Be engaged in a full time business and can assume liabilities for any performance or warranty service required.
6. The City Council shall not award a contract to a company that is in arrears in its obligations to the City.
7. No payments shall be made to any person of public monies under any contract by the City with such person until such person has paid all obligations and debts owed to the City, or has made satisfactory arrangements to pay the same.

ADDENDA: Any interpretations, corrections or changes to the ITB will be made by addenda no later than 48 hours prior to the date and time fixed for submission of proposals. Sole issuing authority of addenda shall be vested in the City of Port Arthur Purchasing Manager. The City assumes no responsibility for the proposer's failure to obtain and/or properly submit any addendum. Failure to acknowledge and submit any addendum may be cause for the bid to be rejected. It is the vendor's responsibility to check for any addendums that might have been issued before bid closing date and time. **All addenda will be numbered consecutively, beginning with 1.**

PRICES: The bidder should show in the bid both the unit price and total amount, where required, of each item listed. In the event of error or discrepancy in the mathematics, the unit price shall prevail.

PURCHASE ORDER: A purchase order(s) shall be generated by the City of Port Arthur to the successful bidder. The purchase order number must appear on all itemized invoices.

INVOICES: All invoices shall be mailed directly to the City of Port Arthur, Attn.: **Transit**, P.O. Box 1089, Port Arthur, Texas 77641.

PAYMENT: Payment will be made upon receipt of the original invoice and the acceptance of the goods or services by the City of Port Arthur, in accordance with the State of Texas Prompt

Payment Act, Article 601f V.T.C.S. The City's standard payment terms are net 30, i.e. payment is due 30 days from the date of the invoice.

SALES TAX: The City of Port Arthur is exempt by law from payment of Texas Sales Tax and Federal Excise Tax; therefore the proposal shall not include Sales Tax.

VENUE: This agreement will be governed and construed according to the laws of the State of Texas. This agreement is performable in Port Arthur, Texas, Jefferson County. The City of Port Arthur may request and rely on advice, decisions, and opinions of the Attorney General of Texas and the City Attorney concerning any portion of these requirements.

COMPLIANCE WITH LAWS: The Contractor shall comply with all applicable laws, ordinances, rules, orders, regulations and codes of the federal, state and local governments relating to performance of work herein.

INTEREST OF MEMBERS OF CITY: No member of the governing body of the City, and no other officer, employee or agent of the City who exercises any functions or responsibilities in connection with the planning and carrying out of the program, shall have any personal financial interest, direct or indirect, in this Contract; and, the Contractor shall take appropriate steps to assure compliance.

DELINQUENT PAYMENTS DUE CITY: The City of Port Arthur Code of Ordinances prohibits the City from granting any license, privilege or paying money to any-one owing delinquent taxes, paving assessments or any money to the City until such debts are paid or until satisfactory arrangements for payment has been made. Bidders must complete and sign the AFFIDAVIT included as part of this ITB.

QUANTITIES: Quantities shown are estimated, based on projected use. It is specifically understood and agreed that these quantities are approximate and any additional quantities will be paid for at the quoted price. It is further understood that the contractor shall not have any claim against the City of Port Arthur for quantities less than the estimated amount.

SHIPPING INFORMATION: All bids are to be F.O.B., City of Port Arthur, Port Arthur, TX 77640

INCORPORATION OF PROVISIONS REQUIRED BY LAW: Each provision and clause required by law to be inserted into the Contract shall be deemed to be enacted herein and the Contract shall be read and enforced as though each were included herein. If, through mistake or otherwise, any such provision is not inserted or is not correctly inserted the Contract shall be amended to make such insertion on application by either party.

CONTRACTOR'S OBLIGATIONS: The Contractor shall and will, in good workmanlike manner, perform all work and furnish all supplies and materials, machinery, equipment, facilities and means, except as herein otherwise expressly specified, necessary or proper to perform and complete all the work required by this Contract, in accordance with the provisions of this Contract and said specifications.

The apparent silence of these specifications as to any detail or to the apparent omission from it of a detailed description concerning any point shall be regarded as meaning that only the best commercial practices are to prevail.

While the purpose of the specifications is to indicate minimum requirements in the way of capability, performance, construction, and other details, its use is not intended to deprive the City of Port Arthur the option of selecting goods which may be considered more suitable for the purpose involved.

Under the Title VI of the Civil Rights Act of 1964, no person shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.

RELEASES AND RECEIPTS: The City of Port Arthur before making payments may require the Contractor to furnish releases or receipts for any or all persons performing work and supplying material or service to the Contractor, or any sub-contractors for work under this contract, if this is deemed necessary to protect its interests.

CARE OF WORK: The Contractor shall be responsible for all damages to person or property that occurs as a result of his fault or negligence in connection with the work performed until completion and final acceptance by the City.

SUB-CONTRACTS: The Contractor shall not execute an agreement with any sub-contractor or permit any sub-contractor to perform any work included in this Contract until he has received from the City of Port Arthur written approval of such agreement.

INSURANCE: All insurance must be written by an insurer licensed to conduct business in the State of Texas, unless otherwise permitted by Owner. The Contractor shall, at his own expense, purchase, maintain and keep in force insurance that will protect against injury and/or damages which may arise out of or result from operations under this contract, whether the operations be by himself or by any subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, of the following types and limits

1. Standard Worker's Compensation Insurance:
2. Commercial General Liability occurrence type insurance City of Port Arthur, its officers, agents, and employees must be named as an additional insured):
 - a. Bodily injury \$1,000,000 single limit per occurrence or \$1,000,000 each person /\$1,000,000 per occurrence; and,
 - b. Property Damage \$1,000,000 per occurrence regardless of contract amount; and,

c. Professional Liability: \$1,000,000.

Contractor shall cause Contractor's insurance company or insurance agent to fill in all information required (including names of insurance agency, contractor and insurance companies, and policy numbers, effective dates and expiration dates) and to date and sign and do all other things necessary to complete and make into valid certificates of insurance and pertaining to the above listed items, and before commencing any of the work and within the time otherwise specified, Contractor shall file completed certificates of insurance with the Owner.

None of the provisions in said certificate of insurance should be altered or modified in any respect except as herein expressly authorized. Said CERTIFICATE OF INSURANCE Form should contain a provision that coverage afforded under the policies will not be altered, modified or canceled unless at least fifteen (15) days prior written notice has been given to the City of Port Arthur. Contractor shall also file with the City of Port Arthur valid CERTIFICATE OF INSURANCE on like form from or for all Subcontractors and showing the Subcontractor (s) as the Insured. Said completed CERTIFICATE OF INSURANCE Form (s) shall in any event be filed with the City of Port Arthur not more than ten (10) days after execution of this Contract.

NOTICE TO PROCEED: Notice to Proceed shall be issued within ten (10) days of the execution of the Contract by OWNER. Should there be any reasons why Notice to Proceed cannot be issued within such period, the time may be extended by mutual agreement between OWNER and CONTRACTOR.

DISCLOSURE OF INTERESTED PARTIES FORM 1295: A person or business, who enters into a contract with the City, meeting the conditions according to Texas Local Government Code Sec. 2252.908, is required to file Form 1295 with Texas Ethics Commission. **This form is not required unless there is a contract between the vendor and the City of Port Arthur. Do not submit this form unless you receive an award letter from the City.**

PUBLIC INSPECTION OF BIDS: The City strictly adheres to the Texas Public Information Act (Texas Government Code Chapter 552.001, et seq.) and all other governing statutes, regulations, and laws regarding the disclosure of RFP information. Proposal Documents are not available for public inspection until after the contract award. If the Bidder has notified the City, in writing, that the Bid Document contains trade secrets or confidential information, the City will generally take reasonable steps to prevent disclosure of such information, in accordance with the Public Information Act. This is a statement of general policy only, and in no event shall the City be liable for disclosure of such information by the City in response to a request, regardless of the City's failure to take any such reasonable steps, even if the City is negligent in failing to do so.

AMBIGUITY: Any ambiguity in the Bid Document as a result of omission, error, lack of clarity or non-compliance by the Bidder with specifications, instructions and all conditions shall be construed in the favor of the City.

ADDITIONAL INFORMATION: City may request any other information necessary to determine Bidder's ability to meet the minimum standards required by this ITB.

CHANGE ORDER

- (a) The Contracting Officer may at any time, and without notice to the sureties, if any, by a written order, make changes within the general scope of this contract in any one or more of the following: (is) drawings, designs, or specifications; (ii) extending term of contract; and (iii) equitable adjustment in price/time of performance. If any such change causes an increase or decrease in the Contractor's cost of, or the time required for, the performance of any part of the work under this contract, whether changed or not changed by the order, an equitable adjustment shall be made in the contract price or delivery schedule, or both, and the contract shall be modified in writing accordingly.
- (b) Any notice of intent to assert a claim for adjustment under this clause must be asserted by the Contractor within 30 days from the date of receipt of the Contracting Officer's written order; provided, however, that later notice shall not bar the Contractor's claim if the Contractor can demonstrate that PAT was not prejudiced by the delay in notification. In no event shall any claim be asserted after final payment.

I. GENERAL:

The undersigned vendor certifies to abide by these clauses and include the following clauses in each subcontract financed in whole or in part with Federal Transit Administration (FTA) funds. Vendors are certifying by reference the entire list of FTA's current fiscal year Certifications and Assurances (for fiscal year: **2021**), and shall download the same at: <https://www.transit.dot.gov/funding/grantee-resources/certifications-and-assurances/certifications-assurances>

A. Access to Third Party Contract Records (ALL)

As required by 49 U.S.C. § 5325(g). The VENDOR agrees provide sufficient access to records as needed to assure proper project management and compliance with Federal laws and regulations.

B. Interest of Members of or Delegates to Congress (ALL)

The vendor certifies that no member of or delegate to the Congress of the United States (US) shall be admitted to any share or part of this contract or to any benefit arising therefrom.

C. Prohibited Interest (ALL)

The vendor certifies that no member, officer or employee of the Public Body or of a local public body during his or her tenure or one year thereafter shall have any interest, direct or indirect, in this contract or the proceeds thereof.

D. Cargo Preference - Use of United States-Flag Vessels (property transported on ocean vessels)

The vendor agrees: a. to use privately owned US -Flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material or commodities pursuant to the underlying contract to the extent such vessels are available at fair and reasonable rates for US-Flag commercial vessels; b. to furnish within 20 working days following the date of loading for shipments originating within the US or within 30 working days following the date of loading for shipments originating outside the US, a legible copy of a rated, "on-board" commercial ocean bill-of-lading in English for each shipment of cargo to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590 and to the FTA recipient (through the contractor in the case of a subcontractor's bill-of-lading).

E. Energy Conservation (ALL)

The vendor agrees to comply with mandatory standards and policies relating to energy efficiency, which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act.

F. No Obligation by the Federal Government. (ALL)

The Purchaser and vendor acknowledge and agree that, notwithstanding any concurrence by the Federal Government in or approval of the solicitation or award of the underlying contract, absent the express written consent by the Federal Government, the Federal Government is not a party to this contract and shall not be subject to any obligations or liabilities to the Purchaser, Contractor or any other party (whether or not a party to that contract) pertaining to any matter resulting from the underlying contract).

G. Program Fraud and False or Fraudulent Statements or Related Acts (ALL)

The vendor acknowledges that the provisions of the Program Fraud Civil Remedies Act of 1986, as amended, 31 U.S.C. §3801 et seq. and U.S. DOT regulations, "Program Fraud Civil Remedies," 49 C.F.R. Part 31, apply to its actions pertaining to this project. The vendor certifies truthfulness and accuracy of any statement it makes pertaining to the FTA-assisted project. The vendor acknowledges that if it makes, or causes to be made, a false, fictitious or fraudulent claim, statement, submission or certification, the Federal Government reserves the right to impose the penalties of the Program Fraud Civil Remedies Act of 1986 as deemed appropriate. The vendor acknowledges that if it makes, or causes to be made, a false, fictitious or fraudulent claim, statement submission, or certification to the Federal Government relating to the FTA-assisted project, per 49 U.S.C. §5307, the Government reserves the right to impose the penalties of 18 U.S.C. §1001 and 49 U.S.C. §5307(n)(1) on the Contractor, as deemed appropriate.

H. Contract Work Hours (all over 100K)

(1) **Overtime requirements** - No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) **Violation; liability for unpaid wages; liquidated damages** - In the event of any violation of the clause set forth in paragraph (1) of this section, the contractor & any subcontractor responsible therefore shall be liable for unpaid wages and shall be liable to the United States for liquidated damages which shall be computed for each individual laborer, mechanic, watchman or guard employed in violation of the clause set forth in paragraph (1) of this section, in the sum of \$10 for each calendar day that an individual was required / permitted to work over 40 hours in a workweek without payment of overtime wages required by the clause in paragraph (1) of this section.

(3) **Withholding for unpaid wages and liquidated damages** - The purchaser shall upon its own action or upon written request of the Department of Labor (DOL) withhold or cause to be withheld, from any money payable for work performed by the contractor or subcontractor under any contract or other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as set-forth in paragraph (2) of this section.

(4) **Subcontracts** - The contractor or subcontractor shall include the clauses set forth in this section and require the same from subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with these clauses.

(5) **Payrolls and basic records** - Payrolls and related basic records shall be maintained by the contractor during the course of the work and preserved for three years thereafter for all laborers and mechanics working at the work site (or under the United States Housing Act of 1937 or the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address and social security number of each worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records showing that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, that the plan or program has been communicated in writing to the laborers or mechanics affected, and records of the costs anticipated or actual costs incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of registration of apprenticeship programs, certification of trainee programs, registration of the apprentices and trainees, and ratios & wage rates prescribed in applicable programs.

I. Civil Rights (over 10K)

(1) **Nondiscrimination** - In accordance with Title VI of the Civil Rights Act (CRA), as amended, 42 U.S.C. §2000d, section 303 of the Age Discrimination Act of 1975, as amended, 42 U.S.C. §6102, section 202 of the Americans with Disabilities Act of 1990, 42 U.S.C. §12132, and Federal transit law at 49 U.S.C. §5332, the vendor agrees that it will not discriminate against any employee or applicant for employment because of race, color, creed, national origin, sex, age, or disability. In addition, the vendor agrees to comply with applicable Federal implementing regulations and other implementing requirements FTA may issue.

(2) **Equal Employment Opportunity** - The following equal employment opportunity requirements apply:

(a) **Race, Color, Creed, National Origin, Sex** - In accordance with Title VI of the CRA, as amended, 42 U.S.C. §2000e, and Federal transit laws at 49 U.S.C. §5332, the vendor agrees to comply with all applicable equal employment opportunity requirements of U.S. DOL regulations, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, DOL," 41 C.F.R. Parts 60 et seq., (which implement Executive Order No. 11246, "Equal Employment Opportunity," as amended by Executive Order No. 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," 42 U.S.C. §2000e note), and with any applicable Federal statutes, executive orders, regulations and Federal policies that may in the future affect construction activities undertaken in the course of the Project. The vendor agrees to take affirmative action to ensure that applicants are employed & treated during employment without regard to their race, color, creed, national origin, sex or age. Action shall include but not be limited to employment, upgrading, demotion, transfer, recruitment, layoff, termination, rates of pay or other forms of compensation; and selection for training, including apprenticeship. The vendor agrees to comply with any implementing requirements FTA may issue.

(b) **Age** - In accordance with section 4 of the Age Discrimination in Employment Act of 1967 (29 U.S.C. §§623 and 49 U.S.C. §5332), the vendor agrees to refrain from discrimination against present and prospective employees for reason of age. and comply with any implementing requirements FTA may issue.

(c) Disabilities - In accordance with section 102 of the Americans with Disabilities Act (42 U.S.C. §12112), the contractor agrees to comply with the requirements of U.S. Equal Employment Opportunity Commission, "Regulations to Implement the Equal Employment Provisions of the Americans with Disabilities Act," 29 C.F.R. Part 1630, pertaining to employment of persons with disabilities. and to comply with any implementing requirements FTA may issue.

J. Incorporation of Federal Transit Administration (FTA) Terms (ALL)

The preceding provisions include, in part, certain Standard Terms and Conditions required by DOT, whether or not expressly set forth in the preceding contract provisions. All contractual provisions required by DOT, as set forth in FTA circular 4220.1F are hereby incorporated by reference. Anything to the contrary herein notwithstanding, all FTA mandated terms shall be deemed to control in the event of a conflict with other provisions contained in this Agreement. The Contractor shall not perform any act, fail to perform any act, or refuse to comply with any transit agency requests which would cause the transit agency to violate FTA terms and conditions.

K. Application of Federal, State, & Local Laws, Regulations, & Directives (Federal Changes) (ALL)

The VENDOR agrees that Federal laws and regulations control project award and implementation. The VENDOR understands and agrees that unless the recipient requests FTA approval in writing, the VENDOR may incur a violation of Federal laws or regulations or this agreement if it implements an alternative procedure or course of action not approved by FTA. The VENDOR understands and agrees that Federal laws, regulations, and directives applicable on the date on which Federal assistance is awarded may be modified from time to time. In particular, new Federal laws, regulations, and directives may become effective after the date the project agreement is effective, and might apply to that project agreement. The VENDOR agrees that the most recent versions of such Federal laws, regulations, and directives will apply to the administration of the project at any particular time.

L. Right of the State Government to Terminate (ALL)

Upon written notice, the VENDOR agrees that the State Government may suspend or terminate all or any part of State assistance if terms of the project agreement are violated, if the State Government determines that the purposes of the laws authorizing the Project would not be adequately served by the continuation of State assistance for the Project, if reasonable progress on the Project is not made, if there is a violation of the project agreement that endangers substantial performance of the Project, or if the State Government determines that State assistance has been willfully misused by failing to make appropriate use of Project property. Termination of State assistance for the Project will not typically invalidate obligations properly incurred before the termination date to the extent those obligations cannot be canceled. The State Government reserves the right to require the refund of the entire amount of State assistance provided for the Project or a lesser amount.

M. Disputes, Breaches, Defaults, or Other Litigation (over 150K)

The VENDOR agrees that FTA has a vested interest in the settlement of any dispute, breach, default, or litigation involving the Project. Accordingly:

a. Notification to FTA. The VENDOR is aware that recipients of Federal assistance must notify FTA in writing of any current or prospective major dispute, breach, default, or litigation that may affect the Federal Government's interests in the Project or the administration or enforcement of Federal laws or regulations. If the Federal Government is to be named as a party to litigation for any reason, in any forum, the appropriate FTA Regional Counsel is to be notified in writing before doing so.

b. Federal Interest in Recovery. The VENDOR is aware that the Federal Government retains the right to a proportionate share, based on the percentage of the Federal share awarded for the Project, of proceeds derived from any third party recovery.

c. Enforcement. The VENDOR agrees to pursue its legal rights and remedies available under any third party contract or available under law or regulations.

d. FTA Concurrence. The VENDOR is aware that FTA reserves the right to concur in any compromise or settlement of any claim involving the Project.

e. Alternative Dispute Resolution. The VENDOR is aware that FTA encourages the use of alternative dispute resolution procedures, as may be appropriate.

f. Agency Process.

Transit agency enters dispute resolution process here.

N. Fly America (foreign air transport or travel)

The Contractor agrees to comply with 49 U.S.C. 40118 (the "Fly America" Act) in accordance with the General Services Administration's regulations at 41 CFR Part 301-10, which provide that recipients and subrecipients of Federal funds and their contractors are required to use U.S. Flag air carriers for U.S. Government-financed international air travel and transportation of personal effects or property, to the extent such service is available, unless travel by foreign air carrier is a matter of necessity, as defined by the Fly America Act. The Contractor shall submit, if a foreign air carrier was used, an appropriate certification or memorandum adequately explaining why service by a U.S. flag air carrier was not available or why it was necessary to use a foreign air carrier and shall, in any event, provide a certificate of compliance with the Fly America requirements. The Contractor agrees to include the requirements of this section in all subcontracts that may involve international air transportation.

O. Recycled Products (all products)

The contractor agrees to comply with all the requirements of Section 6002 of the Resource Conservation and Recovery Act (RCRA), as amended (42 U.S.C. 6962), including but not limited to the 40 CFR Part 247, and Executive Order 12873, as they apply to the procurement of the items designated in Subpart B of 40 CFR 247.

P. Access for Individuals with Disabilities (ALL)

The VENDOR agrees to comply with 49 U.S.C. § 5301(d), which states the Federal policy that elderly individuals and individuals with disabilities have the same right as other individuals to use public transportation services and facilities, and that special efforts shall be made in planning and designing those services and facilities to implement transportation accessibility rights for elderly individuals and individuals with disabilities. The VENDOR also agrees to comply with all applicable provisions of section 504 of the Rehabilitation Act of 1973, as amended, with 29 U.S.C. § 794, which prohibits discrimination on the basis of disability; with the Americans with Disabilities Act of 1990 (ADA), as amended, 42 U.S.C. §§ 12101 *et seq.*, which requires that accessible facilities and services be made available to individuals with disabilities; and with the Architectural Barriers Act of 1968, as amended, 42 U.S.C. §§ 4151 *et seq.*, which requires that buildings and public accommodations be accessible to individuals with disabilities; and with other laws and amendments thereto pertaining to access for individuals with disabilities that may be applicable. In addition, the VENDOR agrees to comply with applicable implementing Federal regulations any later amendments thereto, and agrees to follow applicable Federal directives except to the extent FTA approves otherwise in writing. Among those regulations and directives are: (1) U.S. DOT regulations, "Transportation Services for Individuals with Disabilities (ADA)," 49 C.F.R. Part 37; (2) U.S. DOT regulations, "Nondiscrimination on the Basis of Handicap in Programs and Activities Receiving or Benefiting from Federal Financial Assistance," 49 C.F.R. Part 27; (3) Joint U.S. Architectural and Transportation Barriers Compliance Board (U.S. ATBCB)/U.S. DOT regulations, "Americans With Disabilities (ADA) Accessibility Specifications for Transportation Vehicles," 36 C.F.R. Part 1192 and 49 C.F.R. Part 38; (4) U.S. DOJ regulations, "Nondiscrimination on the Basis of Disability in State and Local Government Services," 28 C.F.R. Part 35; (5) U.S. DOJ regulations, "Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities," 28 C.F.R. Part 36; (6) U.S. General Services Administration (U.S. GSA) regulations, "Accommodations for the Physically Handicapped," 41 C.F.R. Subpart 101-19; (7) U.S. EEOC, "Regulations to Implement the Equal Employment Provisions of the Americans with Disabilities Act," 29 C.F.R. Part 1630; (8) U.S. Federal Communications Commission regulations, "Telecommunications Relay Services and Related Customer Premises Equipment for the Hearing and Speech Disabled," 47 C.F.R. Part 64, Subpart F; (9) U.S. ATBCB regulations, "Electronic and Information Technology Accessibility Standards," 36 C.F.R. Part 1194; (10) FTA regulations, "Transportation for Elderly and Handicapped Persons," 49 C.F.R. Part 609; and (11) Federal civil rights and nondiscrimination directives implementing the foregoing Federal laws and regulations, except to the extent the Federal Government determines otherwise in writing.

Q. Debarment and Suspension (over 25K)

The vendor hereby certifies that it and its principals have not presently or within a three year period been debarred, suspended, proposed for debarment, declared ineligible or voluntarily excluded from covered transactions by any Federal agency; and the vendor hereby certifies that it and its principals have not presently or within a three-year period been convicted of or had a civil judgment rendered against them for the commission of a fraud or a criminal offense in connection with obtaining, attempting to obtain or performing a public (Federal, state or local) transaction; violation of Federal or state antitrust statutes; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements or receiving stolen property.

R. Clean Water & Air (over 150K)

The vendor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq. The vendor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. §§7401 et seq. The vendor agrees to report each violation to the Purchaser and understands and agrees that the Purchaser will, in turn, report each violation as required to assure notification to the FTA and the EPA.

S. Non-Lobbying (over 150K)

The undersigned certifies to the best of his or her knowledge and belief that:

1) No federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned to any person for influencing or attempting to influence any officer or employee of an agency, a member of Congress, an officer or employee of Congress in connection with the awarding of any federal contract, the making of any federal grant, the making of any federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any federal contract, grant, loan, or cooperative agreement.

2) If any funds other than federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with this federal contract, grant, loan or cooperative agreement, the undersigned shall complete and submit standard form LLL, "Disclosure Form to Report Lobbying", in accordance with its instructions.

3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, USC. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

T. Lobbying and Disclosure Certification

Name of Company	Printed Name of Person Completing Form
Date	Signature

U. CERTIFICATION TO PURCHASER:

- A. The undersigned vendor certifies that the manufactured good(s) furnished will meet or exceed the specifications, and/or that services rendered will comply with the terms of the solicitation or contract.
- B. The undersigned vendor certifies that it has read all of the bid, proposal, or contract documents and agrees to abide by the terms, certifications, and conditions thereof.

Name of Company	Address	
	Printed Name of Person Completing Form	
Telephone	Signature	
Date	SS# or Tax ID #	
Description of Commodity or Service		
Disadvantaged Business Enterprise Information		Type of Organization (circle)
		<input type="checkbox"/> Sole Proprietorship <input type="checkbox"/> General Proprietorship
Is your firm a DBE? <input type="checkbox"/> (yes) <input type="checkbox"/> (no)		<input type="checkbox"/> Corporation <input type="checkbox"/> Limited Partnership
If yes, what type?		<input type="checkbox"/> Limited Proprietorship

V. Disadvantaged Business Enterprises (DBE) Certification (Transit Vehicle Manufacturer or TVM)

The vendor will provide products compliant with 49 CFR 26.49 regarding the vehicle manufacturer's overall DBE goal.

Name of manufacturer of vehicle(s) to be delivered: _____

W. Disadvantage Business Enterprise (DBE) Race-Neutral Required Clauses (Non-TVM):

The DBE rules set forth in 49 CFR Part 26 apply to all contracts funded in whole or in part with Federal DOT funds. Contracts and subcontracts must contain the clauses listed in 49 CFR 26.13 and 49 CFR 26.29. Sub-recipients with contracts that contain a DBE goal must coordinate with their PTC in order to ensure solicitations and contracts comply with DBE requirements.

49 CFR 26.13 -- What assurances must recipients and contractors make?

Each contract you sign with a contractor (and each subcontract the prime contractor signs with a subcontractor) must include the following assurance:

The contractor, sub recipient or subcontractor 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 49 CFR part 26 in the award and administration of DOT-assisted contracts. 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 recipient deems appropriate, which may include, but is not limited to:

- (1) Withholding monthly progress payments;
- (2) Assessing sanctions;
- (3) Liquidated damages; and/or
- (4) Disqualifying the contractor from future bidding as non-responsible."

49 CFR 26.29 -- What Prompt Payment Mechanisms Must Recipients Have?

Grantees must establish a contract clause requiring prime contractors to pay subcontractors for satisfactory performance no later than 30 days from receipt of each payment the grantee makes to the prime contractor. This clause must require the prompt return of retainage payments from the prime contractor to the subcontractor within 30 days after the subcontractor's work is satisfactorily completed. For more information on these please review 49 CFR 26.29 and the FTA Best Practice Procurement Manual.

X. Altoona Test Certification (for rolling stock purchases) (Check one of the following):

- ☐ The vehicle has been Altoona tested, report number: _____
- ☐ The vehicle is exempt from testing IAW 49 CFR 665.
- ☐ The vehicle is currently being tested at Altoona.

Funds will not be released until the purchasing agency gets a copy of the Altoona test report, as appropriate, per 49 CFR 665.

Y. **Federal Motor Vehicle Safety Standards (FMVSS) Certification (for rolling stock purchases)**

Any vehicles provided by the vendor will comply with all applicable FMVSS. The vendor shall submit 1) manufacturer's FMVSS self-certification sticker information that the vehicle complies with relevant FMVSS or 2) manufacturer's certified statement that the contracted buses will not be subject to FMVSS regulations.

FMVSS Certification

Name of Company	Printed Name of Person Completing Form
Date	Signature

Z. Buy America (Check where applicable): (over \$150K rolling stock, construction, materials)

- ☐ The vendor or offeror hereby certifies it will comply with the requirements of 49 USC 5323(j) and the applicable regulations in 49 CFR 661, providing Buy America compliant manufactured goods or rolling stock.
- ☐ The vendor or offeror cannot comply with the requirements 49 USC 5323(j), but may qualify for an exception to the requirement pursuant to the regulations in 49 CFR 661.

Buy America Certification

Name of Company	Printed Name of Person Completing Form
Date	Signature

II. **SPECIAL PROJECT TYPE PROVISIONS - the following addenda are attached and endorsed as appropriate:**

- A. Construction or Architectural & Engineering Projects ☒
- B. Transit Operations or Management Projects ☐
- C. Intelligent Transportation System or Research & Development ☐



Consolidated Certification Form Addendum B - Transit Operations or Management Projects

I. Transit Employee Protective Arrangements

(a) General Transit Employee Protective Requirements -

To the extent that FTA determines that transit operations are involved, the Contractor agrees to carry out the transit operations work on the underlying contract in compliance with terms and conditions determined by the U.S. Secretary of Labor to be fair and equitable to protect the interests of employees employed under this contract and to meet the employee protective requirements of 49 U.S.C. 5333(b), and U.S. DOL guidelines at 29 C.F.R. Part 215, and any amendments thereto. These terms and conditions are identified in the letter of certification from the U.S. DOL to FTA applicable to the FTA Recipient's project from which Federal assistance is provided to support work on the underlying contract. The Contractor agrees to carry out that work in compliance with the conditions stated in that U.S. DOL letter. The requirements of this subsection (1), however, do not apply to any contract financed with Federal assistance provided by FTA either for projects for elderly individuals and individuals with disabilities authorized by 49 U.S.C. §5310(a)(2), or for projects for nonurbanized areas authorized by 49 U.S.C. §5311. Alternate provisions for those projects are set forth in subsections (b) and (c) of this clause.

(b) Transit Employee Protective Requirements for Projects Authorized by 49 U.S.C. §5310(a)(2) for Elderly Individuals and Individuals with Disabilities -

If the contract involves transit operations financed in whole or in part with Federal assistance authorized by 49 U.S.C. §5310(a)(2), and if the U.S. Secretary of Transportation has determined or determines in the future that the employee protective requirements of 49 U.S.C. §5333(b) are necessary or appropriate for the state and the public body subrecipient for which work is performed on the underlying contract, the Contractor agrees to carry out the Project in compliance with the terms and conditions determined by the U.S. Secretary of Labor to meet the requirements of 49 U.S.C. §5333(b), U.S. DOL guidelines at 29 C.F.R. Part 215, and any amendments thereto. These terms and conditions are identified in the U.S. DOL's letter of certification to FTA, the date of which is set forth Grant Agreement or Cooperative Agreement with the state. The Contractor agrees to perform transit operations in connection with the underlying contract in compliance with the conditions stated in that U.S. DOL letter.

(c) Transit Employee Protective Requirements for Projects Authorized by 49 U.S.C. §5311 in Nonurbanized Areas -

If the contract involves transit operations financed in whole or in part with Federal assistance authorized by 49 U.S.C. §5311, the Contractor agrees to comply with the terms and conditions of the Special Warranty for the Nonurbanized Area Program agreed to by the U.S. Secretaries of Transportation and Labor, dated May 31, 1979, and the procedures implemented by U.S. DOL or any revision thereto. The Contractor also agrees to include the any applicable requirements in each subcontract involving transit operations financed in whole or in part with Federal assistance provided by FTA.

II. Charter Service Operations

The contractor agrees to comply with 49 U.S.C. 5323(d) and 49 CFR Part 604, which provides that recipients and subrecipients of FTA assistance are prohibited from providing charter service using federally funded equipment or facilities if there is at least one private charter operator willing and able to provide the service, except under one of the exceptions at 49 CFR 604.9. Any charter service provided under one of the exceptions must be "incidental," i.e., it must not interfere with or detract from the provision of mass transportation.

III. School Bus Operations

Pursuant to 49 U.S.C. 5323(f) and 49 CFR Part 605, recipients and subrecipients of FTA assistance may not engage in school bus operations exclusively for the transportation of students and school personnel in competition with private school bus operators unless qualified under specified exemptions. When operating exclusive school bus service under an allowable exemption, recipients and subrecipients may not use federally funded equipment, vehicles, or facilities.

IV. Drug & Alcohol Misuse and Testing

Alternate certifications are available in the Best Practices Procurement Manual. Contractors must consult with the transit agency prior to making an alternate certification.

http://www.fta.dot.gov/funding/thirdpartyprocurement/bppm/grants_financing_6195.html#BM31

"Option #2 Provisions" - The contractor agrees to establish and implement a drug and alcohol testing program that complies with 49 CFR Part 655, produce any documentation necessary to establish its compliance with Part 655, and permit any authorized representative of the United States Department of Transportation or its operating administrations, the State Oversight Agency of (name of State), or the (insert name of grantee), to inspect the facilities and records associated with the implementation of the drug and alcohol testing program as required under 49 CFR Part 655 and review the testing process. The contractor agrees further to certify annually its compliance with Part 655 before (insert date) and to submit the Management Information System (MIS) reports before (insert date before March 15) to (insert title and address of person responsible for receiving information). To certify compliance the contractor shall use the "Substance Abuse Certifications" in the "Annual List of Certifications and Assurances for Federal Transit Administration Grants and Cooperative Agreements," which is published annually in the Federal Register.

Transit Operations or Management Project Certification

Name of Company	Printed Name of Person Completing Form
Date	Signature



Consolidated Certification Form Addendum C - Planning, Research & Development, or ITS Projects

A. Rights in Data -

The following requirements apply to each contract involving experimental, developmental or research work:

(1) The term "subject data" used in this clause means recorded information, whether or not copyrighted, that is delivered or specified to be delivered under the contract. The term includes graphic or pictorial delineation in media such as drawings or photographs; text in specifications or related performance or design-type documents; machine forms such as punched cards, magnetic tape, or computer memory printouts; and information retained in computer memory. Examples include, but are not limited to: computer software, engineering drawings and associated lists, specifications, standards, process sheets, manuals, technical reports, catalog item identifications, and related information. The term "subject data" does not include financial reports, cost analyses, and similar information incidental to contract administration.

(2) The following restrictions apply to all subject data first produced in the performance of the contract to which this Attachment has been added:

(a) Except for its own internal use, the Purchaser or Contractor may not publish or reproduce subject data in whole or in part, or in any manner or form, nor may the Purchaser or Contractor authorize others to do so, without the written consent of the Federal Government, until such time as the Federal Government may have either released or approved the release of such data to the public; this restriction on publication, however, does not apply to any contract with an academic institution.

(b) In accordance with 49 C.F.R. §18.34 and 49 C.F.R. §19.36, the Federal Government reserves a royalty-free, non-exclusive and irrevocable license to reproduce, publish, or otherwise use, and to authorize others to use, for "Federal Government purposes," any subject data or copyright described in subsections (2)(b)1 and (2)(b)2 of this clause below. As used in the previous sentence, "for Federal Government purposes," means use only for the direct purposes of the Federal Government. Without the copyright owner's consent, the Federal Government may not extend its Federal license to any other party. 1. Any subject data developed under that contract, whether or not a copyright has been obtained; and 2. Any rights of copyright purchased by the Purchaser or Contractor using Federal assistance in whole or in part provided by FTA.

(c) When FTA awards Federal assistance for experimental, developmental, or research work, it is FTA's general intention to increase transportation knowledge available to the public, rather than to restrict the benefits resulting from the work to participants in that work. Therefore, unless FTA determines otherwise, the Purchaser and the Contractor performing experimental, developmental, or research work required by the underlying contract to which this Attachment is added agrees to permit FTA to make available to the public, either FTA's license in the copyright to any subject data developed in the course of that contract, or a copy of the subject data first produced under the contract for which a copyright has not been obtained. If the experimental, developmental, or research work, which is the subject of the underlying contract, is not completed for any reason whatsoever, all data developed under that contract shall become subject data as defined in subsection (a) of this clause and shall be delivered as the Federal Government may direct. This subsection (c), however, does not apply to adaptations of automatic data processing equipment or programs for the Purchaser or Contractor's use whose costs are financed in whole or in part with Federal assistance provided by FTA for transportation capital projects.

(d) Unless prohibited by state law, upon request by the Federal Government, the Purchaser and the Contractor agree to indemnify, save, and hold harmless the Federal Government, its officers, agents, and employees acting within the scope of their official duties against any liability, including costs and expenses, resulting from any willful or intentional violation by the Purchaser or Contractor of proprietary rights, copyrights, or right of privacy, arising out of the publication, translation, reproduction, delivery, use, or disposition of any data furnished under that contract. Neither the Purchaser nor the Contractor shall be required to indemnify the Federal Government for any such liability arising out of the wrongful act of any employee, official, or agents of the Federal Government.

(e) Nothing contained in this clause on rights in data shall imply a license to the Federal Government under any patent or be construed as affecting the scope of any license or other right otherwise granted to the Federal Government under any patent.

(f) Data developed by the Purchaser or Contractor and financed entirely without using Federal assistance provided by the Federal Government that has been incorporated into work required by the underlying contract to which this Attachment has been added is exempt from the requirements of subsections (b), (c), and (d) of this clause, provided that the Purchaser or Contractor identifies that data in writing at the time of delivery of the contract work.

(g) Unless FTA determines otherwise, the Contractor agrees to include these requirements in each subcontract for experimental, developmental, or research work financed in whole or in part with Federal assistance provided by FTA.

(3) Unless the Federal Government later makes a contrary determination in writing, irrespective of the Contractor's status (i.e., a large business, small business, state government or state instrumentality, local government, nonprofit organization, institution of higher education, individual, etc.), the Purchaser and the Contractor agree to take the necessary actions to provide, through FTA, those rights in that invention due the Federal Government as described in U.S. Department of Commerce regulations, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," 37 C.F.R. Part 401.

(4) The Contractor also agrees to include these requirements in each subcontract for experimental, developmental, or research work financed in whole or in part with Federal assistance provided by FTA.

B. Patent Rights -

The following requirements apply to each contract involving experimental, developmental, or research work:

(1) General - If any invention, improvement, or discovery is conceived or first actually reduced to practice in the course of or under the contract to which this Attachment has been added, and that invention, improvement, or discovery is patentable under the laws of the United States of America or any foreign country, the Purchaser and Contractor agree to take actions necessary to provide immediate notice and a detailed report to the party at a higher tier until FTA is ultimately notified.

(2) Unless the Federal Government later makes a contrary determination in writing, irrespective of the Contractor's status (a large business, small business, state government or state instrumentality, local government, nonprofit organization, institution of higher education, individual), the Purchaser and the Contractor agree to take the necessary actions to provide, through FTA, those rights in that invention due the Federal Government as described in U.S. Department of Commerce regulations, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," 37 C.F.R. Part 401.

(3) The Contractor also agrees to include the requirements of this clause in each subcontract for experimental, developmental, or research work financed in whole or in part with Federal assistance provided by FTA.

C. National Intelligent Transportation Systems Architecture and Standards -

To the extent applicable, the Recipient agrees to conform to the National Intelligent Transportation Systems (ITS) Architecture and Standards as required by SAFETEA-LU §5307(c), 23 U.S.C. §512 note, and follow the provisions of FTA Notice, "FTA National ITS Architecture Policy on Transit Projects," 66 Fed. Reg. 1455 et seq., January 8, 2001, and any other implementing directives FTA may issue at a later date, except to the extent FTA determines otherwise in writing.

Planning, Research & Development, ITS Project Certification

Name of Company	Printed Name of Person Completing Form
Date	Signature

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ITEM 500 MOBILIZATION

1. DESCRIPTION

Establish and remove offices, plants, and facilities. Move personnel, equipment, and supplies to and from the project or the vicinity of the project site to begin work or complete work on Contract Items. Bonds and insurance are required for performing mobilization.

For Contracts with emergency mobilization, provide a person and method of contact available 24 hrs. a day, 7 days a week unless otherwise shown on the plans. The time of notice will be the transmission time of the written notice or notice provided orally by the Department's representative.

2. MEASUREMENT

This Item will be measured by the lump sum as the work progresses. Mobilization is calculated on the base bid only and will not be paid for separately on any additive alternate items added to the Contract.

3. PAYMENT

For this Item, the adjusted Contract amount will be calculated as the total Contract amount less the lump sum for mobilization. Except for Contracts with callout or emergency work, mobilization will be paid in partial payments as follows:

- Payment will be made upon presentation of a paid invoice for the payment or performance bonds and required insurance,
- Payment will be made upon verification of documented expenditures for plant and facility setup. The combined amount for all these facilities will be no more than 10% of the mobilization lump sum or 1% of the total Contract amount, whichever is less,
- When 1% of the adjusted Contract amount for construction Items is earned, 50% of the mobilization lump sum bid or 5% of the total Contract amount, whichever is less, will be paid. Previous payments under this Item will be deducted from this amount,
- When 5% of the adjusted Contract amount for construction Items is earned, 75% of the mobilization lump sum bid or 10% of the total Contract amount, whichever is less, will be paid. Previous payments under the Item will be deducted from this amount,
- When 10% of the adjusted Contract amount for construction Items is earned, 90% of the mobilization lump sum bid or 10% of the total Contract amount, whichever is less, will be paid. Previous payments under this Item will be deducted from this amount,
- Upon final acceptance, 97% of the mobilization lump sum bid will be paid. Previous payments under this Item will be deducted from this amount, and

- Payment for the remainder of the lump sum bid for “Mobilization” will be made after all submittals are received, final quantities have been determined and when any separate vegetative establishment and maintenance, test, and performance periods provided for in the Contract have been successfully completed.

For projects with extended maintenance or performance periods, payment for the remainder of the lump sum bid for “Mobilization” will be made 6 months after final acceptance.

For Contracts with callout or emergency work, “Mobilization,” will be paid as follows:

- Payment will be made upon presentation of a paid invoice for the payment of performance bonds and required insurance,
- Mobilization for callout work will be paid for each callout work request, and
- Mobilization for emergency work will be paid for each emergency work request.

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.

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, 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 lumpsum.

4. PAYMENT

33.1 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.

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 work in the TCP, that work will be measured and paid under pertinent Items.

33.1.1 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 and construction has begun.

33.1.2 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 time frame 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.

33.1.3 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."

33.1.4 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 by 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; nor delays caused directly or indirectly by requirements of the Contract.

33.1.5 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."

Contracts with Callout Work and Work Orders. The work performed and the materials furnished with this Item and measured as provided under "Measurement," will be considered subsidiary to pertinent Items, except for federally funded Contracts.

33.2 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 vehicle, fees, and incidentals necessary to complete the work as directed.

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 accordance 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) 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 doweled 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 paid for directly but will be considered subsidiary to this Item.



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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. CONSTRUCTION

Accept ownership of unsuitable or excess material and dispose of material in accordance with local, state, and federal regulations at locations outside the right of way.

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 as directed.

2.1 Rock Cuts. Excavate to finish subgrade. Manipulate and compact subgrade in accordance with Section 132.3.4., "Compaction Methods," unless excavation is to clean homogenous rock at finish subgrade elevation. 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 finish subgrade.

2.2 Earth Cuts. Excavate to finish subgrade. Scarify subgrade to a uniform depth at least 6 in. below finish subgrade elevation in areas where base or pavement structure will be placed on subgrade. Manipulate and compact subgrade in accordance with Section 132.3.4., "Compaction Methods."

2.3 Take corrective measures as directed if unsuitable material is encountered below subgrade elevations.

2.4 Subgrade Tolerances. Excavate to within 1/2 in. in cross-section and 1/2 in. in 16 ft. measured longitudinally for turnkey construction. Excavate to within 0.1 ft. in cross-section and 0.1 ft. in 16 ft. measured longitudinally for staged construction.

3. MEASUREMENT

This Item will be measured by the cubic yard in its original position as computed by the method of average end areas.

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.

3. 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 and reworking or replacing the undercut material in rock cuts; hauling; disposal of material not used elsewhere on the project; scarification and compaction; and equipment, labor, materials, tools, and incidentals.

Drying required deeper than 6 in. below subgrade elevation 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 subgrade elevations will be performed and paid for in accordance 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."

When a slide not due to the Contractor's negligence or operation occurs, payments 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 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. Use [Tex-100-E](#) material definitions.

2.1 Aggregate. Furnish aggregate of the type and grade shown on the plans and meeting the requirements of 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.

**Table 1
Material Requirements**

Property	Test Method	Grade 1-2	Grade 3	Grade 4 ²	Grade 5
Sampling	Tex-400-A				
Master gradation sieve size (cumulative % retained)	Tex-110-E				
2-1/2"		0	0	As shown on the plans	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
Liquid Limit, % Max	Tex-104-E	40	40	As shown on the plans	35
Plasticity Index, Max ¹	Tex-106-E	10	12	As shown on the plans	10
Plasticity index, Min ¹		As shown on the plans	As shown on the plans	As shown on the plans	As shown on the plans

Wet ball mill, % Max	Tex-116-E	40	–	As shown on the plans	40
Wet ball mill, % Max increase passing the #40 sieve		20	–	As shown on the plans	20
Min compressive strength, psi	Tex-117-E			As shown on the plans	
lateral pressure 0 psi		35	–		–
lateral pressure 3 psi		–	–		90
lateral pressure 15 psi		175	–		175

1. Determine plastic index in accordance with [Tex-107-E](#) (linear shrinkage) when liquid limit is unattainable as defined in [Tex-104-E](#).
2. Grade 4 may be further designated as Grade 4A, Grade 4B, etc.

2.1.1 Material Tolerances. The Engineer may accept material if no more than 1 of the 5 most recent gradation tests has an individual sieve outside the specified limits of the gradation.

When target grading is required by the plans, no single failing test may exceed the master grading by more than 5 percentage points on sieves No. 4 and larger or 3 percentage points on sieves smaller than No. 4.

The Engineer may accept material if no more than 1 of the 5 most recent plasticity index tests is outside the specified limit. No single failing test may exceed the allowable limit by more than 2 points.

2.1.2 Material Types. Do not use fillers or binders unless approved. Furnish the type specified 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 2 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 2 or more crushed faces as determined by [Tex-460-A](#), Part I. Blending of 2 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 in Section 247.2.1.3.2., “Recycled Material (Including Crushed Concrete) Requirements,” 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.

2.2.1 Recycled Material. Reclaimed asphalt pavement (RAP) and other recycled materials may be used when shown on the plans. Request approval to blend 2 or more sources of recycled materials.

2.2.1.1 Limits on Percentage. Do not exceed 20% RAP by weight, when RAP is allowed, unless otherwise shown on the plans. The percentage limitations for other recycled materials will be as shown on the plans.

2.2.2 Recycled Material (Including Crushed Concrete) Requirements.

2.2.3 Contractor-Furnished Recycled Materials. Provide recycled materials, other than RAP, that have a maximum sulfate content of 3,000 ppm when tested in accordance with [Tex-145-E](#). When the Contractor furnishes the recycled materials, including crushed concrete, the final product will be subject to the requirements of Table 1 for the grade specified. Certify compliance with [DMS-11000](#), “Evaluating and Using Nonhazardous Recyclable Materials Guidelines,” for Contractor furnished recycled materials. In addition, recycled materials must be free from reinforcing steel and other objectionable material and have at most 1.5% deleterious material when tested in accordance with [Tex-413-A](#). For RAP, do not exceed a maximum percent loss from decantation of 5.0% when tested in accordance with [Tex-406-A](#). Test RAP without removing the halt.

Department-Furnished Required Recycled Materials. When the Department furnishes and requires the use of recycled materials, unless otherwise shown on the plans:

- Department-required recycled material will not be subject to the requirements in Table 1,
- Contractor-furnished materials are subject to the requirements in Table 1 and this Item,
- the final product, blended, will be subject to the requirements in Table 1, and
- for final product, unblended (100% Department-furnished required recycled material), the liquid limit, plasticity index, wet ball mill, and compressive strength is waived.

Crush Department-furnished RAP so that 100% passes the 2 in. sieve. The Contractor is responsible for uniformly blending to meet the percentage required.

2.2.3.1 Department-Furnished and Allowed Recycled Materials. When the Department furnishes and allows the use of recycled materials or allows the Contractor to furnish recycled

materials, the final blended product is subject to the requirements of Table 1 and the plans.

2.2.3.2 Recycled Material Sources. Department-owned recycled material is available to the Contractor only when shown on the plans. Return unused Department-owned recycled materials to the Department stockpile location designated by the Engineer unless otherwise shown on the plans.

The use of Contractor-owned recycled materials is allowed when shown on the plans. Contractor-owned surplus recycled materials 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. Do not intermingle Contractor-owned recycled material with Department-owned recycled material unless approved.

2.4 Water. Furnish water free of industrial wastes and other objectionable matter.

2.5 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.

3. EQUIPMENT

Provide machinery, tools, and equipment necessary for proper execution of the work.

3.1 Provide rollers in accordance with Item 210, "Rolling." Provide proof rollers in accordance with Item 216, "Proof Rolling," when required.

3.2 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, 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 because 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 accordance 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 rolls the roadbed in accordance with Item 216, "Proof Rolling," 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 with 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."

Begin rolling longitudinally at the sides and proceed towards 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 alternate 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.

- i. **Ordinary Compaction.** Roll with 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.
- ii. **Density Control.** Compact to at least 100% of the maximum dry density determined by [Tex-113-E](#), unless otherwise shown on the plans. Maintain moisture during compaction within ± 2 percentage points of the optimum moisture content as determined by [Tex-113-E](#). Measure the moisture content of the material in accordance with [Tex-115-E](#) or [Tex-103-E](#) during compaction daily and report the results the same day to the Engineer, unless otherwise shown on the plans or directed. Do not achieve density by drying the material after compaction.
- iii. The Engineer will determine roadway density and moisture content of completed sections in accordance with [Tex-115-E](#). The Engineer may accept the section if no more than 1 of the 5 most recent density tests is below the specified density and the failing test is no more than 3 pcf below the specified density.

4.4 Finishing. After completing compaction, clip, skin, or tight-blade the surface with 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 with 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 feet measured longitudinally or 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 re-compact 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. This section applies to the final travel lanes that receive a 1 or 2 course surface treatment for the final surface, unless otherwise shown on the plans. Measure ride quality of the base course after placement of the prime coat and before placement of the surface treatment, unless otherwise approved. Use a certified profiler operator from the Department's MPL. When requested, furnish the Engineer documentation for the person certified to operate the profiler.

Provide all profile measurements to the Engineer in electronic data files within 3 days after placement of the prime coat 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 having an average international roughness index (IRI) value greater than 100.0 in. per mile to an IRI value of 100.0 in. per mile or less for each wheel path, unless otherwise shown on the plans.

Re-profile and correct sections that fail to maintain ride quality until placement of the next course, as directed. Correct re-profiled sections until specification requirements are met, as approved. Perform this work at no additional expense to the Department.

5. MEASUREMENT

Flexible base will be measured as follows:

- **Flexible Base (Complete in Place).** The square yard method.

Measurement by and square yard is a plans quantity measurement. The quantity to be paid for 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 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 as shown on the plans.

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 shown 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, "Proof Rolling."

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 accordance with pertinent Items or 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, and equipment, labor, tools, and incidentals.

ITEM 360 CONCRETE PAVEMENT

1. DESCRIPTION

Construct hydraulic cement concrete pavement with or without curbs on the concrete pavement.

2. MATERIALS

12.1 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 or a minimum average flexural strength of 450 psi at 7 days or a minimum average compressive strength of 4,000 psi or a minimum average flexural strength of 570 psi at 28 days. Test in accordance with [Tex-448-A](#) or [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 coefficient of thermal expansion not more than 5.5×10^{-6} in./in./°F. Provide satisfactory [Tex-428-A](#) test data from an approved testing laboratory if the coarse aggregate coefficient of thermal expansion listed on the Department's *Concrete Rated Source Quality Catalog* is not equal to or less than 5.5×10^{-6} in./in./°F.

Provide Class HES concrete for very early opening of small pavement areas or leave-outs to traffic when shown on the plans or allowed. Design Class HES to meet the requirements of Class P and a minimum average compressive strength of 3,200 psi or a minimum average flexural strength of 450 psi in 24 hr., unless other early strength and time requirements are shown on the plans or allowed.

Use Class A or P concrete meeting the requirements of Item 421, "Hydraulic Cement Concrete," and this Item for curbs that are placed separately from the pavement.

12.2 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.

12.2.1 Dowels. Provide smooth, straight dowels of the size shown on the plans, free of burrs, and conforming to the requirements of Item 440, "Reinforcement for Concrete." Coat dowels with a thin film of grease, wax, silicone or other approved de-bonding material. Provide dowel caps on the lubricated end of each dowel bar used in an expansion joint. Provide dowel caps filled with a soft compressible material with enough range of



movement to allow complete closure of the expansion joint.

12.2.2 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 Pavements," when used. Multiple-piece tie bars used on individual projects must be sampled in accordance with [Tex-711-I](#), and tested in accordance with DMS-4515 "Multiple Piece Tie Bars for Concrete Pavements."

12.3 Alternative Reinforcing Materials. Provide reinforcement materials of the dimensions and with the physical properties specified when allowed or required by the plans. Provide manufacturer's certification of required material properties.

12.4 Curing Materials. Provide Type 2 membrane curing compound conforming to [DMS-4650](#), "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants." Provide SS-1 emulsified asphalt conforming to Item 300, "Asphalts, Oils, and Emulsions," for concrete pavement to be overlaid with asphalt concrete under this Contract unless otherwise shown on the plans or approved. Provide materials for other methods of curing conforming to the requirements of Item 422, "Concrete Superstructures." Provide insulating blankets for curing fast track concrete pavement with a minimum thermal resistance (R) rating of 0.5 hour-square foot F/BTU. Use insulating blankets that are free from tears and are in good condition.

12.5 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.

12.6 Evaporation Retardant. Provide evaporation retardant conforming to [DMS-4650](#), "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants."

12.7 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."

3. EQUIPMENT

Furnish and maintain all equipment in good working condition. Use measuring, mixing, and delivery equipment conforming to the requirements of Item 421, "Hydraulic Cement Concrete." Obtain approval for other equipment used.

13.1 Placing, Consolidating, and Finishing Equipment. Provide approved 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 approved automatic grade control system on slip-forming equipment. Provide approved mechanically operated finishing floats capable of producing a uniformly smooth pavement surface. Provide equipment capable of providing a fine, light water fog mist.

When string-less paving equipment is used, use 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 accordance 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 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.

13.2 Forming Equipment

13.2 .1 Pavement Forms. Provide metal 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 from detrimental kinks, bends, or warps that could affect ride quality or alignment. Provide flexible or curved metal or wood forms for curves of 100-ft. radius or less.

13.2.2 Curb Forms. Provide curb forms for separately placed curbs that are not slip formed that conform to the requirements of Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."

13.3 Reinforcing Steel Inserting Equipment. Provide inserting equipment that accurately inserts and positions reinforcing steel in the plastic concrete parallel to the profile grade and horizontal alignment in accordance to plan details when approved.

13.4 Texturing Equipment.

13.4.1 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.

13.4.2 Tinning Equipment. Provide a self-propelled metal tine device equipped with steel tines with cross-section approximately 1/32 in. thick × 1/12 in. wide. Provide tines for transverse tinning equipment spaced at approximately 1 in., center-to-center, or provide tines for longitudinal tinning equipment spaced at approximately 3/4 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 in emergencies due to equipment breakdown.

13.5 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. Provide curing equipment that is independent of all other equipment when required to meet the requirements of Section 360.4.9., "Curing." Hand-operated pressurized spraying equipment with atomizing nozzles may only be used on small or irregular areas, narrow width sections, or in emergencies due to equipment breakdown.

13.6 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.

13.7 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.

13.8 Testing Equipment. Provide testing equipment regardless of job-control testing responsibilities in accordance with Item 421, "Hydraulic Cement Concrete," unless otherwise shown on the plans or specified.

13.9 Coring Equipment. Provide coring equipment capable of extracting cores in accordance with the requirements of [Tex-424-A](#) when required.

13.10 Miscellaneous Equipment. Furnish both 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 conformity with the required section and established grade until the pavement concrete is placed. Keep subgrade or base damp 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.

14.1 Paving and Quality Control Plan. Submit a paving and quality control 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, testing, construction methods, other details and description of all equipment. List certified personnel performing the testing. Submit revisions to the paving and quality control plan for approval.

14.2 Job-Control Testing. Perform all fresh and hardened concrete job-control testing at the specified frequency unless otherwise shown on the plans. Provide job-control testing personnel meeting the requirements of Item 421, "Hydraulic Cement Concrete." Provide and maintain testing equipment, including strength testing equipment at a location acceptable to the Engineer. Use of a commercial laboratory is acceptable. Maintain all testing equipment calibrated in accordance with pertinent test methods. Make strength-testing equipment available to the Engineer for verification testing.

Provide the Engineer the opportunity to witness all tests. The Engineer may require a retest if not given the opportunity to witness. Furnish a copy of all test results to the Engineer daily. Check the first few concrete loads for slump and temperature to verify concrete conformance and consistency on start-up production days. Sample and prepare strength-test specimens (2 specimens per test) on the first day of production and for each 3,000 sq. yd. or fraction thereof of concrete pavement thereafter. Prepare at least 1 set of strength-test specimens for each production day. Perform slump and temperature tests each time strength specimens are made. Monitor concrete temperature to ensure that concrete is consistently within the temperature requirements. The Engineer will direct random job-control sampling and testing. Immediately investigate and take corrective action as approved if any Contractor test result, including tests performed for verification purposes, does not meet specification requirements.

The Engineer will perform job-control testing when the testing by the Contractor is waived by the plans; however, this does not waive the Contractor's responsibility for providing materials and work in accordance with this Item.

14.2.1 Job-Control Strength. Use 7-day job-control concrete strength testing in accordance with [Tex-448-A](#) or [Tex-418-A](#) unless otherwise shown on the plans or permitted.

Use a compressive strength of 3,200 psi or a lower job-control strength value proven to meet a 28-day compressive strength of 4,000 psi as correlated in accordance with [Tex-427-A](#) for 7-day job-control by compressive strength. Use a flexural strength of 450 psi or a lower job-control strength value proven to meet a 28-day flexural strength of 570 psi as correlated in accordance with [Tex-427-A](#) for 7-day job-control by flexural strength.

Job control of concrete strength may be correlated to an age other than 7 days in accordance with [Tex-427-A](#) when approved. Job-control strength of Class HES concrete is 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 job-control concrete strength test value is more than 10% below the required job-control strength or when 3 consecutive job-control strength values fall below the required job-control 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 job-control strength is

more than 15% below the required job-control strength. Remove and replace pavements found to be structurally inadequate at no additional cost when directed.

14.2.2 Split-Sample Verification Testing. Perform split-sample verification testing with the Engineer on random samples taken and split by the Engineer at a rate of at least 1 for every 10 job-control samples. The Engineer will evaluate the results of split-sample verification testing. Immediately investigate and take corrective action as approved when results of split-sample verification testing differ more than the allowable differences shown in Table 1, or the average of 10 job-control strength results and the Engineer's split-sample strength result differ by more than 10%.

Table 1
Verification Testing Limits

Test Method	Allowable Differences
Temperature, Tex-422-A	2°F
Flexural strength, Tex-448-A	19%
Compressive strength, Tex-418-A	10%

14.3 Reinforcing Steel and Joint Assemblies. Accurately place and secure in position all reinforcing steel as shown on the plans. 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. 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. Use multiple-piece tie bars, drill and epoxy grout tie bars, or, if approved, mechanically inserted single-piece tie bars at longitudinal construction joints. Verify that tie bars that are drilled and epoxied or mechanically inserted into concrete at longitudinal construction joints develop a pullout resistance equal to a minimum of 3/4 of the yield strength of the steel after 7 days. Test 15 bars using 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. Acceptable corrective measures include but are not limited to installation of additional or longer tie bars.

14.3.1 Manual Placement. Secure reinforcing bars at alternate intersections with wire ties or locking support chairs. Tie all splices with wire.

14.3.2 Mechanical Placement. Complete the work using manual placement methods described above if mechanical placement of reinforcement results in steel misalignment or improper location, poor concrete consolidation, or other inadequacies.

14.4 Joints. Install joints as shown on the plans. Joint sealants are not required on concrete pavement that is to be overlaid with asphaltic materials. 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. Install a rigid transverse bulkhead, for the reinforcing steel, and shaped accurately to the cross-section of the pavement when placing of concrete is stopped.

14.4.1 Placing Reinforcement at Joints. Complete and place the assembly of parts at pavement joints at the required location and elevation, with all parts rigidly secured in the required position, when shown on the plans.

14.5 Transverse Construction Joints.

14.5.1 Continuously Reinforced Concrete Pavement (CRCP). Install additional longitudinal reinforcement through the bulkhead when shown on the plans. Protect the reinforcing steel immediately beyond the construction joint from damage, vibration, and impact.

14.5.2 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.

14.5.3 Curb Joints. Provide joints in the curb of the same type and location as the adjacent pavement. Use expansion joint material of the same thickness, type, and quality required for the pavement and of the section shown for the curb. Extend expansion joints through the curb. Construct curb joints at all transverse pavement joints. Place reinforcing steel into the plastic concrete pavement for non-monolithic curbs as shown on the plans unless otherwise approved. Form or saw the weakened plane joint across the full width of concrete pavement and through the monolithic curbs. Construct curb joints in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."

14.6 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 form riding 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 aside 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 forms. Repair damage resulting from form removal and honeycombed areas with a mortar mix within 24 hr. after form removal unless otherwise approved. Clean joint face and repair honeycombed or damaged areas 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 are within 2 in. of that depth are permitted if the subbase is trenched or the full width and length of the form base is 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.

14.7 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 conforming to the requirements of Item 421, "Hydraulic Cement Concrete." 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.

14.8 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.

14.8.1 Consolidation. Consolidate all concrete by 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 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.

14.8.2 Curbs. Conform to the requirements of Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter" where curbs are placed separately.

14.8.3 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.

14.9 Spreading and Finishing. Finish all concrete pavement with approved self-propelled equipment. Use power-driven spreaders, power-driven vibrators, power-driven

strike-off, screed, or approved alternate equipment. Use the transverse finishing equipment to compact and strike-off 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.

14.9.1 Finished Surface. Perform sufficient checks with long-handled 10-ft. and 15-ft. straightedges on the plastic concrete to ensure the final surface is within the tolerances specified in Surface Test A in Item 585, "Ride Quality for Pavement Surfaces." Check with the straightedge parallel to the centerline.

14.9.2 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, and 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.

14.9.3 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 the carpet from getting plugged with grout. 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 transverse 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 the carpet from getting plugged with grout. 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.

14.9.4 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.

14.9.5 Emergency Procedures. Use hand-operated equipment for applying texture, evaporation retardant, and cure in the event of equipment breakdown.

14.10 Curing. Keep the concrete pavement surface from drying as described in 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, "Concrete Superstructures," may be used when specified or approved.

14.10.1 Membrane Curing. Spray the concrete surface uniformly with 2 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 cracking. Time the application of curing compound to prevent plastic shrinkage 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.

14.10.2 Asphalt Curing. Apply a uniform coating of asphalt curing at a rate of 90 to 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 the emulsion in a mixed condition during application.

14.10.3 Curing Class HES Concrete. Provide membrane curing in accordance with Section 360.4.9.1., "Membrane Curing," for all Class HES concrete pavement. Promptly follow by wet mat curing in accordance with Section 422.4.8., "Final Curing," until opening strength is achieved but not less than 24 hr.

14.10.4 Curing Fast-Track Concrete Pavement. Provide wet mat curing unless otherwise shown on the plans or as directed. Cure in accordance with Section 422.4.8., "Final Curing." Apply a Type 1-D or Type 2 membrane cure

instead of wet mat curing if the air temperature is below 65°F and insulating blankets are used.

14.11 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. Reduce paving production if necessary to ensure timely sawing of joints. Promptly restore membrane cure damaged within the first 72 hr. of curing.

14.12 Protection of Pavement and Opening to Traffic. Testing for early opening is the responsibility of the Contractor regardless of job-control testing responsibilities unless otherwise shown on the plans or as directed. Testing result interpretation for opening to traffic is subject to approval.

14.12.1 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.

14.12.2 Opening Pavement to All Traffic. Pavement that is 7 days old may be opened to all traffic. Clean pavement, place stable material against the pavement edges, seal joints, and perform all other traffic safety related work before opening to traffic.

14.12.3 Opening Pavement to Construction Equipment. Unless otherwise shown on the plans, concrete pavement may be opened early to concrete paving equipment and related delivery equipment after the concrete is at least 48 hr. old and opening strength has been demonstrated in accordance with Section 360.4.11.4., "Early Opening to All Traffic," before curing is complete. 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.

14.12.4 Early Opening to All Traffic. Concrete pavement may be opened after curing is complete and the concrete has attained a flexural strength of 450 psi or

a compressive strength of 3,200 psi, except that pavement using Class HES concrete may be opened after 24 hr. if the specified strength is achieved.

14.12.4.1 Strength Testing. Test concrete specimens cured under the same conditions as the portion of the pavement involved.

14.12.5 Maturity Method. Use the maturity method, [Tex-426-A](#), to estimate concrete strength for early opening pavement to traffic unless otherwise shown on the plans. Install at least 2 maturity sensors for each day's placement in areas where the maturity method will be used for early opening. Maturity sensors, when used, will be installed near the day's final placement for areas being evaluated for early opening. Use test specimens to verify the strength-maturity relationship in accordance with [Tex-426-A](#), starting with the first day's placement corresponding to the early opening pavement section.

Verify the strength-maturity relationship 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.

14.12.6 Fast Track Concrete Pavement. Open the pavement after the concrete has been cured for at least 8 hr. and attained a minimum compressive strength of 1,800 psi or a minimum flexural strength of 255 psi when tested in accordance with Section 360.4.11.4.1., "Strength Testing," or Section 360.4.11.4.2., "Maturity Method," unless otherwise directed. Cover the pavement with insulating blankets when the air temperature is below 65°F until the pavement is opened to traffic.

14.12.7 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. Remove all obstructing materials, place stable material against the pavement edges, and perform other work involved in providing for the safety of traffic as required for emergency opening.

14.13 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 1 thickness test consisting of 1 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 of more than 0.2 in. from plan thickness and to determine the limits of deficiencies of more than 0.75 in. from plan thickness. Fill core holes using an approved concrete mixture and method.

14.13.1 Thickness Deficiencies Greater than 0.2 in. Take one 4-in. diameter core at that location to verify the measurement when any depth test measured in accordance with [Tex-423-A](#) is deficient by more than 0.2 in. from the plan thickness.

Take 2 additional cores from the unit (as defined in Section 360.4.12.3., “Pavement Units for Payment Adjustment” at intervals of at least 150 ft. and at selected locations if the core is deficient by more than 0.2 in., but not by more than 0.75 in. from the plan thickness and determine the thickness of the unit for payment purposes by averaging the length of the 3 cores. In calculations of the average thickness of this unit of pavement, measurements more than the specified thickness by more than 0.2 in. will be considered as the specified thickness plus 0.2 in.

14.13.2 Thickness Deficiencies Greater than 0.75 in. Take additional cores at 10-ft. intervals in each direction parallel to the centerline to determine the boundary of the deficient area if a core is deficient by more than 0.75 in. The Engineer will evaluate any area of pavement found deficient in thickness by more than 0.75 in., but not more than 1 in. Remove and replace the deficient areas without additional compensation or retain deficient areas without compensation, as directed. Remove and replace any area of pavement found deficient in thickness by more than 1 in. without additional compensation.

14.13.3 Pavement Units for Payment Adjustment. Limits for applying a payment adjustment for deficient pavement thickness from 0.20 in. to not more than 0.75 in. are 500 ft. of pavement in each lane. Lane width will be as shown on typical sections and pavement design standards.

For greater than 0.75 in. deficient thickness, the limits for applying zero payment or requiring removal will be defined by coring or equivalent nondestructive means as determined by the Engineer. The remaining portion of the unit determined to be less than 0.75 in. deficient will be subject to the payment adjustment based on the average core thickness 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.

Limits for applying payment adjustment for deficient pavement thickness for ramps, widenings, acceleration and deceleration lanes, and other miscellaneous areas are 500 ft. in length. Areas less than 500 ft. in length will be individually evaluated for payment adjustment based on the plan area.

14.14 Ride Quality. Measure ride quality in accordance with Item 585, “Ride Quality for Pavement Surfaces,” unless otherwise shown on the plans.

5. MEASUREMENT

This Item will be measured as follows:

15.1 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.

15.2 Curb. Curb on concrete pavement will be measured by the foot in place.

6. PAYMENT

These prices are full compensation for materials, equipment, labor, tools, and incidentals.

16.1 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 adjusted unit price bid for "Concrete Pavement" of the type and depth specified as adjusted in accordance with Section 360.6.2., "Deficient Thickness Adjustment."

16.2 Deficient Thickness Adjustment. Where the average thickness of pavement is deficient in thickness by more than 0.2 in. but not more than 0.75 in., payment will be made using the adjustment factor as specified in Table 2 applied to the bid price for the deficient area for each unit as defined under Section 360.4.12.3., "Pavement Units for Payment Adjustment."

Table 2
Deficient Thickness Price Adjustment Factor

Deficiency in Thickness Determined by Cores (in.)	Proportional Part of Contract Price Allowed (Adjustment Factor)
Not deficient	1.00
Over 0.00 through 0.20	1.00
Over 0.20 through 0.30	0.80
Over 0.30 through 0.40	0.72
Over 0.40 through 0.50	0.68
Over 0.50 through 0.75	0.57

16.3 Curb. Work performed and furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Curb" of the type specified.

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 indicated 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.

Pipes. Avoid damaging appurtenances determined by the Engineer to be salvageable.

2.2.1 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.

2.2.2 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 accordance with the erection drawings. Remove steel piles or cut off 2 ft. or more below the permanent ground line.

2.2.3 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 accordance 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 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 in accordance with the Storm Water Pollution Prevention Plan (SWP3) on the plans and the Texas Pollutant Discharge Elimination System (TPDES) General Permit TXR150000.

Control measures are defined as Best Management Practices used to prevent or reduce the discharge of pollutants. 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 or Sediment Control Approved Products lists. Perform work in a manner to prevent degradation of receiving waters, facilitate project construction, and comply with applicable federal, state, and local regulations. Ensure the installation and maintenance of control measures is performed in accordance with the manufacturers or designer's specifications.

2. MATERIALS

2.1 Construction Exits. Contractors shall use FOD Track out Control Matt to control Debris and Mud from Construction Vehicles leaving the Project Site.

2.2 Temporary Sediment Control Fence. Provide a net-reinforced fence using woven geo-textile fabric. Logos visible to the traveling public will not be allowed.

2.2.1. Fabric. Provide fabric materials in accordance with [DMS-6230](#), "Temporary Sediment Control Fence Fabric."

2.2.2 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 Å~ 4 in. boards. Furnish hardwood posts with a minimum cross-section of 1-1/2 Å~ 1-1/2 in. Furnish T- or L-shaped steel posts with a minimum weight of 1.25 lb. per foot.

2.2.3. Net Reinforcement. Provide net reinforcement of at least 12.5 gauge (SWG) galvanized welded wire mesh, with a maximum opening size of 2 Å~ 4 in., at least 24 in. wide, unless otherwise shown on the plans.

2.2.4. Staples. Provide staples with a crown at least 3/4 in. wide and legs 1/2 in. long.

2.2.5. Used Materials. Use recycled material meeting the applicable requirements if approved.

2.3 . Biodegradable Erosion Control Logs.

2.3.1. 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 called out on the plans. Permit no more than 5% of the material to escape from the containment mesh. Furnish compost meeting the requirements of Item 161.

2.3.2. 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.

2.3.3. Size. Furnish biodegradable erosion control logs with diameters shown on the plans or as directed. Stuff containment mesh densely so logs do not deform.

3. QUALIFICATIONS, TRAINING, AND EMPLOYEE REQUIREMENTS

3.1 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 if 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 Contraction - 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 City'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 City'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 General Permit TXR150000, and as directed. Coordinate storm water management with all other work on the project. Develop and implement an SWP3 for project-specific material supply plants within and outside of the **City's** right of way in accordance with the specific or general storm water permit requirements. Prevent water pollution from storm water 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 phone and able to respond to project-related storm water management or other environmental emergencies 24 hr. per day.

4.2.1. **Commencement.** Implement the SWP3 as shown and as directed. Contractor-proposed recommendations for changes will be allowed as approved. Conform to the established guidelines in the TPDES General Permit 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 the TPDES General Permit 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 the TPDES General Permit 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 the TPDES General Permit TXR150000. An exception will be allowed in arid areas as defined in the TPDES General Permit TXR150000.

4.3.4. Restricted Activities and Required Precautions. Do not discharge onto the ground or surface waters any pollutants such as chemicals, raw sewage, fuels, lubricants, coolants, hydraulic fluids, bitumen, or any other petroleum product.

Operate and maintain equipment on-site to prevent actual or potential water pollution. Manage, control, and dispose of litter on-site 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 the TPDES General Permit 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). 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, according to manufacturers' guidelines, and in accordance with the TPDES General Permit 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 City 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 with the time frame specified is when site conditions are “Too Wet to Work.”

Take immediate action if a correction is deemed critical as directed. When corrections are not made within the established time frame, 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 of the SWP3, plans, or TPDES General Permit 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 the permit, 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. **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. Contractors shall use FOD Track out Control Matt to control Debris and Mud from Construction Vehicles leaving the Project Site.

4.5 Short-Term.

4.5.1 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.

4.5.2 Earthwork for Erosion Control. Perform excavation and embankment operations to minimize erosion and to remove collected sediments from other erosion control devices.

4.5.3 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.

4.5.4. Excavation of Sediment and Debris. Remove sediment and debris when accumulation affects the performance of the devices, after a rain, and when directed.

4.5.5 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, as specified in this Section, or as directed.

4.5.6 Installation of Posts. Embed posts at least 18 in. deep, or adequately anchor, if in rock, with a spacing of 6 to 8 ft. and install on a slight angle toward the runoff source.

4.5.7 Fabric Anchoring. Dig trenches along the uphill side of the fence to anchor 6 to 8 in. of fabric. Provide a minimum trench cross-section of 6 x 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.

4.5.8 Fabric and Net Reinforcement Attachment. Attach the reinforcement to wooden posts with staples, or to steel posts with T-clips, in at least 4 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 by hog rings or cord every 15 in. or less.

4.5.9 Fabric and Net Splices. Locate splices at a fence post with a minimum lap of 6 in. attached in at least 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 1 patch every 15 to 20 ft.),
- posts without bends, and
- backing without holes.

4.5.10 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 as a result of normal rain events, prevent damage to the logs, and as approved, such that flow is not allowed under the logs. Temporarily removing and replacing biodegradable erosion logs as to facilitate daily work is allowed at the Contractor's expense.

4.6. Monitoring and Documentation.

Monitor the control measures daily if there are BMPs in place and/or soil disturbing activities are evident to ensure compliance with the SWP3 and TPDES General Permit TXR150000. During time suspensions when work is not occurring or contract non-workdays, 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 as described in 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, 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 on a periodic basis as directed.

5. MEASUREMENT

5.1 Construction Exits. Contractors shall use FOD Track out Control Matt to control Debris and Mud from Construction Vehicles leaving the Project Site. FOD Track out Control Matt will be measured by the lumpsum

5.2 Earthwork for Erosion and Sediment Control.

5.2.1. Volume Measurement.

In Place.

Excavation. Excavation will be measured by the cubic yard in its original position and the volume computed by the method of average end areas.

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 that the embankment is to be constructed for the feature and
- the lines, grades and slopes of the accepted embankment for the feature.

5.3. Temporary Sediment-Control Fence. Installation or removal of temporary sediment-control fence will be measured by the foot.

5.4. 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.

6. PAYMENT

The following will not be paid for directly but are subsidiary to pertinent Items:

- erosion-control measures for Contractor project-specific locations (PSLs) inside and outside the right of way (such as 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.

6.1 Construction Exits. Contractors shall use FOD Track out Control Matt to control Debris and Mud from Construction Vehicles leaving the Project Site. FOD Track out Control Matt will be measured and paid by the lumpsum.

6.2. Earthwork for Erosion and Sediment Control.

6.2.1. 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),"

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.

6.3 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:

6.3.1. 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.

6.3.2. 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.

6.4 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:

6.4.1. 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.

6.4.2. 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.

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 conforming to:

- 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 approved, use fibers meeting the requirements of [DMS-4550](#), "Fibers for Concrete," to replace reinforcing steel in Class A concrete. 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 from voids and honeycomb, in the required shape, line, and grade. Round exposed edges with an edging tool of the radius shown on the plans. Mix, place, and cure concrete in accordance with Item 420, "Concrete Substructures." Construct joints at locations shown on the plans. Cure for at least 72 hr.

Furnish and place reinforcing steel in accordance with Item 440, "Reinforcement for Concrete."

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 2 contacts on a 10-ft. straightedge.

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 to 3/8 in. less than the dimensions of the finished curb unless otherwise approved. After initial set, plaster surface with mortar consisting of 1-part hydraulic cement and 2 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. Extruded or Slip formed Concrete. Hand-tamp and sprinkle subgrade or foundation material 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 with 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 grade line.

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 slip forming.

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.

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ITEM 531 SIDEWALKS

1. DESCRIPTION

Construct hydraulic cement concrete sidewalks.

2. MATERIALS

Furnish materials conforming to 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 course aggregate for extruded Class A concrete. Use other grades if approved.

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.

Mix and place concrete in accordance 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. Ensure that the sidewalk depth and reinforcement are not less than the driveway cross-sectional details shown on the plans where a sidewalk crosses a concrete driveway.

Provide finished work with a well-compacted mass, a surface free from voids and honeycomb, and the required true-to-line shape and grade. Cure for at least 72 hr. in accordance with Item 420, "Concrete Substructures."

47.1 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.

47.2 Extruded or Slip formed Concrete. Provide any additional surface finishing immediately after extrusion or slip forming as required 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, adjacent flares or side curb, and detectable warning surface as 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 "Concrete Sidewalks" of the depth specified 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 connect to concrete driveways or turnouts will be measured and paid for in accordance with Item 530, "Intersections, Driveways, and Turnouts."

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. $\pm 1/8$ in. between parallel wires with at least 7 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, 2 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.

- 2 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 by 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 1C for all top rail pipes. Provide 1.660 in. 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 7-wire strand cables manufactured of galvanized annealed steel at least 3/8 in. in diameter.
- 2.10. Barbed Wire.** Provide 3 strands of twisted 12.5-gauge barbed wire with 2-point, 14-gauge barbs spaced approximately 5 in. apart conforming to ASTM A121 or ASTM A585 when specified on the plans.
- 2.11. Barbed Wire Support Arms.** Provide support arms at an angle of 45° from vertical, with clips for attaching 3 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 specified 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 2 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 galvanizes all materials unless specified otherwise in this Item or 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 galvanizes 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-5Al-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 galvanizes inside and outside according to ASTM F1043(1.8 oz./sq. ft. galvanized zinc weight).

2.15.2.2. **High Strength Pipe.** Hot dip galvanizes before or after forming pipe according to ASTM F1043 Group 1C and as follows:

- Outside—minimum 0.9 oz./sq. ft. galvanized zinc weight with a verifiable polymer overcoat.
- Inside—minimum 0.9 oz./sq. ft. 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 according to 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 conformance with Item 445, "Galvanizing."

2.15.4. **Tension Wire.** Zinc-coat tension wire with a minimum coating of 0.80 oz./sq. ft. or aluminum-coat with a minimum coating of 0.30 oz./sq. ft.

2.15.5. **Barbed Wire.** Zinc-coat barbed wire in accordance with ASTM A121 (0.80 oz./sq. ft.) or aluminum-coat in accordance with ASTM A585 (0.30 oz./sq. ft.).

2.15.6. **Pull Cable.** Zinc-coat pull cable with a minimum coating of 0.80 oz./sq. ft. of individual-wire surface when tested in conformance with ASTM A116.

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
Standard	Space 10 ft. apart
Corner	Space 500 ft. apart and at each change in direction exceeding 20° vertically
Gate Posts	horizontal angle point

Install cables on all terminal posts and extend to adjacent posts. Install cables on each side of corner and pull posts with 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 outside diameter of the post.

Fill the hole in the solid rock with grout consisting of 1-part hydraulic cement and 3 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 over 1/2 cu. yd. Hand mixing concrete is allowed on batches under 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.

- 3.2.5 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 and 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 by 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 with 1 × 1/8 in. flat steel bands with 3/8-in. carriage bolts at intervals up to 15 in.

- 3.2.6 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.

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.

- 3.2.7 Repair of Coatings.** Repair damaged zinc coating in accordance with Section 445.3.5., "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 is subsidiary to this Item.

- **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.
- **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.
- **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.
- **Gate (Install).** This price is full compensation for installing gate and for providing materials, center anchorages, equipment, labor, tools, and incidentals.
- **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.
- **Gate (Remove).** This price is full compensation for removing gate and for materials, equipment, labor, tools, and incidentals.

SPECIAL SPECIFICATION 5084 BOLLARDS

1. CONSTRUCTION

Install bollards to the depth as shown on the plans or as directed. Clean bollard holes free of loose dirt and debris, and thoroughly compact bottom of hole to the correct elevation for placement of the bollards. Place bollards to the correct alignment, elevation, and plumb. Backfill around fixed and timber bollards with minimum 3000 PSI concrete.

Remove and replace existing bollards of the type shown on the plans or as directed. Remove and dispose of existing bollards as shown on the plans or as directed. Install bollard foundation of the size and depth as shown on the plans.

2. MEASUREMENT

This Item will be measured by each bollard installed, removed and replaced, or removed as shown on the plans.

3. 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 types of "Bollards" specified as follows:

"Fixed Bollards," "Removable Bollards," "Treated Timber Bollards," "Remove and Replacing Bollards," and "Removing Bollards" of the type shown on the plans. This price is full compensation for furnishing, preparing, hauling and installing materials; for excavation and backfill, and for labor, tools, equipment and incidentals.



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SPECIAL SPECIFICATION 5706

WATER MAINS AND SERVICE LINES

1. DESCRIPTION

Provide and install a complete water main system in accordance with the plans and specifications and in compliance with the Department's Utility Accommodation Policy (UAP)(Title 43, T.A.C., Sections 21.31-21.55). The water mains shall be of the sizes, materials and dimensions shown on the plans and shall include all pipe, all joints and connections to new and existing pipes, all valves, fittings, pipe joint restraint systems, blocking, and incidentals, as may be required to complete the work.

The abbreviations AWWA, ASA, ASTM, and ANSI, as used in this specification, refer to the following organizations or technical societies:

AWWA - American Water Works Association ASA - American Standards Association

ASTM - American Society for Testing and Materials

ANSI - American National Standards Institute

Where reference is made to specifications of the above organizations, it is to be construed to mean the latest standard in effect on the date of the proposal.

2. MATERIALS

All materials used in this project are to be new and unused unless otherwise specified on the plans, specifications or the proposal.

(1) High Density Polyethylene (HDPE) Pipe and Fittings.

- (a) High Density Polyethylene Pipe and Fittings.** All pipe and fittings shall conform to the same requirements as those specified for HDPE pipe. All HDPE shall have a minimum pressure rating of 160 psi and a minimum dimension ratio of 11 (DR 11).

Where standard ductile iron mechanical joint fittings are coupled to plain-end (square-cut) HDPE pipe, mechanical joint adapters must be used. Use Driscopipe Mechanical Joint Adapter (DIPS) Kit or approved equal.

- (b) Pipe Joint Restraint System for HDPE Pipe.** Restraint devices shall be used where ductile iron mechanical joint bell fittings are coupled to plain-end (square-cut) HDPE pipe, to prevent movement of pipe connections. The restraint system shall have a minimum pressure rating of 250 psi. The

restrainer must not be directionally sensitive.

Underwriter Laboratories and Factory Mutual certifications shall be required on the restraint system. Each restraint device shall be packaged individually and include installation instructions.

The pipe shall be restrained by a split retainer band that shall be cast ductile iron, meeting or exceeding ASTM A536 Grade 65-45-12. The inside face or contact surface of the band shall be of sufficient width to incorporate machined non-directionally sensitive serrations to grip the outside circumference of the pipe. The serrations shall provide full (360 degree) contact and maintain pipe roundness and avoid any points of localized stress. The split band casting shall be designed to bottom-out before clamping forces (110 ft-lb minimum torque) can over-stress the pipe, but will provide full non-directionally sensitive restraint at the rated pressure.

Bolts and nuts used to attach the split retainer ring shall comply with ANSI B 18.2/18.2.2, SAE Grade 5. Tee bolts, nuts and restraining rods shall be fabricated from high strength, low-alloy steel in accordance with AWWA C111.

Restraint devices shall be Uni-Flange Block Buster 1300C or approved equal.

(2) Polyethylene Tubing and Brass Fittings for Polyethylene Service Lines.

- (a) Polyethylene Tubing. All polyethylene (PE) plastic tubing shall be high density, high molecular weight plastic tubing, pressure rated at 200 psi working pressure and must bear the National Sanitary Foundation seal of approval for potable water service.

When tested for Environmental Stress Cracking, the PE tubing shall not show any loss of pressure in the 6 specimens tested for 3 hours in accordance with the requirements of ASTM D 2737 using the test pressure of 400 psi at 73.4 F.

The minimum burst pressure shall be 630 psi at 73.4 F determined in accordance with ASTM D 1599, latest revision. The time of testing of each specimen shall be between 60 and 70 seconds.

The tubing shall not fail, balloon, burst or weep as defined in ASTM D 1598, latest revision, when tested in accordance with the Sustained Pressure Test Method of ASTM D 2737 but under the following test conditions:

Temperature	Time	Pressure
73.4 F	1,000 Hours	400 psi
100 F	1,000 Hours	330 psi

(b) Markings. Permanent marking on the tubing shall include the following at intervals of not more than 5 feet:

1. Nominal tubing size
2. The type of plastic material, i.e., PE 3408.
3. The Standard Dimension Ratio (SDR) and the pressure rating in psi for water at 73.4 F (e.g., SDR-9,200 psi).
4. The manufacturer's name or trademark code and seal of approval (NSF mark) of the National Sanitation Foundation.

(c) Tube Size. PE tubing shall be standard copper tube size outside diameter, with Standard Dimension Ratio (SDR) of 7. Standard sizes, dimensions and tolerances shall be as follows:

Nominal Tube Size (Inches)	Outside Diameter		Wall Thickness	
	Average (Inches)	Tolerance (Inches)	Minimum (Inches)	Tolerance (Inches)
3/4	0.875	± 0.004	0.097	+ 0.010
1	1.125	± 0.005	0.125	+ 0.012
1-1/4	1.375	± 0.005	0.153	+ 0.015
1-1/2	1.625	± 0.006	0.181	+ 0.018
2	2.125	± 0.006	0.236	+ 0.024

(d) Brass Fittings. Unless otherwise modified herein, water works brass goods consisting of corporation stops, curb stops, couplings, connectors, nipples, etc., will be required in underground installations of service lines in the water distribution system.

The brass composition is to conform to ASTM Designation B62 and the threads are to conform to AWWA Standard C800 for "Threads for Underground Service Line Fittings".

All casting is to have a natural, clean uniform and smooth surface, and be free from internal porosity.

All machining is to be done in a workmanlike manner and within the acceptable tolerances.

Unless otherwise specified each fitting is to be furnished with a 1/16 in. thick fiber gasket.

(3) Gate Valves, Tapping Valves and Tapping Sleeves.

- (a) Gate Valves.** Gate valves 4" - 16" shall be iron bodied, resilient seated and in accordance with AWWA C-509, latest revision.

All valves shall have a working pressure of 200 psi and shall be hydrostatically tested from both directions. The shell shall be tested at 400 psi, with no leakage. The body, bonnet, and stuffing box shall be flanged with ATSM A-307 Grade B bolts and nuts, and rust proofed in accordance with ASTM A-123.

Stems shall be machined from modified manganese bronze rod with an intregal forged thrust collar machined to size. Stem seals shall be one "O" ring above and one stem "O" ring below the thrust collar forming a lubricant reservoir between to isolate and lubricate the thrust collar, bearing surfaces and "O" rings.

Valve discs shall be cast ASTM B-62 bronze stem nut to provide disc rigidity and positive travel stop to prevent over compression of the resilient seat. The disc seat shall be open to flow on one side to prevent collection of debris.

The disc seat rings shall be molded natural rubber, internally steel reinforced and machined, epoxy coated matting surface in the valve body. The disc seat rings shall be attached to the disc by self-setting type 304 S.S. replaceable screws.

All internal ferrous materials shall be factory coated with a thermoset epoxy to a dry film thickness of 4 mils.

Exterior coating shall be in accordance with applicable sections of the specification.

Ends shall be wither flanged, mechanical joint, or pushon end as indicated on the plans and in accordance with AWWA C-500.

- (b) Tapping Valves and Tapping Sleeves.** Tapping sleeves are to be mechanical joint type as specified.

Tapping valves are to be mechanical joint type conforming to the requirements of the preceding section.

Tapping valves and sleeves are to be furnished with glands, bolts and gaskets.

Tapping sleeves made of steel are to have a coat of baked-on vinyl coating, or epoxy coated. In place of this, tapping sleeves may be manufactured of

stainless steel.

All bolts are to be high strength low alloy steel meeting requirements of AWWA Standard C111.

- (4) Valve Boxes. All valve box assemblies are to conform to the details shown on the plans. Each valve box assembly is to be of cast-iron and is to consist of a base, top section, and lid.

Valve boxes are to be of a single size with a nominal diameter of 6 in.

The valve box lid is to be labeled "water" and is to be so designed so that it will remain firmly seated in place when subjected to vehicular traffic.

The valve box assembly is to be of sufficient toughness and strength to withstand impact loads and shock resulting from vehicular traffic.

The valve box assembly is to be coated with a standard bituminous coating of either coal tar or asphalt base applied to all inside and outside surfaces.

(5) Backfill.

- (a) Bedding and Initial Backfill for Water Mains. No. 6 pea gravel or 1" inch (or less) rock

- (b) Secondary Backfill for Water Mains. Approved materials excavated from the trench free of brush, debris, large rock or stones and earth clods.

- (6) Concrete. All concrete used in sidewalks and blocking mains is to conform to Item 421, "Hydraulic Cement Concrete". Class "A" concrete is to be used in sidewalks; Class "D" concrete is to be used for thrust blocking.

- (7) Reinforcing Steel. All bar reinforcement is to be Grades 40 or 60, conforming to the requirements of Item 440, "Reinforcing Steel".

- (8) Affidavit of Compliance. Unless otherwise directed by the Engineer, the Contractor is to furnish a manufacturer's affidavit of compliance for each of the materials used in this project. The affidavit is to certify that factory inspection and all specified tests have been made and that the material furnished complies with the requirements outlined herein.

- (9) Nonmetallic Pipe Detection. Where nonmetallic pipe is installed longitudinally, a method of detecting the location of the nonmetallic pipe is to be required. A durable metal detection wire for nonmetallic pipe detection should be used in conjunction with plastic tracer tape unless the plastic tracer tape contains the detection wire. The specific method used is to be as approved by the Engineer. The materials involved are to be as specified by the manufacturer.

3. CONSTRUCTION METHODS

- (1) Excavation. Excavation (trenching) as required to complete the water main installation is to be performed in accordance with Item 400, "Excavation and Backfill for Structures", as outlined herein, as shown on the plans and as directed by the Engineer. Blasting to perform the excavation is not allowed.
- (a) Trenches. All excavation is to be to a depth to provide a minimum of 4 ft. of cover over the top of the pipe unless otherwise shown on the plans or authorized in writing by the Engineer. Not more than 500 linear ft. of trench is to be opened between the trench cutting and the trench backfilling, except as otherwise directed by the Engineer. The Contractor is to make exploratory cross cuts ahead of pipe laying operations to verify grades of other underground utilities and is to gradually adjust the depth of excavation to clear such utilities. Where new water mains and sanitary sewer mains parallel each other they are to be at least 9 ft. apart unless the sanitary sewer main is constructed of cast-iron pipe or the equivalent of 150 psi pressure pipe with watertight joints or unless other precautions approved by the Texas Commission on Environmental Quality are taken to make the sewer main watertight and to prevent contamination of the water main.
- (b) Width of Trench. Trenches are to be of sufficient width to provide ample working space for men engaged in handling pipe and making joints. In no case is the width of the trench inside sheeting and bracing lines be less than 16 in. greater than the pipe diameter or as shown in Table 1, "Trench Width".

In order to protect the pipe from external loads it is necessary to limit the width of the lower portion of the trench below an elevation of 6 in. above the top of the installed pipe. Such limiting minimum and maximum trench widths together with the permissible clearance between the installed pipe and either trench wall is to be as shown in Table 1, "Trench Width".

Table 1
Trench Width

Pipe	Minimum Trench Width	Maximum Trench Width
6" AC, DI, PVC, & Steel	22"	30"
8" AC, DI, PVC, & Steel	24"	32"
12" AC, DI, PVC, & Steel	28"	36"
16" AC, DI, & Steel	32"	40"

20" AC, DI, & Steel	36"	48"
24" AC, DI, & Steel	40"	54"
30" DI, & Steel	46"	60"
36" DI, & Steel	52"	66"
42" Steel	58"	72"
20" CSC	*42"	*48"
24" CSC	*48"	*54"
30" CSC	*54"	*60"
36" CSC	*60"	*66"
42" CSC	*66"	*72"

* Manufacturer's Minimum – Maximum

- (c) Classification of Excavated Materials. No classification of excavated materials will be made. Excavation and trench work is to include the removal and subsequent handling of all materials excavated in accordance with Item 400, "Excavation and Backfill for Structures".
- (d) Grade of Trench Bottom. The trench is to be over-excavated to a depth of six (6) inches below the grade line established for the bottom of the pipe, regardless of the type of pipe. The grade line of the pipe is to then be met by the addition of a layer of approved selected material as directed by the Engineer.
- (e) Excavation Below Grade. Any part of the bottom of the trench excavated below the limits specified in Section 3.(1)(d), "Grade of Trench Bottom", is to be corrected with approved material and compacted as directed by the Engineer. Should excessive over-excavation occur, except at bell holes, the grade is to be restored in accordance with the methods described in Section 3.(1)(f), "Unstable Conditions at Grade".
- (f) Unstable Conditions at Grade. Where the bottom of the trench at grade is found to be unstable or to include ashes, cinders, any type of refuse, vegetable or other organic material, or large pieces of fragments or inorganic materials which in the judgment of the Engineer should be removed, the Contractor is to excavate and remove such unsuitable material to the width and depth directed by the Engineer. Before the pipe is laid the grade is to be restored by backfilling with an approved material in layers of three (3) inches prior to compaction. The layers are to be slightly moistened and thoroughly compacted so as to provide a uniform and continuous bearing and support for the pipe at every point between bell or collar holes. The finished grade is to be accurately graded to provide uniform bearing and support for each section of pipe at every point along its entire length except for the portions of the pipe sections where it is necessary to excavate for bell holes and for the proper seating of pipe joints.
- (g) Trench Excavation Protection. All trench excavation required on this project is

to be accomplished as required by the provisions of Item 402, "Trench Excavation Protection".

- (h) Caution in Excavation. The Contractor is to proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures and utilities may be determined whether shown on the plans or not. Machine excavation is not permitted closer than 12 in. on either side of other existing underground utilities. The Contractor is to be responsible for the repair of such structures and utilities when broken or damaged. He is also to be responsible for adjusting alignment and trench grades with reference to such structures in order to obtain specified clearance for the water main construction.

Whenever the Engineer determines that it is necessary to explore and excavate to determine the location of existing underground structures and utilities, the Contractor is to make explorations and excavations for such purposes at his expense.

- (i) Protection and Restoration of Underground Structures and Facilities. The Contractor is to furnish temporary support, adequate protection, and maintenance of all underground and surface structures, drains, sewers, and other obstructions encountered in the progress of the work. All underground structures and utilities which are disturbed are to be restored by the Contractor at his expense.

In the event that a sanitary sewer is broken by the Contractor's operations the release of sewage into the trench is to be immediately intercepted by the insertion of a section of sheet metal tubing known as a "tin-horn" between the broken ends of the sewer. All leakage at the ends of the "tin-horn" is to be effectively stopped. The "tin-horn" is to remain in place until such time as permanent repairs can be made. It is to be the responsibility of the Contractor to determine sufficiently in advance of his trenching

operations the size of all sanitary sewer lines and services which will require this treatment.

All sanitary sewer lines crossing the excavation, whether bridged or replaced, are to have proper support consisting of sound timber supports having a minimum 2 in. nominal thickness and a minimum 6 in. nominal width placed with the width horizontal and extending a minimum of 12 in. into the trench wall on either side.

In all cases where a sewer pipe is replaced or bridged, the backfill material is to be thoroughly compacted to the bottom of the pipe and compacted by hand from this point to a distance of 6 in. above the top of the sewer line being replaced.

The locations of all sewer lines crossing excavations, whether replaced or bridged are to be properly marked, and care is to be taken to avoid damage to the pipe through the use of a hydratamping machine or other mechanical equipment. The Contractor is to be liable for the failure of such lines due to negligence or poor workmanship.

- (j) **Backfill Material Derived from Excavation.** All excavated materials which the Engineer determines are suitable for reuse as trench backfill is to be separated where practicable from the general excavation material, or as directed by the Engineer.
- (k) **Pavement.** The Contractor is to remove pavement and surfaces as a part of the trench excavation. The removal of pavement and surfaces and their restoration is to be based on the minimum trench widths as specified in Table 1, "Trench Width", plus 6 in., or as otherwise provided herein. The Contractor is to use such methods as sawing, drilling, or chipping to assure the breaking of the pavement along straight lines. If the Contractor removes or damages pavement or surfaces beyond the limits specified above, such pavement and surfaces are to be restored at the expense of the Contractor.

Where water line construction necessitates cutting through existing streets outside the limits of new street construction, said streets are to be replaced in kind as directed by the Engineer.

Where, in the opinion of the Engineer, it is necessary to maintain traffic across a trench, the Contractor is to install temporary metal bridges as necessary to facilitate the movement of traffic.

The street surface adjacent to the trench is to be kept free of surplus spoil. Construction materials are to be placed at locations that will minimize interference with the traveling public.

- (l) **Concrete Sidewalks, Driveways, Etc.** All concrete sidewalks, driveways, etc., are to be cut with a concrete saw. When transverse expansion or "dummy" joints are encountered, the concrete is to be removed to the nearest transverse joint on each side of the trench and restored. The depth of cut is to be such that upon removal of the concrete, the sides of the cut are to be straight and square.

Existing reinforcing wire fabric or bars are to be cut and removed to permit completion of trench excavation, pipe laying, and backfill operations. When the backfill operations have been completed, the existing reinforcement is to be replaced in its original position and satisfactorily spliced prior to the replacement of concrete over the new trench alignment.

Transverse "dummy" joints are to be made by a jointing tool or other means acceptable to the Engineer, and are to match in depth and thickness in the

existing transverse joints.

Expansion joint material is to be provided where new construction abuts the existing curb or driveway if the Engineer deems it necessary.

Concrete is to be spaded, tamped, and thoroughly compacted until mortar entirely covers the surface and has a monolithic finish. The top surface is to be floated, troweled, and finished to match the existing concrete surface.

Immediately after finishing, the concrete surface is to be protected by a membrane compound curing agent, or by wetted cotton or burlap mats. Either method is to be subject to approval by the Engineer.

(2) Pipe Laying.

- (a) General Requirements.** The Contractor is to start his work at a tie-in point, unless otherwise indicated on the plans. Pipe is to be laid with bell ends facing the direction of laying, unless otherwise authorized or directed by the Engineer. Under no circumstances is pipe to be laid in water and no pipe is to be laid under unsuitable weather or trench conditions. All valves and fire hydrants must be installed as soon as pipe laying reaches their established location. Pipe is to be installed to the required lines and grades with fittings, valves, and hydrants placed at the required locations.

Spigots are to be centered in bells or collars, all valves and hydrant stems are to be set plumb, and fire hydrant nozzles are to face as shown on the plans or as directed by the Engineer. No valve or other control on the existing system is to be operated for any purpose by the Contractor unless approved by the Engineer.

The Contractor is to maintain a neat and orderly work area. Complete cleanup is to be maintained at all times as closely behind the pipe laying operations as possible, but in no case is such cleanup be permitted to lag more than 1,000 ft. behind the pipe laying, unless otherwise directed by the Engineer.

- (b) Crossing other Underground Lines.** New water mains crossing other utilities are to have a minimum of 24 in. of cover over the top of the pipe unless otherwise waived or modified by the Engineer. Excavation around other utilities is to be done by hand for at least 12 in. all around. Any damage to the protective wrap on gas lines or electrodes is to be reported immediately to the Gas Company.
- (c) Pipe Grade.** Pipe grades are to be as required on the plans, or as directed by the Engineer. Grades are to be met as specified by Subarticle 3.(1), "Excavation". Care is to be taken to insure that the pipe barrel has uniform contact with the bedding material for its full length except at couplings. The coupling is not to be in contact with the original trench bottom prior to backfill.

Bedding material is to be placed under the coupling and compacted by hand prior to backfilling so as to provide an even bearing surface under the coupling and pipe. To insure an even bearing, a straightedge is to be used to check the grade for each joint of pipe before the pipe is placed in the trench. Change in grade is to be made only at joints.

- (d) **Bedding and Bedding Materials.** Prior to placing pipe in a trench, the trench is to have been excavated to the proper depth as required in Subarticle 3.(1), "Excavation". Approved materials are to be smoothly worked by hand across the entire width of the trench bottom to provide a support bedding for the pipe. The bedding material for asbestos-cement pipe in the nominal diameters of 6, 8 and 12 in. is to be well graded gravels having a minimum thickness of 4 in. and conforming to the gradation requirements contained in Section 2.(5)(a), "Bedding and Initial Backfill for Water Mains". Where unstable materials and laying conditions as defined in Section 3.(1)(f), "Unstable Conditions at Grade", are encountered at the pipe bearing level, the unsuitable materials are to be removed and replaced to a minimum thickness of 6 in. for all nominal diameters of asbestos-cement and ductile-iron pipe with a gravel subgrade filler conforming to the gradation requirements contained in Section 2.(5)(a), "Bedding and Initial Backfill for Water Mains".
- (e) **Cleaning Ductile-Iron Pipe and Cast-Iron Fittings.** All lumps, blisters, and excess coal-tar coating is to be removed from the ends of ductile-iron pipe and cast-iron fittings. The outside of the spigot and the inside of the bell is to be wire-brushed and wiped clean, dry, and free from oil and grease before the pipe is laid. The interior of the pipe is to be blown clean with compressed air or swabbed out clean and dry as directed by the Engineer. Immediately prior to placing any pipe in the trench the interior is to be cleaned by an approved brush or swab or with compressed air to remove all dirt and foreign materials. All pipe and fittings are to be inspected by the Contractor for defects while suspended above ground.
- (f) **Lowering Materials into Trench.** Proper implements, tools and facilities satisfactory to the Engineer are to be approved and used by the Contractor for the safe and convenient prosecution of work. All pipe, fittings, valves, and hydrants are to be carefully lowered into the trench piece by piece by means of a derrick, ropes, or other suitable tools or equipment in such a manner as to prevent damage to water main materials and protective coatings and lining. Under no circumstances are water main materials to be dropped or dumped into the trench.
- (g) **Installing Pipe.** Every precaution is to be taken to prevent foreign material from entering the pipe while it is being placed in the line. Under adverse trench conditions and as otherwise required by the Engineer, a heavy, tightly woven canvas bag of suitable size is to be placed over each end prior to lowering the

pipe into the trench and left in place until a connection is made to the adjacent pipe.

After placing a length of pipe in the trench, the jointed end is to be centered on the pipe already in place, forced into place, brought to correct line and grade, and at the joint completed in accordance with the requirements specified herein. The pipe is to be secured in place with approved backfill material tamped around it except at the bells. Pipe and fittings which do not allow a sufficient and uniform space for joints will be rejected by the Engineer and are to be replaced with pipe and fittings for

proper dimensions. Precautions are to be taken to prevent dirt or other foreign matter from entering the joint space.

At times when pipe laying is not in progress the open end of pipe in the trench is to be closed by a watertight plug or other means approved by the Engineer. Pipe in the trench which cannot temporarily be jointed is to be capped or plugged at each end to make it watertight. This provision is to apply during all periods when pipe laying is not in progress. Should water enter the trench, the seal is to remain in place until the trench is completely dry.

- (h) Defective or Damaged Material. Pipe and accessories are to be inspected for defects prior to being lowered into the trench. Any defective, damaged, or unsound material is to be repaired or replaced as directed by the Engineer.

Should a damaged piece of pipe furnished by the Contractor be placed in the water main, the Contractor is to furnish, at his expense, all labor and materials required for removing and replacing the defective pipe and restoring the street to its condition just prior to the failure of the pipe. Should the Contractor damage the pipe after installation, the Engineer may permit the damaged section to be cut from the length unless it is the opinion of the Engineer that the entire length was damaged. The cost and replacement of broken pipe is to be at the expense of the Contractor.

- (i) Water For Contractor's Use. Water for flushing and testing mains, jetting trenches, and for drinking purposes will be made available to the Contractor at existing facilities of the City of Killeen. The Contractor is to furnish all necessary pipe, hose extensions, or transportation to the point of use. The necessary water will be furnished to the Contractor without charge except that the City reserves the right to rescind this provision upon evidence of undue wastage or unauthorized use of water and, in lieu thereof, to provide metered service to the Contractor in accordance with existing regulations. The Contractor is to provide a valve to be attached to the fire hydrants from which water is being drawn. The fire hydrant is to be opened full and is to remain fully opened when in use. Only the connection valve is to be operated to obtain the required water.

- (j) Holes at Bells and Collars. Bell holes of sufficient size are to be provided at each joint to permit the joints to be made properly. For mechanical type joints the minimum clearance between the bell and natural ground is to be 6 in. in all directions. For asbestos-cement pipe joints clearance is to be sufficient to manipulate rings and collars. Bell holes for concrete steel cylinder pipe are to be of sufficient size to properly joint the pipe and place the required grout. Subject to the above provisions the length of excavation for bell holes below grade of the trench bottom is to be kept to a minimum.
- (k) Deviations in Line or Grade. Wherever obstructions, not shown on the plans, are encountered during the progress of the work and such obstructions interfere to such an extent that an alteration on the plan is required, the Engineer is to have the authority to change the plans and direct a deviation from the line and grade or to arrange with the owners of the structures for the removal, relocation, or reconstruction of the obstruction. Any deviation from the line is to be accomplished by the use of appropriate bends unless such requirements are specifically waived by the Engineer.
- (l) Cutting Pipe. The cutting of pipe for inserting valves, fittings or closure pieces is to be accomplished in a neat and workmanlike manner so as to produce a smooth end at right angles to the axis of the pipe. Where possible, pipe 20 in. in diameter and larger is to be cut by machine or by hydraulically tensioned wheel cutters; otherwise, with the approval of the Engineer, the pipe may be cut manually with a cold chisel or by electric arc using carbon or steel welding rods. Only qualified and experienced workmen are to be used, and under no circumstances is a workman not equipped with proper safety goggles and helmet permitted to engage in this work.

Where field cutting is required on asbestos-cement pipe the pipe is to be adequately supported and cut with cutters designed for cutting asbestos-cement pipe as manufactured by "Mathews", "Spring Load", or approved equal.

The end of the pipe which is to be used is to be machined with a suitable machining tool such as a "Mathews", "Spring Load", or approved equal to remove all rough edges. Under no conditions is asbestos-cement pipe to be cut with a shear type cutter.

All cuts made on ductile-iron pipe are to be done with a torch or power saw. The cuts are to be made at right angles to the pipe axis and are to be smooth. The edges of the cut are to be finished smoothly with a hand or machine tool to remove all rough edges. The outside edge of pipe should be finished with a small taper at an angle of about 30 degrees.

- (m) Protective Coating and Wrapping on Joints. All bolts and nuts installed for underground service on valves, fire hydrants, cast-iron mechanical joint fittings, pipe joints, and other ferrous metal appurtenances are to be packed in an approved asphaltic material after installation. After the joint has been made

and bolts drawn to proper tension, the joint including glands, flanges, bolt heads, and nuts are to be packed in asphaltic materials such as Talcote, GS-722, or approved equal, to a minimum thickness of 1 in. over all surface. Coating and wrapping of joints is to be considered subsidiary to the installation and will not be paid for directly.

- (n) Joint Assembly. The installation of pipe and the assembly of rubber ring joints for ductile-iron pipe, concrete-steel cylinder pipe, and asbestos-cement pipe is to conform to the pipe manufacturer's assembly instructions. The method of inserting spigot ends of pipe in bells or collars known as "stabbing" is not permitted with pipe larger than 6 in. in size. Spigot ends of pipe larger than 6 in. in size must be properly inserted in the joint by means of suitable pushing or pulling devices.

The installation of mechanical couplings is to be assembled and installed according to the standards recommended by the manufacturer. Prior to the installation of the mechanical coupling, the pipe ends are to be cleaned by wire brush or other acceptable method to provide a smooth bearing surface for the rubber compression gasket. The pipe is to be marked to align the end of the coupling which will center it over the joint. After positioning, the nuts are to be drawn up finger tight. Uniform pressure on the gaskets is to be applied by tightening alternate bolts on the opposite side of the circle in incremental amounts. Final tensioning is to be accomplished with a torque wrench and in a manner similar to the tightening procedure. The coupling is to then be left undisturbed for 24 hours to allow the gaskets to "pack-in". Final torque check is to then be made prior to coating and wrapping the joint. Table 5, Torque for Mechanical Couplings, sets forth the proper torque for various sized mechanical couplings and is included for the convenience of the Contractor.

Table 5
Torque for Mechanical Couplings

Coupling Size	Bolt Diameter	Torque
2" to 24"	5/8"	75 ft/lb
2" to 24"	3/4"	90 ft/lb
30" and 36" (1/4"x7" & 1/4"x5" Middle Rings)	5/8"	65 ft/lb
30" thru 36" (3/8" & heavier Middle Rings)	5/8"	70 ft/lb
30" to 48"	3/4"	80 ft/lb

- (o) Fittings. Fittings 6 in. through 12 in. in size are to be either mechanical joint unless otherwise stated on the plans. Fittings 16 in. through 24 in. in size are to be mechanical joint type unless otherwise specified on the plans. Adaptors are to be used where necessary to provide a transition between

asbestos-cement pipe and the fittings. When asbestos-cement pipe is used a rubber ring joint is to be provided not more than 7 ft. from both sides of fitting unless a rubber joint fitting is used. Thrust blocking is to be provided as specified on the plans or as directed by the Engineer.

- (p) Tie-in to Existing Mains. The Contractor is to make all ties to existing mains required by the plans as soon as pipe laying reaches the designated location except where the plans provide for the tie-in to be made after the new main has been released for service by the City of Killeen. Ties to existing mains are to consist of wet and dry connections. A "wet connection" is a connection to a water main under pressure and is made by a pipe tapping machine without interrupting service to customers. A "dry connection" is a connection to a water main while the main is empty. Cutting, capping, plugging, adapters, couplings, and abandoning existing water mains is to be considered subsidiary to new main construction and will not be paid for directly.
- (q) Abandonment of Old Mains and Valves. The Contractor is to accomplish all cutting, capping, plugging, and blocking necessary to isolate those existing mains retained in service from those abandoned. The open ends of abandoned mains and all other openings or holes in such mains occasioned by cutting or removal of outlets are to be blocked off by manually forcing cement grout or concrete into and around the openings in sufficient quantity to provide a permanent substantially watertight seal.

Valves abandoned in the execution of the work are to have the valve box removed and backfilled with sand to the finished surface. The valve covers are to be salvaged and returned to the City. Abandoning old mains and valves is to be considered subsidiary to the installation and will not be paid for directly.

- (r) Cutting-in Valves. The work involved in cutting a valve into an existing main is to consist of excavation and backfilling with approved selected material; hauling and disposition of surplus excavation and other materials; installation of the valve, valve box assembly, all pipe cut used to complete cut-in; reaction blocking; polyethylene wrapping where required.
- (s) Tapping Sleeves and Valves. The work involved in the installation of a tapping sleeve and valve is to consist of excavation, backfilling the excavation with approved selected material, installing the tapping sleeve, reaction blocking, tapping valve, valve box assembly, concrete collar where subjected to street traffic, and a cast iron lid.

When the tap hole location requires pavement removal, payment for the replacement of pavement will be based upon a maximum of 30 sq. ft. for tapping sleeves and valves of the various types and sizes installed.

When the tap hole is in a location which does not require pavement removal

and replacement, backfilling to existing grade and restoration of the area is to be included in the unit price bid for tapping sleeves and valves of the various types and sizes installed.

- (t) Cutting-in Tees or Bends. The work involved in cutting in a tee or bend is to consist of excavation, backfilling the excavation with approved selected material, installation of all pipe cut and used to complete the connection, fittings, and reaction blocking required.
- (u) Horizontal Directional Drilling HDPE Pipe. Horizontal directional drilling of HDPE pipe for water mains shall be performed at the locations shown on the plans and at such other locations specifically designated by the Engineer. Horizontal directional drilling operations shall conform to the requirements of Special Specification, "Horizontal Directional Drilling".
- (v) Pipe Joint Restraint System. Restraint devices shall be used where ductile iron mechanical joint bell fittings are coupled to plain-end (square-cut) HDPE pipe, to prevent movement of pipe connections. Mechanical joint adapters will be required for the HDPE pipe.

Pipe joint restraints shall be utilized to prevent movement for PVC push-on bell and spigot pipe connections. The restrainer may be adapted to connect a plain end PVC pipe to a ductile iron mechanical joint (MJ) bell fitting.

All restraint devices shall be installed in accordance with the manufacturer's instructions.

(3) Miscellaneous Appurtenances.

- (a) Valve Boxes, Pits, and Manholes. Valves are to be provided with valve boxes shown on the plans.

The valve box is to be placed in such a manner to prevent shock or stress from being transmitted to the valve. It is to be centered and set plumb over the operating nut of the valve with the box cover flush with the surface of the finished pavement or at such other level as may be directed by the Engineer. Valve boxes located in streets or other areas subjected to vehicular traffic are to be provided with concrete collars as shown on the plans. Collars around such valve boxes are to be formed and finished off neatly and in a workmanlike manner.

Existing valve boxes located within the limits of new street construction which are in conflict are to be adjusted to match proposed finish grades.

- (b) Anchorage and Blocking. Suitable reaction blocking or anchorage is to be provided at all dead ends, plugs, caps, tees, crosses, and bends as shown on the plans. Anchor blocks are to be constructed solidly behind the fitting and symmetrical with the axis of resultant thrust except where this is not

possible as in the case of gravity anchorage for vertical bends. Special ties and anchor fittings may be utilized in conjunction with blocking when shown on the plans or as directed by the Engineer.

Concrete blocking for mains is to be Class "D" (1,500 psi) placed between solid ground and the fitting except as otherwise shown on the plans. The area of bearing in contact with solid ground is to be that shown on the plans or as directed by the Engineer.

The blocking is to be placed so that pipe and fitting joints will be accessible. Bituminous felt paper is to be placed between the pipe or fitting and the concrete.

The reaction block on the unused branch of a tee is to be poured separately from the block across the back of the tee. If they are poured simultaneously, a rigid partition is to be placed between the blocks.

Valves 12 in. and larger in size are to be supported on a concrete pad extending vertically from 12 in. below the bottom of the valve to the lower quarter point of the hub and laterally from face to face of hubs and transversely from wall to wall of the trench.

(4) Backfill.

- (a) Initial Backfill.** For pipe in all nominal diameters, materials conforming to the requirements contained in Section 2.(5)(a) are to be placed under and along both sides of the pipe and carefully worked by hand under the pipe haunches at the minimum elevation shown in the backfill diagram on the plans.

The first lift of initial backfill is to be inspected and approved prior to placement of the second lift. The second lift of initial backfill material is to extend from the spring line of the pipe to a depth sufficient to produce a compacted depth of material. The second lift is to be evenly spread in a similar manner as the first lift.

Care is to be taken to see that no earth clods or trench sides are allowed to fall or rest against the pipe prior to completion of initial backfill. Where all nominal diameters of pipe are to be placed in rock cut or where trench walls or conditions are unstable as defined in Section 3.(1)(f), "Unstable Conditions at Grade", well graded gravels are to be used for initial backfill conforming to the gradation requirements contained in Section 2.(5)(a). No mechanical or hand compaction will be required on well graded gravels.

- (b) Secondary Backfill.** Secondary backfill materials for all types and sizes of pipe are to conform to the requirements contained in Section 2.(5)(b), "Secondary Backfill for Water Mains".

The Contractor will be required to place and compact secondary backfill

materials in all trenches in accordance with the requirements of Item 400, "Excavation and Backfill for Structures", except for measurement and payment.

The backfill and clean-up of trenches is to be as directed by the Engineer, is to begin immediately upon the completion of the hydrostatic test and is to continue until a final and complete clean-up is obtained. Any portion of the trench which is left open in excess of that required to facilitate hydrostatic testing may be ordered closed by the Engineer.

Surplus excavated materials are to be disposed of as directed by the Engineer.

- (c) Sand Backfilling of Cross Trenches and Open Holes. Service lines, meter boxes, or other specials are to be backfilled with sand and thoroughly consolidated by saturating with water, unless otherwise directed by the Engineer. The use of mechanical tamping equipment for compaction of backfill will not be permitted at such locations. Disposal of surplus excavated material and placement of sand is to be considered subsidiary to trenching and backfilling and will not be paid for directly.

(5) Flushing and Testing Mains.

- (a) Flushing. Immediately upon completion of pipelaying, the Contractor is to flush all mains which are scheduled to be disinfected. This flushing is to be at the direction of the Engineer and is to consist of completely filling sections of main between valves and then displacing such initial volumes of water by introducing clear water from existing facilities into and through the main to the point of discharge from the main being flushed. The flow-through is to continue until the Engineer determines all dust, debris, or foreign matter that may have entered during pipe laying operations has been flushed out. The new line is to then be left under system pressure for testing.

To avoid damage to pavement and inconvenience to the public, fire hoses are to be used to direct flushing water from the main into suitable drainage channels or sewers.

- (b) Operation of Valves. No valve in the distribution system is to be operated by the Contractor without prior permission of the Engineer. The Contractor is to notify the Engineer when a valve is to be operated and is to only operate the valve in the presence of the Engineer's representative.
- (c) Hydrostatic Tests. All new mains are to be hydrostatically field tested at a maximum test pressure of 150 psi before acceptance by the Engineer.

All joints which are found to leak either by observation or during any test are to be made watertight by the Contractor. In case repairs are required, the hydrostatic field test is to be repeated until the pipe installation conforms to the specified requirements and is acceptable to the Engineer. The expense for tests the hydrostatic pressure test shall be subsidiary to the work required under

this contract and no direct payment will be made.

After the new main has been laid and backfilled as specified, but prior to chlorination and replacement of pavement, it is to be filled with water for a minimum of 24 hours and then subjected to a hydrostatic pressure test. The specified test pressure is to be supplied by means of a pump connected to the main in a satisfactory manner. The pump, pipe connection, and all necessary apparatus including gauges and meters are to be furnished by the Contractor. Unless otherwise specified, the City of Killeen will furnish water for filling lines and making tests through existing mains.

Before applying the specified test pressure, all air is to be expelled from the main. To accomplish this, taps are to be made, if necessary, at the points of highest elevation and afterwards tightly plugged. At intervals during the test, the entire route of the new main is to be inspected to locate any leaks or breaks. If any are found, they are to be stopped or repaired. The test is to be repeated until satisfactory results are obtained.

The hydrostatic test is to be made so that the maximum pressure at the lowest point does not exceed the specified test pressure. The duration of each pressure test is to be a minimum of 4 hours for new mains in excess of 1,000 ft. after the main has been brought up to test pressure. The test pressure is to be measured by means of a tested and properly calibrated pressure gauge acceptable to the Engineer. All pressure tests are to be continued until the Engineer is satisfied that the new main meets the requirements of these specifications. Should any test of pipe in place disclose leakage greater than listed in Table 6A or 6B, Hydrostatic Test Leakage Allowances, the Contractor is to, at his expense, locate and repair the defective joints until the leakage is within the specified allowance. Leakage is defined as the quantity of water supplied into the newly laid main, or any valved section of it, necessary to maintain the specified leakage test pressure after the main has been filled with water and the air expelled. The Contractor is to notify the Engineer prior to beginning the test, and the City's Inspector is to be present during the pressure test.

HDPE pipe pipe leakage allowances shall conform to DI leakage allowances listed on Table 6A, Hydrostatic Test Leakage Allowances.

Table 6A
Hydrostatic Test Leakage Allowances (Maximum) @ 150 psi

Nom Dia-Ty Pipe	Allowable Leakage in Gallons Per Hour (GPH) ** Pipe Length in Feet									
	100	200	300	400	500	600	700	800	900	1000
6"AC	0.14	0.28	0.43	0.57	0.71	0.85	0.99	1.14	1.28	1.42
6"DI*	0.11	0.22	0.33	0.44	0.55	0.66	0.77	0.88	0.99	1.10
8"AC	0.19	0.38	0.56	0.75	0.94	1.13	1.32	1.50	1.70	1.80
8"DI*	0.15	0.29	0.44	0.59	0.74	0.88	1.03	1.18	1.32	1.47
12"AC	0.28	0.57	0.85	1.13	1.42	1.70	1.98	2.26	2.55	2.83
12"DI*	0.22	0.44	0.66	0.88	1.10	1.32	1.54	1.76	1.98	2.20
16"AC	0.38	0.75	1.13	1.50	1.88	2.26	2.63	3.01	3.38	3.76
16"DI*	0.29	0.59	0.88	1.18	1.47	1.76	2.06	2.35	2.65	2.94
20"AC	0.47	0.94	1.41	1.88	2.35	2.82	3.29	3.76	4.23	4.70
20"DI*	0.39	0.74	1.10	1.47	1.84	2.21	2.55	2.94	3.31	3.68
20"CSC	0.08	0.16	0.24	0.32	0.40	0.47	0.55	0.63	0.71	0.79
24"AC	0.57	1.13	1.70	2.26	2.83	3.39	3.96	4.52	5.09	5.65
24"DI*	0.44	0.88	1.32	1.76	2.21	2.65	3.09	3.53	3.97	4.41
24"CSC	0.10	0.19	0.29	0.38	0.48	0.57	0.67	0.76	0.86	0.95
30"AC	0.71	1.41	2.12	2.82	3.53	4.24	4.94	5.65	6.35	7.06
30"DI*	0.55	1.10	1.66	2.21	2.76	3.31	3.86	4.42	4.97	5.52
30"CSC	0.12	0.24	0.35	0.47	0.59	0.71	0.83	0.94	1.06	1.18
36"AC	0.85	1.70	2.54	3.39	4.24	5.09	5.94	6.78	7.63	8.48
36"DI*	0.66	1.32	1.99	2.65	3.31	3.97	4.63	5.30	5.96	6.62
36"CSC	0.14	0.28	0.43	0.57	0.71	0.85	0.99	1.14	1.28	1.42
42"DI*	0.77	1.54	2.32	3.09	3.86	4.63	5.40	6.18	6.95	7.72
42"CSC	0.17	0.33	0.50	0.66	0.83	1.00	1.16	1.33	1.49	1.66
48"DI*	0.88	1.77	2.65	3.53	4.42	5.30	6.18	7.06	7.95	8.83
48"CSC	0.19	0.38	0.57	0.76	0.95	1.13	1.32	1.51	1.70	1.89
54"CSC	0.21	0.42	0.63	0.84	1.05	1.26	1.47	1.68	1.89	2.10
60"CSC	0.24	0.48	0.72	0.96	1.20	1.44	1.68	1.92	2.16	2.40

* DI Pipe includes mechanical and push-on joints.

** GPH for CSC Pipe are manufacturer's maximum.

Note: Leakage allowances may be determined for footages not specifically listed by interpolation and/or by the combination of various tabular data.

Example No. 1: The maximum leakage allowances for 6,000 LF of 6" AC pipe would be the sum of the values for 5,000 LF and 1,000 LF, or 8.15 GPH plus 1.63 GPH equals 9.78 GPH.

Example No. 2: The maximum leakage allowance for 1,550 LF of 6" AC pipe would be the sum of the values for 1,000 LF and the interpolated value of 550 LF, or 1.63 GPH plus 0.90 GPH equals 2.53 GPH.

Table 6B
Hydrostatic Test Leakage Allowances (Maximum) @ 200 psi

Nom	Allowable Leakage in Gallons Per Hour (GPH) **									
Dia-Ty	Pipe Length in Feet									
Pipe	100	200	400	600	800	1000	2000	3000	4000	5000
6"AC	0.16	0.33	0.65	0.98	1.30	1.63	3.26	4.89	6.52	8.15
6"DI*	0.13	0.25	0.51	0.76	1.02	1.27	2.54	3.81	5.08	6.35
8"AC	0.22	0.44	0.87	1.31	1.74	2.18	4.36	6.54	8.72	10.90
8"DI*	0.17	0.34	0.68	1.02	1.36	1.70	3.40	5.10	6.80	8.50
12"AC	0.33	0.65	1.30	1.96	2.61	3.26	6.52	9.78	13.04	16.30
12"DI*	0.26	0.51	1.02	1.53	2.04	2.55	5.10	7.65	10.20	12.75
16"AC	0.44	0.87	1.75	2.62	3.50	4.37	8.74	13.11	17.48	21.85
16"DI*	0.34	0.68	1.36	2.04	2.72	3.40	6.80	10.20	13.60	17.00
20"AC	0.55	1.09	2.18	3.27	4.36	5.45	10.90	16.35	21.80	27.25
20"DI*	0.43	0.85	1.70	2.55	3.40	4.25	8.50	12.75	17.00	21.25
20"CSC	0.08	0.16	0.32	0.47	0.63	0.79	1.58	2.37	3.16	3.95
24"AC	0.65	1.31	2.62	3.92	5.23	6.54	13.08	19.62	26.16	32.70
24"DI*	0.51	1.02	2.04	3.06	4.08	5.10	10.20	15.30	20.40	25.50
24"CSC	0.10	0.19	0.38	0.57	0.76	0.95	1.90	2.85	3.80	4.75
30"AC	0.82	1.63	3.27	4.90	6.54	8.17	16.34	24.51	32.68	40.89
30"DI*	0.64	1.27	2.55	3.82	5.10	6.37	12.74	19.11	25.48	31.85
30"CSC	0.12	0.24	0.47	0.71	0.94	1.18	2.36	3.54	4.72	5.90
36"AC	0.98	1.96	3.92	5.88	7.84	9.80	19.60	29.40	39.20	49.00
36"DI*	0.76	1.53	3.06	4.58	6.11	7.64	15.28	22.92	30.56	38.20
36"CSC	0.14	0.28	0.57	0.85	1.14	1.42	2.84	4.26	5.68	7.10
42"DI*	0.89	1.78	3.57	5.35	7.14	8.92	17.84	26.76	35.68	44.60
42"CSC	0.17	0.33	0.66	1.00	1.33	1.66	3.32	4.98	6.64	8.30
48"DI*	1.02	2.04	4.08	6.11	8.15	10.19	20.38	30.57	40.76	50.95
48"CSC	0.19	0.38	0.76	1.13	1.51	1.89	3.78	5.67	7.56	9.4
54"CSC	0.21	0.42	0.84	1.26	1.68	2.10	4.20	6.30	8.40	10.50
60"CSC	0.23	0.46	0.92	1.38	1.84	2.30	4.60	6.90	9.20	11.50

- * DI Pipe includes mechanical and push-on joints.
- ** GPH for CSC Pipe are manufacturer's maximum.

Note: Leakage allowances may be determined for footages not specifically listed by interpolation and/or by the combination of various tabular data.

Example No. 1: The maximum leakage allowances for 6,000 LF of 6" AC pipe would be the sum of the values for 5,000 LF and 1,000 LF, or 8.15 GPH plus 1.63 GPH equals 9.78 GPH.

Example No. 2: The maximum leakage allowance for 1,550 LF of 6" AC pipe would be the sum of the values for 1,000 LF and the interpolated value of 550 LF, or 1.63 GPH plus 0.90 GPH equals 2.53 GPH.

(6) Disinfection of Mains Utilizing Dry Calcium Hypochlorite.

- (a) **Calcium Hypochlorite (HTH).** Mains are to be disinfected with dry Calcium Hypochlorite (HTH) where shown on the plans or as directed by the Engineer.
- (b) **Dosage.** The Contractor is to disinfect the new or replaced mains with Calcium Hypochlorite (HTH) of 70 % available chlorine. Sufficient Calcium Hypochlorite (HTH) is to be used to obtain a minimum chlorine concentration of 50 ppm. The following Table 7, Chlorine Dosage, is included for the convenience of the Contractor:

**Table 7 Chlorine
Dosage**

Diameter of Pipe Inches	Ounces Per Foot To Obtain 50 ppm Chlorine Dosage
6	0.0138
8	0.0233
10	0.0364
12	0.0523
14	0.0708
16	0.0934
18	0.1175
20	0.1455
24	0.2080
30	0.3270
36	0.4690
42	0.6370
48	0.8330

A heaping tablespoon holds approximately 1/2 ounce, and a standard measuring cup holds approximately 8 ounces.

(c) **Filling the Main.** Those sections of main to which dry Calcium Hypochlorite (HTH) has been applied is to be filled slowly to allow for the even distribution of the disinfecting material. The manipulation of valves is to be under the supervision of the Engineer's representative in accordance with Section 3.(5)(b), "Operation of Valves".

(d) **Holding Time.** The length of time that sections of main disinfected with Calcium Hypochlorite (HTH) is to be allowed to stand undisturbed will depend upon the particular job.

When circumstances permit a shutdown with no customers out of service, the required minimum detention time will be 24 hours with a 50 ppm chlorine dosage.

When customers are out of service during a shutdown with no leakage past valves, the required minimum detention time will be 3 hours and the chlorine dosage will be 300 ppm.

When customers are out of service during a shutdown with some leakage past valves, the required minimum detention time will be 30 minutes with a 500 ppm chlorine dosage.

(e) **Flushing.** Following the expiration of the specified holding time, the treated section of main is to be flushed thoroughly by the Contractor in accordance with the applicable provisions of Subarticle 3.(5), "Flushing and Testing Mains". Flushing is to continue until no chlorine remains detectable by taste or odor or until the chlorine residual is less than 0.3 ppm.

(f) **Preventing Reverse Flow.** Valves are to be manipulated so that the strong chlorine solution in the line being treated will be flushed out of the main and will not flow back into the line supplying the water.

(g) **Supervision.** All disinfection is to be done under the general supervision of the City of Killeen.

(h) **Additional Treatment.** Should the new main fail to meet minimum public health standards for bacteriological quality after flushing, further treatment is to be as directed by the Engineer. If further disinfection is required, chlorination is to be done in accordance with Subarticle 3.(6), "Disinfection of Mains Utilizing Dry Calcium Hypochlorite". In no case, however, is the new line to be acceptable as complete and satisfactory until the bacteriological quality of the water taken from the main meets the Standards of the Texas Commission on Environmental Quality.

(i) **Safeguarding and Backfilling Open Holes.** The Contractor is to be

responsible for safeguarding any open holes excavated or left open for flushing and disinfection purposes. Following completion of disinfection, the Contractor is to backfill such holes in accordance with appropriate provisions of Subarticle 3.(4), "Backfill".

(7) Service Supply Lines.

- (a) Designation of Service Supply Lines.** A water supply line located between the water main and water meter, or between the water main and property or right of way line if un-metered, is designated as a service supply line.
- (b) Service Supply Line Installation.** Excavation, backfill, cutting and replacement of pavement is to be in accordance with Subarticle 3.(1), "Excavation". The minimum depth of cover over the top of the service supply lines is to be 36 in., unless otherwise shown on the plans. The minimum trench width for service supply lines 2 in. and smaller is to be 8 in. while the minimum trench width for service supply lines larger than 2 in. is to be the nominal pipe diameter plus 16 in.. All service supply lines are to be embedded in sand in accordance with Section 3.(4)(c), "Sand Backfilling of Cross Trenches and Open Holes". Final trench backfill and restoration for service supply lines is to be completed in accordance with Subarticle 3.(4), "Backfill". For service supply lines outside the limits of new street construction, said street is to be replaced in accordance with Section 3.(1)(k), "Pavement".
- (c) Reconnecting Service Lines.** Both the old and new water mains at existing service line connections shown on the plans are to be exposed, the old main for the purpose of gaining access to the existing service corporation stop and the new main for the purpose of installing the new corporation stop. A service saddle shall be installed on the new main. The new main is to be drilled and tapped with an approved tapping machine, a new corporation stop installed and the trench extended laterally to expose a sufficient length of the existing service line to provide slack to bend it into position for tying to the new corporation stop. After suitable notification to the customer, the Contractor is to "kill" the existing service by closing the corporation stop at the old main, cut the existing service at a point opposite the new main, attach a compression PE fitting, and connect it to the new corporation stop. The Contractor is to then immediately open the stop and restore water service to the customer. Where it is not possible to obtain sufficient length in the existing service to tie directly to the new main, at the direction of the Engineer, the Contractor is to provide the necessary length of new PE tubing and tie it to the existing meter and the new corporation stop by means of a compression coupling. Cutting and bending of the tubing, introduction of slack to compensate soil movement, and completion of the installation is to be as shown on the plans.

(d) **Meter Boxes.** Existing meters and meter boxes that are disturbed during the course of the work specified are to be correctly reset by the Contractor. The correct meter and meter box configuration is to have the meter set horizontal, approximately 6 in. below the top of the meter box lid so that the meter is above the bottom of the meter box and in line with the meter box lid opening. The top of the meter box is to be flush with the existing ground surface. All excess soil above the meter coupling, meter flange and meter nuts inside the meter box is to be removed so that the meter

register is clearly visible. The Contractor is to exercise special care during excavation at the existing meter location in order to minimize the disturbance of the customer's yard piping. However, if the existing meter elevation is low, the Contractor is to raise the existing meter to conform to the correct configuration indicated herein. If the existing meter box elevation is high, the Contractor is to lower the existing meter box to conform to the correct configuration indicated herein. Payment to the Contractor for the work defined herein is to be considered subsidiary to the work required under this contract and no direct payment will be made. Prior to or during the final acceptance inspection of the work under this contract, the Contractor or his representative and the Engineer are to verify the correct setting of each meter and meter box configuration.

~~(8) **Installation of the Nonmetallic Pipe Detection System.** The nonmetallic pipe detection system is to be installed concurrently with the proposed pipe placement. This installation is to be as specified by the manufacturer and/or as approved by the Engineer.~~

4. MEASUREMENT

This Item will be measured as follows: ""Pipe Service Line (HDPE)", for water pipe of the various sizes shown on the plans, will be measured by the Linear foot as follows: From the water meter to centerline intersection of runs and branches of tees to the end of the valve of a dead-end run.

Between the centerline intersections of runs and branches of tees, and where the branch is plugged for future connection, the measurement will include the entire laying length of the branch or branches of the fitting.

The measurement of each line of pipe of each size will be continuous and is to include the full laying lengths of all fittings and valves installed between the ends of such line except that the laying lengths of reducers will be divided equally between the connected pipe sizes. Lines leading to a tapping connection with an existing main will be measured to the center of the main tapped.

"Gate Valve and Box (Complete)" will be measured as each assembly of the various sizes installed.

"Tapping Sleeve, Valve and Box (Complete)" will be measured as considered subsidiary to the pipe installation.

~~"Cut-in Tee or Bend (Complete)" will be measured as each assembly of the various sizes of ductile iron tees and bends cut-in to the existing water main.~~

~~"Temporary Blow-off (Complete)" will be measured as each assembly of the various sizes installed and is to consist of all galvanized iron pipe, gate valve and fittings.~~

"Cast-Iron Fittings" and "Ductile-Iron Fittings" will be measured as considered subsidiary to the pipe installation.

"Trench Excavation Protection" will be considered subsidiary to the pipe installation.

"Tie-In (Complete)" will be measured as each of the various sizes and types completed.

"Reconnect Short Service" will be measured as each of the various sizes of service lines reconnected.

"Excavation" will not be measured for payment, but is to be considered subsidiary to the pipe installation.

"Select Backfill" will not be measured for payment, but is to be considered subsidiary to the pipe and other appurtenance installation.

~~"Horizontal Directional Drilling (Water Main)" will be measured by the foot of the size and type of water main installed by the horizontal directional drilling method.~~

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 prices bid for the items of work hereinafter described. These prices are to be full compensation for furnishing and hauling all materials; for placing or installing the materials; for inspection and testing; and for all other items of material, labor, equipment, tools and incidentals necessary to complete the work in accordance with the plans and specifications.

Payment for "Pipe Service Line (HDPE)" will be made at the unit price bid per linear foot of pipe of the various sizes installed by the open cut method. This payment is also to include selected bedding, excavation, and backfill materials.

Payment for "Gate Valve and Box (Complete)" and "Tapping Sleeve, Valve and Box (Complete)" will be made at the unit price bid for each such assembly of the various sizes installed. This payment is also to include selected embedment material, anti-corrosion embedment when specified, concrete collar at the valve box, riser pipe, cast-iron boot, packing, tarpaper, concrete grout, concrete reaction blocking, asphaltic material for bolts, nuts and ferrous surfaces, polyethylene sleeve where required.

Payment for "Cut-in Tee or Bend (Complete)" will be made at considered subsidiary to the pipe installation.

Payment for "Permanent Blow-off (Complete)" and/or "Temporary Blow-off (Complete)" will be made considered subsidiary to the pipe installation.

Payment for "Cast-Iron Fittings" and "Ductile-Iron Fittings" will be made as considered subsidiary to the pipe installation.

Payment for "Trench Excavation Protection" is to be made as considered subsidiary to the pipe installation. ~~Sheeting, trench boxes or trench shields, sheet piling, cribbing, bracing, shoring, dewatering or diversion of water to provide adequate drainage. Payment is also to include the additional excavation and backfill required, any jacking, jack removal and removal of the trench support after completion and be full compensation for all other labor, materials, tools, equipment and incidentals necessary to complete the work.~~

Payment for "Tie-In (Complete)" will be made as considered subsidiary to the pipe installation ~~at the unit price bid for each tie-in of the various sizes and types completed. This payment is to include shutdown and isolation of the existing main to which the tie is to be made, cutting pipe for connection, de-watering the excavation, and customer notification of service interruption where required.~~

Payment for "Reconnect Short Service" will be made as considered subsidiary to the pipe installation ~~at the unit price bid for each service line of the various sizes and types reconnected. This payment is to include sand backfill, meter box relocation where required, PE tubing, valve and valve box assembly, and fittings of the various sizes used in the service line reconnection.~~

~~Payment for "Cut and Replace Concrete Sidewalk, Driveway, Etc." will be made at the unit price bid for each sq. ft. of surface area of concrete sidewalk cut and replaced, but not to exceed the minimum trench width specified in Section 3.(1)(b), "Width of Trench".~~

No direct payment will be made for concrete blocking of water mains; coating and wrapping pipe joints; trench excavation below specified limits; excavation and removal of unsuitable material at bottom of trench grade and restoration with approved material; supporting pipe or conduits of public utilities; abandonment of water mains and valves; resetting existing meters and meter boxes in proper configuration; valve boxes and meter boxes; flushing water mains; and disinfection of water mains utilizing Calcium Hypochlorite. This work is to be considered subsidiary to the various bid items.

No direct payment will be made for furnishing and installing the nonmetallic pipe detection system. This work and materials are to be considered subsidiary to the various pay items. In addition, the Contractor is to ensure that the detection system is complete and operational to the satisfaction of the Engineer.

Payment for "Horizontal Directional Drilling (Water Main)" will be made at the unit price bid per foot of the size and type of water main installed by the horizontal directional drilling method. This payment shall include the furnishing of the water pipe, coating, selected embedment material, backfill, surface restoration, hauling and disposal of surplus materials; for placing or installing the materials; for inspection and testing; and for all items of material, labor, equipment, tools and incidentals necessary to complete the work in accordance with the plans and Special Specification, "Horizontal Directional Drilling". Payment will be made only after final acceptance of the horizontal directional drilled pipe. No partial payment will be made.

No direct payment will be made for furnishing and installing the pipe joint restraint system. This work and materials shall be considered subsidiary to the various bid items.

PART 2 – PRODUCTS

BACKFLOW PREVENTERS

2.1 MANUFACTURER

- A. [Zurn Elkay Water Solutions, 1747 Commerce Way, Paso Robles, CA 93446. Toll Free (855) 663-9876.] Website: www.zurn.com or comparable

2.2 BACKFLOW PREVENTERS

- B. Reduced-Pressure-Principle Backflow Preventers:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Wilkins: **Model 975XL3 (Lead-Free)** or comparable product
 2. Standard: ASSE 1013, CSA B64.4, cUPC, IAPMO, USC FCCCHR, UL Listed, and AWWA C511, NSF/ANSI/CAN 61 & 372
 3. Operation: Continuous-pressure applications unless otherwise indicated.
 4. Pressure Loss: 15 PSI (104 kPa) (1" - 2"), 16 PSI (110 kPa) (3/4") maximum, 15 PSI (104 kPa) (1/2"), through middle third of flow range.
 5. Size: NPS 1/2 to NPS 2 (DN 15 to DN 50).
 6. Design Flow Rate: 8 GPM (1/2"), 30 GPM (3/4"), 50 GPM (1"), 75 GPM (1-1/4"), 100 GPM (1-1/2"), 160 GPM (2")
 7. Pressure Loss at Design Flow Rate: 15 PSI (104 kPa) (1" - 2"), 19 PSI (131 kPa) (3/4"), 15 PSI (104 kPa) (1/2"),
 8. Body: Bronze
 9. Configuration: Designed for [horizontal, straight-through] flow.
 10. Accessories:
 - a. Shut-off Valves: Ball type with threaded ends on inlet and outlet.
 - b. Air-Gap Fitting: ASME A1 12.1.2, matching backflow-preventer connection.
 - c. Strainer Option: Bronze wye strainer (Wilkins Model SXL) or comparable
 - d. Water Meter Type: [gpm meter] [Remote meter reading] [cu ft/min meter].
 - e. For UL and FM approvals provide indicating-type shut-off valves.

C. Double-Check, Backflow-Prevention Assemblies :

1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Industries, LLC; Wilkins; [Model 950XL3 (Lead-Free)] or comparable product Standard: ASSE 1015.
2. Operation: Continuous-pressure applications unless otherwise indicated.
3. Pressure Loss: 7 PSI (48 kPa) maximum, through middle third of flow range.
4. Size: NPS 3/4 to NPS 2 (DN20 to DN50).
5. Design Flow Rate: 30 GPM (3/4"), 50 GPM (1"), 75 GPM (1-1/4"), 100 GPM (1-1/2"), 160 GPM (2")
6. Pressure Loss at Design Flow Rate: Less than 10 PSI (69 kPa)
7. Body: Bronze
8. Configuration: Designed for horizontal (straight-through), vertical up (straight-through) flow.
9. Accessories:
 - a. Shut-off Valves NPS 2 (DN 50) and Smaller: Ball type with threaded ends on inlet and outlet.
 - b. Strainer Option: Bronze wye strainer (Wilkins Model SXL) or comparable
 - c. Water Meter Type: [gpm meter] [Remote meter reading] [cu ft/min meter].
 - d. For UL and FM approvals provide indicating-type shut-off valves.

SPECIAL SPECIFICATION 6071 FIBER OPTIC CABLE

1. DESCRIPTION

Furnish and install fiber optic cable in designated locations, install existing fiber optic cable in designated locations, and remove fiber optic cable as shown on the plans and as detailed in accordance with these Specifications.

2. MATERIALS

2.1. **General Requirements.** Provide, assemble, fabricate and install materials that are new, corrosion resistant and in strict accordance with the details shown on the plans and in the specifications.

Furnish, install, splice and test all the required fiber optic cable. Provide, as subsidiary to this item, all splicing kits, fiber optic cable caps, connectors, moisture/water sealants, terminators, splice trays, pig tails and accessories necessary to complete the fiber optic network. Provide all equipment necessary for installation, splicing and testing.

2.2. **Functional Requirements.** The fiber optic cable is the primary central to field communications medium for voice, data and video. Provide cable that is suitable for installation in an underground conduit environment including constant immersion in water. Provide only non-metallic cable.

Splice and/or terminate all fibers in the fiber optic cable as shown on the plans and as specified herein.

Provide all fiber optic glass manufactured by the same manufacturer.

2.3. **Environmental Requirements.** Provide cable that functions within specifications over its full lifetime at a temperature range of -10°F to +140°F, and when totally immersed in water for indefinite periods of time.

2.4. **Optical Requirements.**

2.4.1 Cable Configuration.

Provide single mode fiber having a step index profile with a core/cladding size of 8.3/125 microns.

2.4.2 Attenuation.

Provide single mode fiber with nominal attenuation of 0.35db/.62-mile maximum at a wavelength of 1310 nm and nominal attenuation of 0.25 db/.62-mile maximum at a wavelength of 1550 nm.

2.4.3 Bandwidth.

Provide single mode fiber with a maximum dispersion of 3.5 seconds/nanometer /kilometer at 1310 nm

3. MECHANICAL REQUIREMENTS

- 3.1. **Fiber Optic Cable.** Provide fiber optic cable with quantity of fibers as shown on the plans.
- 3.1.1. **Diameter.** Provide cable with an outer diameter of less than .88 inches, containing fibers with a nominal core diameter of 8.3 microns and an outer diameter of 125 microns \pm 1 micron.
 - 3.1.2. **Color Coding.** Provide cable with positive identification of each fiber using color coding of both the fibers and the binders in the cable
 - 3.1.3. **Core/Clad Concentricity.** Provide fiber with a Core/Clad concentricity less than or equal to 0.8 microns.
 - 3.1.4. **Primary Coating.** Provide fiber with a high-density polymer coating of a minimum of 250 micrometers to prevent abrasion of the fiber surface, or as approved by the Engineer.
 - 3.1.5. **Buffering.** Enclose individual fibers in an oversized plastic tube filled with a non-hygroscopic compound or coated with a heavy polymer coating and enclosed in a tight flexible thermoplastic jacket to provide strength for practical handling, to prevent micro bends and to preserve the individual fibers during installation and long-term service.
 - 3.1.6. **Tensile Strength.** Provide cable that can withstand a pulling tension of 600 pounds without changing the characteristics of the optical fibers. Requirements for a higher pulling tension may be provided by the Engineer.
 - 3.1.7. **Bend Radius.** Provide cable that can withstand a minimum bending radius of 10 times its outer diameter during operation and 20 times its outer diameter during installation without changing the characteristics of the optical fibers.
 - 3.1.8. **Cable Configuration.** Provide fiber optic cable consisting of an extruded plastic tube filled with a filling compound and containing up to 24 fiber bundles or up to 30 ribbon units stacked in a rectangular array.
 - 3.1.9. **Grouping.** Group the fibers in each cable in layers or sub-bundles. Distinctly color-code each group for quick and easy identification, even in dim light. Provide cable whose jacket construction and configuration of internal groups is such that the groups can be easily separated at splice points, permitting 1 set of fibers to be cut and spliced while the others remain continuous. Submit proposed cable designs for the Engineer's approval prior to procurement and installation of cable.

- 3.1.10. **Jacket and reinforcing.** Provide cable where all strength members are made of 2 groups of glass longitudinally applied, diametrical from each other over the cable core or as approved by the Engineer and enclosed within a high-density polyethylene (HDPE) jacket. Provide cable that is fully filled with non-hygroscopic water blocking compound to prevent water and moisture penetration.

- 3.2. **Fiber Optic Jumpers.** Provide fiber optic jumper cables to cross connect the cable distribution panel to the fiber optic transmission equipment. Provide jumpers that are yellow in color for single mode fiber and have strain relief on the connectors. Provide fiber with a 900 micron or 1000-micron polymer coating with tight buffer tube, Kevlar strength member and a PVC jacket.

Provide jumpers 3 feet in length or as directed by the Engineer, with one end having an ST connector and the other end having a connector suitable to be connected to the fiber optic transmission equipment selected.

Inspect the Fiber Distribution Frame and provide all necessary items to terminate fibers.

Consider all fiber jumpers as subsidiary to this item.

4. CONSTRUCTION

- 4.1. **General.** Use the latest available installation machinery, jacking equipment, cable pulling machinery (with appropriate tension monitors), splicing equipment, testing equipment, and other miscellaneous tools when installing the cable, splicing the fiber, attaching connectors, and mounting hardware in cabinets.

Use installation techniques and fixtures that result in ease of maintenance and ready access to all components for testing and measurements.

- 4.2. **Mechanical Components.** Ensure that all external screws, nuts and locking washers are stainless steel. Do not use self-tapping screws unless specifically approved by the Engineer.

Provide parts that are made of corrosion resistant material such as plastic, stainless steel, anodized aluminum or brass.

Protect all materials used in construction from fungus growth and moisture deterioration.

Separate dissimilar metals by an inert dielectric material.

- 4.3. **Installation Requirements.** Install the fiber optic cable with installation techniques that will not degrade the optical and mechanical characteristics of the cables at the time of installation. Trim any trees necessary that interfere with installation of fiber optic cable on temporary poles or existing CPS with Utility poles, subsidiary to this item.

4.3.1. **Installation in Conduit.** Install Fiber Optic Cable in existing or new conduit as shown on plans and according to installation requirements detailed in this specification. Perform the cable pulling operations in a way that ensures that the minimum bending radius of the cable is not exceeded during the unreeling and pulling operations. Use entry guide chutes to guide the cable into the pull-box conduit ports. Use lubricating compound to minimize cable-to-conduit friction.

Use corner rollers (wheels) with radii not less than the minimum installation bending radius of the cable. Use a series array of smaller wheels for accomplishing the bend if the array is specifically approved by the cable manufacturer. Continuously measure the pulling tension and do not allow it to exceed the maximum tension specified by the manufacturer of the cable. Use fuse links and breaks to insure that cable tension does not exceed 600 lb.

When simultaneously pulling fiber optic cable with other cables, use separate grooved rollers for each cable.

Seal conduits with a 2-part urethane after cable installation.

4.3.2. **Installation on Temporary poles.** Install fiber optic cable on contractor provided and installed temporary timber poles as shown on plans and according to installation requirements detailed in this specification. See plan sheets for details of installation. New timber poles required for temporary installation are subsidiary to this item.

4.3.3. **Installation on CPS poles.** Install fiber optic cable on existing CPS with Utility poles as shown on plans and according to installation requirements detailed in this specification. See plan sheets for details of installation. Do not damage existing CPS with Utility poles.

4.4. **Removal Requirements.**

4.4.1. **Remove Fiber Optic Cable.** Remove fiber optic cable from conduit as shown on plans. Dispose of removed fiber optic cable unless plans show for it to be re-used (re-installed). See plans for details. Any fiber optic cable damaged by the contractor that is to be re-used will be replaced by the contractor at no cost to TxDOT with new fiber optic cable meeting the approval of the Traffic Management Engineer. Test in accordance with this specification. The Engineer reserves the right to reject the fiber. Rejection will be based on the fiber optic cable test results.

4.4.2. Remove Fiber Optic Cable on Temporary poles. Remove fiber optic cable and steel messenger cable (steel wire strand) from the temporary timber poles and dispose of unless shown otherwise on plans. Remove and dispose of the temporary timber poles. Restore the holes left by the removal of the timber poles to their original or proposed condition by installing same material that surrounds holes (e.g., soil, riprap, etc.).

4.4.3. Remove Fiber Optic Cable on CPS poles. Remove the fiber optic cable and steel messenger cable (steel wire strand) from the existing CPS with Utility poles and dispose of unless shown otherwise on plans. Do not damage existing CPS with Utility poles.

4.5. **Splicing Requirements.** Splice or terminate all optical fibers as shown on the plans or as directed by the Engineer

- DO NOT EXCEED A SPLICE LOSS OF 0.03 DB FOR ANY SPLICE UNLESS SHOWN OTHERWISE ON PLANS.
- Use fusion technique for all splices. Provide fusion splicing equipment that is approved by the Engineer and that is cleaned, calibrated and specifically adjusted to the fiber and environmental conditions at the start of each shift.
- Provide splice enclosures, organizers and incidentals, and cable end preparation tools and procedures that are compatible with the cable type being delivered and approved by the Engineer.
- Package each spliced fiber in a protective sleeve or housing. Completely re-coat bare fibers with a protective 8 RTV, gel or similar substance, prior to application of the sleeve or housing to protect the fiber from scoring, dirt or micro bending.
- Use rack mounted organizer trays to hold the spliced fibers, with each fiber neatly secured to the tray.
- Terminate or splice all fiber inside fiber optic cable interconnect panel modules. The module is a fully enclosed unit capable of supporting the specified cable as shown on the plans.
- Provide interconnect panel modules that are 19 in. rack mountable or as shown on the plans and compatible with any existing equipment.
- Provide modules able to support a minimum of 48 ST connectors in bulkheads.
- Provide splice trays capable of holding either fusion splices or mechanical splices.
- Provide cabinets that contain cabinet mounting brackets with four outside plant cable clamps for strain relief. Install the cable according to the manufacturer's recommended standards for the cable distribution panel selected.
- Include a maintenance loop of at least 10 ft. of cable, coiled up and tied inside the interconnect module or cabinet that fiber optic cable terminates in to allow for future splices in the event of a damaged splice. The

maintenance loop of cable is not paid for directly but is subsidiary to this item.

- Record all splice losses in tabular form and submit to the Engineer for approval.
- Use an Optical Time Domain Reflectometer (OTDR) to test splices made between 2 cables. Test these splices at the required wavelength and provide printouts of the splice tests to the Engineer.

4.6. **Termination Requirements.** Provide matching connectors in cabinets where the optical fibers must be connected to terminal equipment.

- Do not exceed 0.4 dB connector loss for complete connection to the terminal equipment. Qualify and accept connectors based on connector-to-connector mating using similar fibers.
- In the Control Center and at the ends of the system, remove 5 ft. of the unused optical fibers from the buffer tube(s) and place the coiled fibers into a splice tray approved by the Engineer. Clean the water blocking compound from all fibers destined for splice tray usage.

5. TESTING REQUIREMENTS

- 5.1. **General.** As per TxDOT policy, performance testing is to be done on all materials and equipment not previously tested and approved. If technical data are not considered adequate for approval, samples may be requested for test by the Engineer. The contract period will not be extended for time loss or delays caused by testing prior to final TxDOT approval of any items.

Equipment referenced to this specification is subject to Design Approval Tests and Factory Demonstration Tests at the equipment manufacturer's facility, to determine conformance with all the specification requirements. The Engineer may accept certification by an independent testing laboratory in lieu of the design Approval Tests, to verify that the Design Approval Tests have previously been satisfactorily completed. Arrange for, and conduct the tests, in accordance with the specification requirements stated herein.

Ensure that all inspection requirements have been satisfied prior to submission for TxDOT's inspection and acceptance. The Engineer reserves the right to have his/her representative witness all Design Approval Tests and Factory Demonstration Tests.

Results of each test will be compared with the requirements specified herein. Failure to conform to the requirements of any test will be counted as a defect, and equipment will be subject to rejection by the Engineer. Rejected equipment may be offered for retest, provided all non-compliances have been corrected and retested and evidence thereof submitted to the Engineer.

Final inspection and acceptance of the fiber optic cable will be made after the completion of the installation and testing and approval of the documentation described above.

- 5.2. **Manufacturer's Certification.** Include with each reel of fiber optic cable the manufacturer's test data showing conformance to the requirements described in this Special Specification.
- 5.3. **Pre-installation Tests.** Test fiber optic cable at site storage area prior to installation.

Test each optical fiber in the cable from 1 end with an OTDR compatible with wavelength and fiber type. Test for continuity, length, anomalies, and approximate attenuation. Record each measurement with color, location and type of fiber measured. If a meaningful measurement cannot be made from one end, perform the test from the opposite end of that fiber. If the tested loss exceeds the loss from the manufacturer's test data, the Engineer will reject the cable.

- 5.4. **Post Installation Tests.** After installation, test each optical fiber in the cable again for the loss characteristics. Test both directions of operation of the fiber.

Test cable again after each splice and connector installation and submit results to the Engineer as basis for acceptance. Use OTDR and/or power meter/optical light source testing equipment, as specified by the cable manufacturer for this testing.

- 5.5. **Test Procedure.** Submit all test procedures and data forms for the pre-installation and post-installation tests to the Engineer for approval. Furnish data forms containing all the data taken, as well as quantitative results for all tests. Have an authorized representative of the Contractor sign the data forms. Send at least 1 copy of the data forms to the Engineer.

6. DOCUMENTATION REQUIREMENTS

Provide ten complete sets of operation and maintenance manuals containing the following at a minimum:

- Complete and accurate schematic diagrams showing the fiber optic cable plant.
- Complete performance data of the cable plant showing the losses at each splice joint and each terminal connector.
- Installation, splicing, terminating and testing procedures.
- Complete parts list including names of vendors.
- Complete maintenance and trouble-shooting procedures.
- Two months prior to installation, submit 10 copies of the Contractors Installation Practices for approval. Include practices, list of installation equipment, splicing and test equipment. Detail field quality control procedures as well as procedures for corrective action.

7. EXPERIENCE REQUIREMENTS

The Contractor involved in the installation, splicing and testing of the fiber optic cable must meet the following requirements:

- Two years' experience in the installation of fiber optic cables, including fusion splicing, terminating and testing of single mode fibers.
- Two installed systems where fiber optic cables are in outdoor conduits and the systems are in continuous satisfactory operation for at least 1 year. Submit as proof, photographs or other supporting documents, and the names, addresses and telephone numbers of the customers' operating and maintenance personnel who can be contacted regarding the fiber optic systems.
- One fiber optic cable system (which may be 1 of the 2 in the preceding paragraph) which the Contractor can arrange for demonstration to the Engineer and/or his representatives.
- Splicers who have been trained on and are experienced using the specific splicing equipment to be used.

8. MEASUREMENT

Fiber Optic Cable (Single Mode) will be measured by the foot of cable furnished, installed in conduit, spliced, connected, and tested in accordance with these specifications. Fiber Optic Cable (Single Mode) on TEMP poles will be measured by the foot of fiber optic cable furnished, installed on contractor provided and installed timber poles, spliced, connected, and tested in accordance with these specifications. Fiber Optic Cable (Single Mode) on CPS poles will be measured by the foot of fiber optic cable furnished, installed on existing CPS with Utility poles, spliced, connected, and tested in accordance with these specifications. Remove Fiber Optic Cable will be measured by the foot of fiber optic cable removed from conduit. Remove Fiber Optic Cable on TEMP poles will be measured by the foot of fiber optic cable removed from TEMP poles.

Remove Fiber Optic Cable on CPS poles will be measured by the foot of fiber optic cable removed from CPS with Utility poles. Install Existing Fiber Optic Cable in conduit will be measured by the foot of existing cable installed in conduit, spliced, connected, and tested in accordance with these specifications. Install Existing Fiber Optic Cable on TEMP poles will be measured by the foot of existing cable installed on TEMP poles, spliced, connected, and tested in accordance with these specifications. Install Existing Fiber Optic Cable on CPS poles will be measured by the foot of existing cable installed on CPS with Utility poles, spliced, connected, and tested in accordance with these specifications.

9. 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 "Fiber Optic Cable (Single Mode)" of the type specified, "Fiber Optic Cable (Single Mode) on TEMP poles" of the type specified, "Fiber Optic Cable (Single Mode) on CPS poles" of the type specified, "Remove Fiber Optic Cable" of the type specified, "Remove Fiber Optic Cable on TEMP poles" of the type specified, "Remove Fiber Optic Cable on CPS poles" of the type specified, "Install Existing Fiber Optic Cable in conduit", "Install Existing Fiber Optic Cable on TEMP poles", and "Install Existing Fiber Optic Cable on CPS poles".

This price is full compensation for furnishing (except for Existing Fiber Optic Cable) and installing all cables, for providing and installing temporary poles, for pulling through conduit or duct, for installing on temporary poles and/or existing CPS with Utility poles, for testing, splicing, connecting, removing, and re-reeling, and for all materials, labor, tools, equipment, documentation, training and incidentals.



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SPECIAL SPECIFICATION 5084 BOLLARDS

1. DESCRIPTION

Furnish, install, remove and replace bollards as shown on the plans.

2. MATERIALS

Assure that bollards meet retro reflectivity requirements as shown on the plans and specified by the Texas MUTCD and the ATSSA (American Traffic Safety Services Association) Brochure on Retro reflectivity.

2.1. Fixed bollards. Provide fixed bollards consisting of 10 in. diameter galvanized standard weight steel pipe filled with concrete and with form domed cap. Provide steel such as pipe, plates, and other required parts in accordance with Item 442, "Metal for Structures." Paint or galvanize pipe, plates, and other required steel parts in accordance with the plans and meeting the requirements of Item 441, "Steel Structures" and Item 445, "Galvanizing." Provide foundation concrete meeting the requirements of Item 421, "Hydraulic Cement Concrete." Perform welding in accordance with Item 448, "Structural Field Welding."

2.2. Removable Bollards. Provide removable bollards consisting of 6 in. diameter galvanized standard weight steel pipe with form domed cap. Provide steel such as pipe, plates, and other required parts in accordance with Item 442, "Metal for Structures." Paint or galvanize pipe, plates, and other required steel parts in accordance with the plans and meeting the requirements of Item 441, "Steel Structures" and Item 445, "Galvanizing." Provide foundation concrete meeting the requirements of Item 421, "Hydraulic Cement Concrete." Perform welding in accordance with Item 448, "Structural Field Welding."

3. CONSTRUCTION

Install bollards to the depth as shown on the plans or as directed. Clean bollard holes free of loose dirt and debris, and thoroughly compact bottom of hole to the correct elevation for placement of the bollards. Place bollards to the correct alignment, elevation, and plumb. Backfill around fixed and timber bollards with minimum 3000 PSI concrete.

4. MEASUREMENT

This Item will be measured by each bollard installed as 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 LUMP SUM price bid for the various types of "Bollards" specified as follows:

"Fixed Bollards," "Removable Bollards," of the type shown on the plans. This price is full compensation for furnishing, preparing, hauling and installing materials; for excavation and backfill, and for labor, tools, equipment and incidentals.

SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general administrative procedures for submittal and review of Contractor-proposed product option and substitutions.

1.2 STATE REQUIREMENT FOR OPEN SPECIFICATIONS

- A. In accordance with the referenced State Acts, there is no intent in this project that the specification for any material is intended to be "closed" or restricted and open competition is expected and required. (Acts 1965, No. 40, '1; Amended by Acts 1980, No. 803, '1; Acts 1984, No. 182, '1; Acts 1985, No. 832, '1; Acts 1995, No. 484, '1.'2296).
- B. The name of a certain brand, make, manufacturer, or definite specifications is to denote the quality standard of the article desired, but does not restrict bidders to the specific brand, make, manufacturer, or specification named. It is to set forth and convey to prospective bidders the general style, type character, and quality of article desired.
- C. When in specifications or contract documents a particular brand, make of material, device, or equipment is shown or specified, such brand, make of material, device, or equipment shall be regarded merely as a standard.
- D. When in specifications or contract documents an architect or engineer specifies a particular brand, make of material, device, or equipment, or equal thereto, he shall adequately identify said product by including minimally, the model or catalog number of the product

1.3 SUBSTITUTIONS

- A. Architect will consider formal request for substitution of products in place of those mentioned by name or as standard in the Contract Documents. Substitution requests must be received prior to bid opening in accordance with the Instructions to Bidders Document. The substitution request shall contain complete data on the proposed substitute (including cost data), and Contractor shall submit samples for comparison and tests as may be requested by Architect.
- B. If a potential supplier wishes to submit for prior approval a particular product other than a product specified in the contract documents, he shall do so no later than seven (7) working days prior to the opening of bids. Within three days, exclusive of holidays and weekends, after such submission, the prime design professional shall furnish to both the public entity and the potential supplier written approval or denial of the product submitted.
- C. Substitution requests must be submitted on the form provided at the end of this Section.
- D. Document specified product and proposed substitution with complete data, including:
 - 1. Product identification, including name and address of manufacturer.
 - 2. Product description, performance and test data, and reference standards.
 - 3. Sample, if requested.
 - 4. Description of any anticipated effect that acceptance of proposed substitution will have on Progress Schedule, construction methods, or other items of Work.
 - 5. Description of any differences between specified product and proposed substitution.
 - 6. Difference in cost between specified product and proposed substitution.
- E. By making request for substitutions, the Contractor:
 - 1. Represents that he has personally investigated the proposed substitute product and determined

- that it is equal or superior in all respects to that specified;
2. Represents that he will provide the same or greater warranty for the substitution that he would for that specified;
 3. Will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects;
 4. Certifies that the cost data presented is complete and includes all related cost under this Contract but excludes costs under separate contracts, and excludes the Architect's redesign cost and waives all claims for additional costs related to the substitution which subsequently become apparent; and
 5. Agrees to replace the substituted materials which prove to be defective or otherwise unsatisfactory for the service intended within the warranty period with material or equipment originally specified at no additional cost to the Owner.
- F. Substitutions will not be considered if:
1. They are indicated or implied on Shop Drawings or other submittals without submittal of a substitution request.
 2. Approval will require substantial revision of Contract Documents without additional compensation to Architect.
- G. The Architect has sole authority to determine acceptability of proposed substitution, and will issue acceptance or rejection by notation on the shop drawing review stamp or in other written form.

END OF SECTION 01 25 00

(Substitution Request Form follows – 2 pages)

**PROJECT MANUAL
DESIGN DEVELOPMENT**

PORT ARTHUR TRANSIT

NEW BUS CANOPY AND PARKING

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MARCH 2026**



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DOCUMENT 01 25 19
SUBSTITUTION REQUEST FORM

DATE: _____

TO: _____

ATTENTION: _____

PROJECT: _____

We submit for your consideration the following product as a substitution for the specified product:

Section No. Paragraph Specified Product

Proposed Substitution: _____

Reason for Substitution: _____

Product Data:

Attach complete technical data for both the specified product and the proposed substitution. Include information on changes to Contract Documents that the proposed substitution will require for its proper installation.

Samples:

☐ Attached ☐ Will be furnished upon request

Does the substitution affect dimensions shown on Drawings?

☐ No ☐ Yes (explain) _____

Effects of proposed substitution on other Work:

Differences between proposed substitution and specified Product:



Manufacturer's warranties of the proposed substitution are:

☐ Same ☐ Different (explain) _____

Maintenance service and spare parts are available for proposed substitution from:

Previous installations where proposed substitution may be seen:

Project: _____	Project: _____
Owner: _____	Owner: _____
Architect: _____	Architect: _____
Date Installed: _____	Date Installed: _____

Cost savings to be realized by Owner, if proposed substitution is approved:

Change to Contract Time, if proposed substitution is approved:

☐ No Change ☐ Add _____ days ☐ Deduct _____ days

Submittal constitutes a representation that Contractor has read and agrees to the provisions of Section 01 2500.

Submitted by Contractor:

Signature

Firm

For Use by Architect:

Based on the information supplied by the Contractor, the Architect has reviewed the proposed substitution on the basis of design concept of the Work and conformance with information given in Contract Documents.

☐ Approved ☐ Approved as Noted ☐ Rejected

Submit Additional Information: _____

By: _____ Date: _____

END OF REQUEST FORM 01 25 19

SECTION 03 10 00

CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Provide required formwork and related accessories for proper construction of cast-in-place structural concrete work.
- B. Work, items and requirements specified elsewhere that apply and/or relate to this Section include:
 - 1. Drilled Concrete Piers and Shafts - Section 31 63 29.
 - 2. Concrete Reinforcing - Section 03 20 00.
 - 3. Cast-In-Place Concrete - Section 03 30 00.

1.02 WORK INSTALLED BUT FURNISHED IN OTHER SECTIONS

- A. Built-in-anchors, inserts and bolts for connection of other materials.
- B. Built-in-sleeves.

1.03 QUALITY ASSURANCE

- A. Design criteria: Conform to ACI 347-(Latest Edition).
 - 1. The design and engineering of formwork, as well as its construction, shall be the responsibility of the contractor.
- B. Allowable Tolerances: Conform to ACI 117-(Latest Edition).

1.04 STORAGE OF MATERIALS

- A. Store form materials and accessories on dunnage and under cover of protective sheeting.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Forms:
 - 1. Framing: Kiln dried softwood lumber, PS 20-70.
 - 2. Plyform: B-B plyform, sanded, Class I, EXT-DEPA, grade trademarked of APA, PSI-66. Fiber or metal forms may be used in lieu of plywood, subject to Architect's approval.
 - 3. Void Forms: Sizes as indicated on drawings.
 - a) Provide and install a complete, closed cell, void form system that effectively isolates the structural/foundation elements from the soil. Provide all components, connectors, seam covers, tape, sealant, end closures, protective boards, moisture barriers, etc., necessary to complete the installation. Provide products suitable for use under the designated elements.
 - b) Void form components shall consist of corrugated paper material with a moisture resistant exterior, and having an interior fabrication of a uniform cellular configuration that is composed of non-wax impregnated components. Void forms are temporary forms and shall decompose after placement of concrete. Void forms shall be biodegradable.
 - c) Design void forms to fully support the weight of wet concrete shown in sections and details and temporary construction loading until the loads can be supported by the concrete structure.
 - d) The manufacturer shall provide written confirmation of their product's ability to perform satisfactorily under the design conditions.
 - e) Void forms for grade beams and walls shall be rectangular forms matching the width of grade beam or wall. Approved products include WallVoid and Seam Pads as manufactured by SureVoid Products, Inc., Englewood, CO. (800) 458-5444, or

- f) Provide side retainer boards on each side of all pier caps, grade beams, and walls. Retainer boards shall be high-density polypropylene or high-density polyethylene, lightweight, flexible retainer block to prevent migration of backfill under suspended building foundation. Retainer shall extend above and below void form depth, have sufficient strength to resist lateral loads applied by soil, and be impact resistant. Retainer shall be capable of being exposed to earth and moisture without deterioration. Approved products include Backfill Retainer by SureVoid and SureRetainer by Motzblock, as supplied by SureVoid Products, Inc., (888) 803-8643, or approved equal.
 - g) Voids that abut piers shall properly void the circular edge of all drilled piers. Use pre-manufactured, non-field cut, sealed void forms, with curved, radial, vertical edges adjacent to the piers. Approved products include ArcVoid and SureRound PierVoid as manufactured by SureVoid Products, Inc., Englewood, CO. (800) 458-5444, or approved equal.
- 4. Pier Top Forms: Sizes (interior diameter) to match pier diameters shown on drawings. Provide cylindrical forms of sufficient strength to properly form upper portions of concrete piers without distortion. Approved products include Commercial Sure Tops as manufactured by SureVoid Products, Inc. (Englewood, Co. (800) 458-5444).
- B. Pan Forms: Metal or fiberglass pan forms designed to support wet concrete without deflection. Provide new forms or properly reconditioned used forms. Provide required end closures.
 - 1. Metal: 18 gauge steel.
 - 2. Fiberglass: Molded fiberglass - reinforced plastic, alkali-resistant contact faces, long-form type.
- C. Rustications, Bevels, and Chamfers: Mill from Northern White Pine, smooth and free of irregularities.
- D. Shores: Patented shores of adequate strength and bracing to safely support imposed loads.
- E. Form Oil: Non-staining, paraffin-base oil having a specific gravity of between 0.8 and 0.9.
- F. Form Ties: Bolts, rods, or patented devices having a minimum tensile strength of 3,000 lbs., adjustable in length, free of lugs which would leave a hole larger than 5/8" in diameter and having a full one-inch depth of break-back.

2.02 SUBMITTALS

- A. Submit in accordance with Division 1.
- B. Product Data: For each type of forming product including all void form products and accessories. Product data shall indicate compliance with specifications, instructions for proper storage and installation, protection of materials from moisture prior to concrete pour and guidelines/instructions for evaluation of products if they are exposed to moisture.

PART 3 - EXECUTION

3.01 CONSTRUCTION AND ERECTION

- A. Construct forms in accordance with ACI 347. All elements of the forms, formwork, bracing and shoring shall consist of wood, metal or other manufactured products as specified above. Earth may not be used as a form, either directly or indirectly. Neither earth trenches nor earth trenches lined with another material are acceptable.
- B. Build forms to conform to shapes, lines and dimensions of detailed member of concrete construction. Set to line and grade, and brace and secure to withstand placing of concrete and maintain their shape and position.
- C. Construct forms with care to produce concrete surfaces without unsightly or objectionable form marking exposed concrete surfaces. Provide temporary inspection and clean out openings in bottom of wall and column forms and elsewhere as required by Architect. Seal joints after closing.

- D. Thoroughly clean surfaces of form material and remove nails before reuse. Do not reuse damaged or worn forms. Coat contact surfaces of forms with non-staining form oil prior to placing metal reinforcement.
- E. Install void form system in strict conformance with the manufacturer's recommendations.
 - 1. The manufacturer's representative shall conduct a pre-construction meeting to instruct the work force on proper storage, installation, and concrete placement.
 - 2. Properly void the circular edge of all drilled piers at the intersection with grade beams, walls, pier caps, or structural slabs. Use pre-manufactured, non-field cut, sealed void forms, with curved, radial, vertical edges adjacent to the piers.
 - 3. Cover all joints and seams, and seal all exposed ends, to eliminate concrete flow into the void.
 - 4. Install side retainers where rectangular forms have been used beneath pier caps, grade beams and walls.
 - 5. Protect slab forms from puncture and other damage during concrete placement with a layer of protective cover board (1/8" thick masonite or plywood sheet) over forms. Replace all units that become damaged prior to pouring concrete.
 - 6. Void forms shall remain dry during construction. Replace all units that are exposed to moisture.
- F. Immediately before placing concrete, clean forms of chips, sawdust, and other debris. Immediately after removal of forms, remove form ties, wires and other defects and patch.
- G. Provide pier top forms where excavation and construction techniques do not allow the top of pier to be of uniform shape with smooth sides. Do not allow pier tops to mushroom or widen.

3.02 INSERTS AND ACCESSORIES

- A. Make provisions for required installation of accessories, bolts, hangers, sleeves, anchor slots and inserts cast in concrete, as required by Drawings and other trades. Obtain suitable templates or instructions for installation of items. Place expansion joints where detailed and required.

3.03 REMOVAL OF FORMS AND SHORING

- A. Removal of forms and shores shall be in accordance with ACI 347.
- B. Do not remove shoring until members have acquired specified design strength required to support their own weight and loads. For post-tensioned elements, do not remove shoring until members have acquired a minimum compressive strength as stated in the General Notes and post-tensioning operations are complete.

3.04 FIELD QUALITY CONTROL

- A. The General Contractor shall perform a visual inspection of the void form installation prior to inspection by the testing laboratory.
- B. Immediately prior to the concrete pour, the testing laboratory shall inspect the void form installation for size, placement, and quality of construction and materials. The testing laboratory shall review and inspect the following:
 - 1. Review manufacturer's certification that units are designed to support the wet weight of the concrete.
 - 2. Confirm that the actual product used matches the product submittals.
 - 3. Verify size (both width and depth) of void forms.
 - 4. Confirm placement matches construction documents.
 - 5. Inspect the installation of void forms for tightness of fit, closure of ends, closure of circular formed edges adjacent to piers, adequacy of sealed seams and joints, firmness of installation (firm enough to prevent displacement during concrete placement), and integrity of units. Units that have been damaged by mechanical means or moisture shall be replaced.

END OF SECTION



SECTION 03 20 00

CONCRETE REINFORCING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Provide steel reinforcement for cast-in-place concrete.
- B. Work, items and requirements specified elsewhere that apply and/or relate to this Section include:
 - 1. Quality Control – Division 1
 - 2. Concrete Formwork - Section 03100.
 - 3. Cast-in-place concrete - Section 03300.

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Division 1. Indicate complete reinforcing for each concrete member including materials, sizes, bends, dimensions, bar schedules, stirrup spacing, and placing details.

1.03 DELIVERY AND STORAGE

- A. Stack reinforcing steel in tiers and mark so that each length, size, shape and location can be readily determined. Exercise care to maintain reinforcement free of dirt, mud, paint, rust, grease or oil.

1.04 RELATED SPECIFICATIONS

- A. ACI 318 "Building Code Requirements for Structural Concrete", Latest Edition.
- B. CRSI "Manual of Standard Practice" Latest Edition.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Steel Reinforcement: Deformed billet steel, ASTM A615, Grade 60, unless noted otherwise on Drawings. Deformed billet steel, ASTM A615, Grade 75, as noted on drawings. When welding of reinforcement is required, use all grade 40 bars, or establish weldability in accordance with AWS D12.1.
- B. Welded Wire Fabric: ASTM A185, as indicated on contract drawings.
- C. Miscellaneous Accessories: Provide spacers, chairs, ties, and other devices necessary for properly placing, spacing supporting and fastening reinforcement in place.

2.02 FABRICATION

- A. Fabricate reinforcing steel to sizes, shapes, and lengths detailed in accordance with requirements of ACI 318, and CRSI Manual of Standard Practice.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Accurately place reinforcing steel of sizes, shapes, lengths, spacing and other dimensions in accordance with approved Shop Drawings and CRSI Manual of Standard Practice. Before placing, thoroughly clean reinforcement of any coating which would reduce bonding. Do not heat, cut, or bend bars without Architect's approval. Do not splice reinforcement at points of maximum stress. Stagger splices in adjacent bars and provide a minimum overlap of 30-bar diameters at splices unless specifically noted otherwise on Drawings.

- B. Securely tie at intersections with black annealed wire. Rigidly secure reinforcement in place during concrete placing. Provide concrete coverage for reinforcing as shown on Drawings.

3.02 FIELD QUALITY CONTROL

- A. The General Contractor shall perform a visual inspection of all reinforcing steel for correctness of placement, sizes, quantities, grades and supports, prior to the inspections performed by the Testing Agency.
- B. The Contractor shall provide sufficient time between completion of placement of reinforcing steel and beginning of concreting to allow complete inspection by the Testing Agency and correction of all errors. Placement of reinforcing steel shall be complete prior to inspection by the Testing Agency. The Contractor shall give the Testing Agency at least 24 hours' notice of when their services will be required.
- C. The designated Testing and Inspection Agency shall perform the following reviews and inspections:
 - 1. The steel supplier shall furnish mill certificate reports (written in English) for the Testing Agencies' review.
 - 2. Prior to placement, visually inspect and report on size, type, grade and quality of materials.
 - 3. Observe and report on placement of reinforcement, including size, quantity, vertical location, horizontal location and spacing, correctness of bends, splices and clearances between bars and forms, firmness of installation, and security of supports and ties, immediately prior to concreting.
 - 4. Observe and report on placement of embedded items, including size, vertical location, horizontal spacing, correctness of fabrication, and firmness of installation immediately prior to concreting.
 - 5. Report to the Contractor, Architect, and Engineer all items that deviate from the Contract Documents and/or require clarification prior to concreting. Re-inspect these items after the Contractor has completed the correct installation, just prior to concreting.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SCOPE

- A. Provide reinforced Cast-in-Place concrete work as indicated by the Contract Documents including:
 - 1. Structural concrete.
 - 2. Concrete floor toppings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Testing Laboratory Services: Division 1
- B. Concrete Forming and Accessories: Section 03 10 00
- C. Concrete Reinforcing: Section 03 20 00

1.03 SUBMITTAL

- A. Design of Concrete Mixes: Proposed mix designs shall be prepared and/or reviewed and approved for conformance to the Contract Documents by an independent testing laboratory. Submit the proposed mix designs and the testing laboratory's report to the Architect. Mix design methods shall be in accordance with ACI 318-Latest Edition.

1.04 COORDINATION

Notify responsible trades of schedules of concrete pours to allow adequate time for installation of their work.

1.05 RELATED SPECIFICATIONS

The specifications of the American Society for Testing Materials and ACI Standard 318-Latest Edition, "Building Code Requirements for Structural Concrete" are declared a part of this specification except as modified herein.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Portland cement: ASTM C-150, Type I, or Type II.
- B. Fly Ash: ASTM C618, Class F (Class F blends will not be allowed). Maximum 20% of cementitious material by weight. Fly ash shall not be used in architecturally exposed concrete without expressed approval of the Architect.
- C. Normal Weight Aggregate: ASTM C-33. Provide aggregate from a single source. Free of materials with deleterious reactivity to alkali in cement.
 - 1. Fine Aggregate: Clean, hard durable, uncoated natural sand, free from silt, loam or clay.
 - 2. Coarse Aggregate: Hard, durable, uncoated crushed limestone.
- D. Lightweight Aggregate: Expanded clay or shale coarse aggregate conforming to ASTM C-330. Free of materials with deleterious reactivity to alkali in cement.
- E. Water: Potable.
- F. Admixtures: The following admixtures may be used with approval from the Architect/Engineer (Do not use admixtures containing chloride ions):
 - 1. ASTM C-494 Type A (water-reducing)
 - 2. ASTM C-494 Type D (water-reducing and retarding)

3. ASTM C-494 Type E (water-reducing and accelerating)
 4. ASTM C-494 Type F (high range water reducing (HRWR))
 5. ASTM C-260 Air-entraining
- G. Vapor Retarder: 15 mil polyethylene sheet, type recommended for below-grade application and compatible waterproof tape.
- H. Curing/Sealing Compounds: Non-yellowing clear acrylic, ASTM C-309. Verify compatibility with flooring materials and finishes.

2.02 PROPORTIONS AND MIXING

- A. Proportions and Design:
1. In accordance with approved mix design for each type of concrete scheduled.
 2. Admixtures: Introduce admixtures in quantities and according to methods recommended by admixture manufacturer. Add air-entraining agent to concrete type mixtures where required. Admixtures shall not be used except as specified in the approved mixed design.
 3. Strength:
 - a. The strength of the concrete for each portion of the structure shall be as designated on the project drawings. Strength requirements shall be based on 28-day compressive strengths, unless high early strength is specified in which case required strengths shall be obtained at 7 days.
 4. Slump:
 - a. Slump of concrete of normal weight as determined by "Method of Test for Slump of Portland Cement Concrete" (ASTM C-143), shall be as follows:
SLUMP (INCHES)*

<u>TYPE OF CONSTRUCTION</u>	<u>MAX.</u>	<u>MIN.</u>
Slabs on Metal Deck	4"	2"
Drilled Piers	7"	5"
Concrete Containing HRWR	10"	
All Other Concrete	5"	2"

* For Concrete to be vibrated

- B. Mixing: Ready mixed concrete in accordance with ASTM C-94. Do not transport or use concrete after one and a half hours have elapsed from time of initial mixing. Supplier of transit-mixed concrete shall have a plant of sufficient capacity, and adequate transportation facilities to assure continuous delivery at required rate, so as to provide for continuous concrete placement throughout a pour.

2.03 SOURCE QUALITY CONTROL

- A. Inspection and testing as specified in Division 1.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Inspect foundations, forms, reinforcing steel, pipes, conduits, sleeves, hangers, anchors, inserts, damp-proofing and other work required to be built into concrete. Notify Architect at least one working day in advance of scheduled pour to allow time for adequate observations.
- B. Correct unsatisfactory work prior to pouring concrete.
- C. Remove ice and excess water from excavations and formwork.

3.02 CONCRETE PLACEMENT

- A. Placing Concrete:

1. Convey and place concrete in accordance with ACI 304, latest edition, and in such a manner that there will be no separation of ingredients and as specified below.
- B. Consolidation:
 1. Use mechanical vibrating equipment for consolidation.
 2. Vertically insert and remove hand-held vibrators at 18" on center.
 3. Do not use vibrators to transport concrete in forms.
4. Provide vibrators with minimum speed of 8000 RPM and with sufficient amplitude to consolidate concrete and work around reinforcement, embedded items and into corners of forms. Thoroughly consolidate layers of concrete with previous layers.
- C. Construction Joints: Unless otherwise shown on Drawings, each footing, pier, column, beam, wall and slab shall be considered as a single unit of operation and shall be monolithic in construction. Where construction joints are absolutely unavoidable, locate joints at or near midpoints of spans where approved by Architect. Provide appropriate keys in construction joints, plumb level, whether horizontal or vertical. Place construction joints in exposed concrete work at detailed joints or rustications as approved by Architect.
- D. Expansion Joint Fillers: Place premolded expansion joint fillers at location as detailed. Refer to Drawings for required joint dimensions.
- E. Cold Weather Placement: Do not place concrete when temperature is below 40°F unless cold weather concrete procedures are followed as specified in ACI 306. Calcium chloride or admixtures containing chloride ions shall not be used except where specifically approved by the Architect.
- F. Hot Weather Placement: Exercise special care in accordance with ACI 305 to prevent high temperature in fresh concrete during hot weather. Use water-reducing/set-retarding admixtures in such quantities as especially recommended by the manufacturer to assure that concrete remains workable and lift lines will not be visible. Concrete having a temperature in excess of 95°F will not be permitted without containing a high range water reducing admixture and written certification from the concrete supplier of a successful record of the proposed mix design (Submit mix design with HRWR with a record indicating a maximum tested temperature for Architect/Engineer review prior to use). Cooling of water and/or aggregates will be required if concrete temperatures rise above this limit. When necessary, arrangements for installation of wind breaks, shading, fog spraying, sprinkling, ponding, or wet covering of a light color shall be made in advance of placement, and such protective measures shall be taken as quickly as concrete hardening and finishing operations will allow.
- G. Finishes:
 1. Smooth-trowel finish: Concrete slabs which are to receive finish floor covering, as well as concrete floors, shall be smooth-trowel finished. Jitterbug or tamp surfaces, screed to proper elevation, then float with metal or wood floats. After concrete has set sufficiently to support weight, use mechanical floats for finish leveling. After water sheen has disappeared from surfaces, trowel with steel trowel to smooth surface free from blemishes and trowel marks. Perform final troweling after concrete is so hard that no mortar accumulates on trowel and a ringing sound is produced as trowels are drawn over surfaces.
 2. Broom Finish: Flatwork shall be broom finished where noted specifically on Drawings. Jitterbug or tamp surfaces, screed to proper elevation, then float with wood floats to obtain a tight wood float finish. Prior to final set of concrete, brush concrete surfaces with a broom with grain running as directed, to a texture to match approved samples.
 3. Patch defective areas which do not match approved finish samples. Chip and patch with a mixture of cement and aggregate to match color of adjacent areas. After surface water has evaporated from the area to be patched, the bond coat shall be well brushed into the surface. When the bond coat begins to lose the water sheen, the premixed patching mortar shall be applied. The mortar shall be thoroughly consolidated into place and struck off to leave the patch slightly higher than the surrounding surface. To permit initial shrinkage, it shall be left undisturbed for at least one (1) hour before being finally finished. The patched area shall be kept damp for seven (7) days. Metal tools shall not be used in finishing a patch in a formed wall which will be exposed.

- H. Curing and Protection:
1. Freshly deposited concrete shall be protected from premature drying and excessively hot or cold temperatures. Maintain concrete at a relatively constant temperature without drying for the period of time necessary for the hydration of the cement and proper hardening of the concrete.
 2. Curing shall immediately follow the finishing operation. Concrete shall be kept continuously wet by the method of sprinkling or curing compound for a period of not less than 6 days after placing.
 3. During curing period, maintain above 70° F. for at least 3 days, or above 50° F. for at least 5 days. Spray compound on surfaces using two coats, applying second at right angle to first, at rate of 400 sq. ft. per gallon or as recommended by manufacturer. Restrict traffic on surfaces during cure to protect tracking off of protective film.

3.03 FIELD QUALITY CONTROL

- A. Routine testing of materials, of proposed mix designs and of resulting concrete for compliance with technical requirements of the specifications shall be the duty of the testing agency.
- B. Testing required because of changes in materials or proportions of the mix requested by the Contractor, as well as any extra testing of concrete or materials occasioned by their failure to meet specification requirements, shall be at the Contractor's expense.
- C. Contractor shall provide a secure and protected area for temporary on-site storage of concrete cylinders for initial curing.
1. On-site storage area shall meet the requirement of ASTM C31.
 - a. The storage area shall shield all specimens from direct sunlight.
 - b. The storage temperature shall be monitored and controlled as necessary to meet the temperature range specified in ASTM C31.
- D. The Designated testing agency shall:
1. Test the Contractor's proposed materials for compliance with the Specifications.
 2. Review and check the Contractor's proposed mix design.
 3. Secure production samples of materials at plants or stockpiles during the course of the work and test for compliance with the Specifications.
 4. Check batching and mixing operations to the extent deemed necessary to assure compliance with the Specifications.
 5. Check slump consistency and uniformity of concrete to the extent deemed necessary to assure compliance with the Specifications.
 6. Conduct strength test of the concrete in accordance with the following procedures.
 - a. Secure composite samples in accordance with "Method of Sampling Fresh Concrete" (ASTM C-172). Each sample shall be obtained from a different batch of concrete on a representative, truly random basis. To be representative, the choice of times of sampling, or the batches of concrete to be sampled are to be made on the basis of chance alone, within the period of placement. Batches should not be sampled on the basis of appearance, convenience, or other possibly biased criteria. When pumping or pneumatic equipment is used, samples shall be taken at the discharge end. Water shall not be added to the concrete after the sample has been taken.
 - b. Mold specimens from each sample in accordance with "Practice for Making and Curing Concrete Test Specimens in the Field" (ASTM C-31). Concrete for drilled piers, grade beams and pier caps shall be field cured under field conditions per ASTM C-31. The remainder may be laboratory cured under standard moisture and temperature conditions in accordance ASTM C-31.
 - c. Per ACI 318, each strength test shall consist of the average of strengths of at least two 6x12 cylinders or at least three 4x8 cylinders. When using 6x12 cylinders, mold five specimens from each sample. When using 4x8 cylinders, mold eight specimens from each sample. The size and number of specimens shall remain constant for each class of concrete.
 - d. Test specimens in accordance with "Methods of Test for Compressive Strength of

- Molded Concrete Cylinders" (ASTM C-39).
- i.) When using 6x12 cylinders, test two specimens at 7 days and two at 28 days. Hold one cylinder for testing at Owner's discretion. The 7-day and 28-day test results shall be the averages of the strengths of the two specimens taken on that date.
 - ii.) When using 4x8 cylinders, test three specimens at 7 days and three at 28 days. Hold two cylinders for testing at Owner's discretion. The 7-day and 28-day test results shall be the averages of the strengths of the three specimens taken on that date.
 - iii.) When early high strength concrete is required, additional specimens shall be taken and tested on the early date (two 6x12 specimens or three 4x8 specimens).
- e. Samples for strength tests of each class of concrete (each mix design) placed each day shall be taken not less than once a day, nor less than once for each 100 cu. yd. of concrete, nor less than once for each 5,000 sq. ft. of surface area for slabs or walls.
 - f. If the total volume of concrete is such that the frequency of testing required above would produce less than five strength tests for a given class of concrete (mix design), tests shall be made from at least five randomly selected batches or from each batch if fewer than five batches are used.
 - g. Low strength test results will be investigated in accordance with ACI 318 methods. Acceptance of 56-day strength tests shall be at the Engineer's discretion and may not eliminate the need for other testing methods.
- 7. Determine air content of normal weight concrete on a regular and frequent basis in accordance with either ASTM test method.
 - 8. Determine air content and unit weight of lightweight concrete on a regular and frequent basis in accordance with "Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method" (ASTM C-173) for air content and "Method of Test for Weight per Cubic Foot, Yield, and Air Content (Gravimetric) for Concrete (ASTM C-138) for unit weight.
 - 9. Report temperature of concrete at the time of placing on a regular and frequent basis.
 - 10. Report total water quantity added to batches, including that added after departure of concrete trucks from batch plant.
 - 11. Report all test results to the Architect/Engineer and the Contractor on the same day that test results are made.

3.04 AUTHORITY AND DUTIES OF TESTING AGENCY

- A. Technicians representing the testing agency shall inspect the materials and the manufacture of concrete and shall report their findings to the Architect/Engineer and the Contractor. When it appears that the material or work performed by the Contractor fails to fulfill specification requirements, the technician shall direct the attention of the Architect/Engineer and the Contractor to such failure.
- B. The technician shall not act as foreman or perform other duties for the Contractor. Work will be checked as it progresses, but failure to detect any defective work or materials shall not in any way prevent later rejection when such is discovered, nor shall it obligate the Architect/Engineer for final acceptance. Technicians are not authorized to revoke, alter, relax, enlarge, or replace any requirements of the plans and specifications, nor to approve or accept any portion of the work.

END OF SECTION

SECTION 03 45 00
PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes precast architectural concrete items shown and specified.
- B. Substitutions: Submit in accordance with requirements of Section 01 25 00 and utilize the provided Substitution Request Form (Section 01 25 19).

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials (ASHTO).
- B. American Concrete Institute (ACI).
 - 1. ACI 318 – “Building Code Requirements for Reinforced Concrete”.
 - 2. ACI 533 – “Guide for Precast Concrete Wall Panels”.
- C. Architectural Precast Association (APA).
- D. American Society for Testing and Materials (ASTM).
 - 1. A-36 – “Specification for Carbon Structural Steel”.
 - 2. A-47- “Specification for Ferric Malleable Iron Castings”.
 - 3. A-123- “Steel Products”.
 - 4. A-153- “Specification for Zinc Coating (Hot Dip) on iron and Steel Hardware”.
 - 5. A-185- “Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement”.
 - 6. A-283- “Specification for Low and Intermediate Tensile Strength Carbon Steel Plates”.
 - 7. A-307- “Specification for Carbon Steel Bolts and Studs 60,000 PSI Tensile Strength”.
 - 8. A-325- “Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength”.
 - 9. A-416- “Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete”.
 - 10. A-496- “Specification for Steel Wire, Deformed, for Concrete”.
 - 11. A-500- “Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes”.
 - 12. A-563- “Specification for Carbon and alloy Steel Nuts”.
 - 13. A-572- “Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel”.
 - 14. A-615- “Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement”.
 - 15. A-666- “Specification for Austenitic Stainless Steel, Sheet, Strip, Plate, and Flat Bar”.
 - 16. A-767- “Specification for Zinc-Coated (Galvanized Steel Bars for Concrete Reinforcement”.
 - 17. A-934- “Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars”.
 - 18. C-33- “Specification for Concrete Aggregates”.
 - 19. C-150- “Specification for Portland Cement”.
 - 20. C-260- “Specification for Air-Entraining Admixtures for Concrete”.
 - 21. C-330- “Specification for Lightweight Aggregates for Structural Concrete”.
 - 22. C-404- “Specification for Aggregates for Masonry Grout”.
 - 23. C-494- “Specification for Chemical Admixtures for Concrete”.
 - 24. C-979- “Specification for Pigments for Integrally Colored Concrete”.
 - 25. C-1107- “Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)”.
 - 26. C-1240- “Specification for Silica Fume for Sue in Hydraulic-Cement Concrete “ and
 - 27. D-412- “Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers – Tension”.

28. F-539- "Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs".

- E. American Welding Society (AWS)
 - 1. AWS D1.1- "Structural Welding Code".
- F. Cement and Concrete Reference Laboratory (CCRL).
- G. Concrete Reinforcing Steel Institute (CRSI).
 - 1. "Manual of Standard Practice".
- H. Department of Defense (DOD)
- I. Precast/Prestressed Concrete Institute (PCI)
 - 1. MNL 117- AManual for Quality Control.
 - 2. MNL 120- ADesign Handbook.
- J. Steel Structures Painting Council (SSPC)
 - 1. "Painting Manual".
- K. American Institute of Steel Construction (AISC).
 - 1. "Manual of Steel Construction".

1.4 SYSTEM DESCRIPTION

- A. Performance Requirements: Comply with Standard Building Code, (SBC), municipal building codes, regulations or other governing agencies having jurisdiction, and as follows:
 - 1. Wind Loads.
 - 2. Seismic forces.
 - 3. Building dynamics, thermal, live, impact or concentrated loads, structural deflection, story drift.

1.5 SUBMITTALS

- A. Product Data: Submit product data for manufactured materials and products. Include inserts, color pigments, admixtures, manufacturer's certifications, steel primer and galvanized touch up material.
- B. Shop Drawing:
 - 1. Show in-place location, fabrication details, plans, elevations, anchorages, reinforcement, connection details and methods, dimensions, finishes, relationships to adjacent materials, and erection and placement.
 - 2. Show identification marks, coordinated to Shop Drawings, and date of manufacture on all units to facilitate hauling and erection.
 - 3. Setting diagrams, templates, instructions and directions as required for installation.
- C. Engineering Calculations: Engineering calculations sealed by an engineer licensed to practice in (project state).
- D. Samples: Nominal size 12 inch by 12 inch by appropriate thickness, of each type of unit and finished facing shown and specified for approval of quality, color, and texture of surface finish. Submit prior to fabrication.
- E. Mix Design(s): Proposed concrete mix design for each type and color of concrete mix required including backup mix.
- F. Test Reports: (May include materials, compressive strength, and water absorption).
- G. Certifications:

1. Fabricator's certification for APA, PCI, or applicable municipal certifications.
2. Welder's AWS certification.

1.6 QUALITY ASSURANCE

- A. Fabricator's Qualifications: Firm shall have a minimum of five (5) years' experience in producing units similar to those required for this Project, with sufficient production capacity to produce and deliver required units without causing delay in Work.
1. Fabricating plant shall be certified by one of the following:
 - a) Architectural Precast Association (APA).
 - b) Precast/Prestressed Concrete Institute (PCI), Group A1.
 - c) Applicable municipal building department.
 - d) Firms not certified by APA or PCI shall submit a written Quality Assurance/Quality Control program for approval.
- B. Installer's Qualifications: Installer shall have a record of at least five (5) years of successful installation of units similar to those required for this Project.
- C. Welder's Qualifications: Provide certification that welders to be employed in the Work are certified by AWS and applicable local building officials, and have been recertified in the last 12 months.
- D. Depending upon the nature of units required and type of Project, some or all Quality Assurance qualifications may apply as follows:
1. Testing Agency.
 2. Professional Engineer.
 3. Pre-Construction Testing Service.
- E. Applicable Standards: As specified under Paragraph 1.03 References.
- F. Production Samples or Mock-ups:
1. Provide color and texture range samples for approval prior to production start.
 2. Supply initial production units for job site assembly with other materials, for approval, as noted in this Section and in Division 1.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver units to the Project site in such quantities and at such times to ensure continuity of installation.
- B. Avoid job site storage. When job site storage is required store in a manner to prevent physical damage and so that markings are visible.
- C. Lift and support only at designated lifting or supporting points as shown on reviewed Shop Drawings.
- D. Provide anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions and directions as required for installation.

1.8 PROJECT CONDITIONS

- A. Field Dimensions: General Contractor to furnish field measurements, if required, to precast fabricator.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Approved Fabricators:
 - 1. Jackson Stone Company
Jackson, MS
(601)366.8441
 - 2. Dallas Cast Stone
Dallas, TX
214.428.6269
 - 3. Fabricators not listed as approved shall request approval, as specified in Section 01 25 00 – Substitution Procedures.

2.2 MATERIALS

- A. Concrete Materials:
 - 1. Portland Cement: ASTM C 150, Type I or III, white or gray colors to achieve desired finish colors. Use only one brand, type, and color from the same mill. Gray cement may be used for non-exposed backup mixes.
 - 2. Aggregates: ASTM C 33, gradation may differ to achieve desired finish characteristics. Select coarse and fine aggregate colors and screen sizes to match approved sample(s). Verify that adequate supply, from one pit or quarry, for each type of aggregate is available for the entire Project. If possible obtain entire aggregate supply prior to starting Work, or have aggregate supply held in reserve by aggregate supplier.
 - 3. (Lightweight aggregate: ASTM C 330).
 - 4. Water: Potable. Clean, clear, and free from deleterious amounts of salts, acids, alkalies, organic materials, oils, detergents, or other matter that may interfere with color, curing, or strength of concrete.
 - 5. Admixtures: Select to be compatible in specified mix.
 - a) Air Entraining: ASTM C 260.
 - b) Water Reducing: ASTM C 494, Type A, B, C, F, or G
 - c) Silica Fume: ASTM C 1240, for cement replacement for high performance concrete.
 - d) Coloring Agent: ASTM C 979, compatible with other concrete materials.
 - e) Other constituents: Integral water repellents and other chemicals for which no ASTM standard exists, shall be previously established as suitable for use in concrete or shall be shown by test or experience not to be detrimental to the concrete.
- B. Formwork:
 - 1. Provide forms with acceptable form facing materials that are non-reactive with concrete or form release agents and will produce required finish surfaces.
 - 2. Construct and maintain forms to produce precast concrete units of shapes, lines, and dimensions indicated, within specified tolerances.
- C. Reinforcing Materials:
 - 1. Reinforcing Bars: ASTM A 615, Grade 40 or 60, unless otherwise required to meet structural requirements. Use galvanized reinforcing bars; ASTM A 767, hot-dip galvanized where concrete cover is less than 1-1/2 inches. Epoxy coated reinforcing bars, ASTM A 934, may be used.
 - 2. Steel Welded Wire Fabric: ASTM A 185, plain, cold drawn.
 - 3. Pre-Stressing Tendons: ASTM A 416, Grade 250 or 270, un-coated, 7 wire, low relaxation strand.
- D. Connection Materials:
 - 1. Steel Shapes and Plates: ASTM A 36.
 - 2. Carbon Steel Plates: ASTM A 283.
 - 3. High Strength, Low Alloy Structural Steel: ASTM A 572.
 - 4. Carbon Steel Structural Tubing: ASTM A 500, Grade B.
 - 5. Anchor Bolts: ASTM A 307, carbon steel or ASTM A 325, high strength; bolts nuts, and washers.
 - 6. Welded Headed Studs: AWS D1.1, Type B.

7. Deformed Steel Wire Bar Anchors: ASTM A 496.
8. Stainless Steel Plate: ASTM F 593, Type 304 or Type 316; bolts and studs, nuts and washers.
9. Finish for Steel Connection Materials:
 - a) Hot-dip galvanize (ASTM A 123 or A 153) steel exposed to weather in final assembly.
 - b) Shop Prime Remaining Steel Shapes: SSPC-Paint 25.
 - c) Anchor Bolts, Nuts, Washers, Cadmium Plated: ASTM A 563, Grade C.
 - d) Hot-dip galvanize (ASTM A 153) setting bolts or projecting steel in masonry application.
 - e) Galvanizing Repair Paint: DOD-P-21035A or SSPC-Paint 20.
 - f) Welding Electrodes: Comply with AWS Standards.

E. Bearing Pads: Elastomeric pads, AASHTO M251; ASTM D 412.

F. Grout Materials:

Cement Grout: Cement ASTM C 150; sand ASTM C 404; proportions 1:2.5 by volume, minimum water for placement and hydration.

1. Non-Shrink Grout: ASTM C 1107/
2. Epoxy Grout: Consult Suppliers.

2.3 MIXES

A. Design mixes for each type of concrete specified may be prepared by an independent testing agency or by architectural precast manufacturing plant personnel at precast fabricator=s option.

B. Proportion mixes by either testing agency trial batch or field test data methods in accordance with ACI 211.1, using materials to be used on the project, to provide normal weight concrete with properties as follows:

1. Compressive Strength: 5,000 psi (or other strength requirement) when tested in accordance with ASTM C 39.
2. Maximum water cement ratio 0.40 at point of placement.
3. Add air-entrainment admixture to result in air content at point of placement complying with ACI 533 requirements.
4. List other admixtures and recommended quantities.
5. Water absorption maximum 6% (by weight) when tested in accordance with ASTM C 642.

C. Follow procedures similar to Paragraph 2.3 B for lightweight concrete mixes.

2.4 FABRICATION

A. General:

1. Fabricate precast concrete units with manufacturing and testing procedures, quality control recommendations, and dimensional tolerances as specified in ACI 533, unless more stringent requirements are shown or specified.
2. Fabricate units straight, smooth and true to size and shape, with exposed edges and corners precise and square, unless otherwise indicated.

B. Cast openings larger than 10 inches in any dimension according to locations shown on Shop Drawings. Smaller holes may be field cut when approved by Architect.

C. Reinforcement: Comply with CRSI AManual of Standard Practice= and ACI 318 recommendations. Reinforce architectural precast concrete units to resist handling, transportation, and erection stresses, and to comply with specified performance criteria.

D. Pretension tendons for units in compliance with ACI 533.

- E. Cast-in Items: Provide embedded anchors, inserts, steel shapes, and lifting devices as shown on reviewed Shop Drawings. Window connections are best made by field drilled inserts. Firmly hold cast items in place by jigs, strongbacks, or other approved means.
- F. Comply with ACI-533 requirements for measuring, mixing, transporting, and placing concrete. Place facing mix to a thickness of the greater of 1 inch or 1.5 times the maximum aggregate size. Place back-up concrete to ensure bond with face concrete.
- G. Consolidate concrete using equipment and procedures complying with AC 533.
- H. Permanently mark units with pick-up points as shown on reviewed Shop Drawings. Imprint casting date and piece mark on a surface to be concealed from view in the finished structure.
- I. Cure concrete in accordance with ACI 533 requirements.
- J. Discard units that are warped, cracked, broken, spalled, stained, or otherwise defective unless repairs are approved by the Architect and meet specified requirements. Refer to ACI 533 for product finish requirements unless otherwise shown or specified.
- L. Fabrication Tolerances: Fabricate to tolerances listed in ACI 533. (More stringent tolerances, if required, will cause increased cost).

2.5 FINISHES

- A. Finish exposed surfaces or units to match Architect=s design reference sample, equal to a white or gray limestone finish.
- B. Finish unexposed surfaces of units by float finish or as-cast form finish.

2.6 SOURCE QUALITY CONTROL

- A. Inspect and test architectural precast concrete in accordance with ACI 533.
- B. Producers certified by APA or PCI may conduct their own Quality Control operations with reports to Owner and Architect.
- C. Non-certified producers shall furnish and pay for reports by an independent Testing Laboratory, approved by the Owner as specified in paragraph 2.06D.
- D. Owner may retain an independent Testing Laboratory to evaluate fabricator=s quality control and testing methods. Testing Laboratory shall be certified by CCRL or similar National authority. Fabricator shall allow Testing Laboratory access to all operations pertinent to the Project.
- E. Defective Work: Discard units that do not conform to requirements as shown or specified. Replace with units which meet requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Field Dimensions: Furnish field dimensions to fabricator as required.
- B. Examine substrates and conditions for compliance with requirements for installation, tolerances, true and level bearing surfaces, and other conditions affecting performance of architectural precast concrete units. Do not proceed with installation until unsatisfactory conditions have been corrected.
- C. Do not install until supporting structure has been completed (has attained minimum allowable design compressive strength).

3.2 ERECTION

- A. Erection shall be by persons experienced and trained in placement and securing of architectural precast concrete units.
- B. Erect level, plumb, and true to line. Do not allow cumulative dimensional errors to develop. Adjustments such as shimming which would place additional stress on units will not be permitted. Adhere to dimensional tolerances in accordance with ACI recommendations. Erect and secure in a manner to prevent damage to unit or units in place. Replace any damaged units.
- C. Lift and handle precast using lift points and embeds as shown on precast Shop Drawings.
- D. Erection Tolerances:
- E. Erect within tolerances listed in ACI 533.
- F. Erect to conform to structure tolerances listed in ACI 533.
- G. Where to stage joint seal is required, sequence with sealant applicator to ensure that sealant, gaskets and similar items required for interior side seal are installed concurrently with installation of precast units.
- H. Joint Sealants. As specified in Section 07 92 00.

3.3 REPAIR

- A. Repair exposed surfaces of units to match color, texture, and uniformity of surrounding units.
- B. Remove and replace damaged units when repairs do not meet requirements.

3.4 CLEANING

- A. Clean exposed surfaces of units after erection if soiled or stained.
- B. Wash and rinse according to architectural precast concrete fabricator's recommendations. Protect other work from damage while cleaning.
- C. Do not use cleaning materials or methods that change the appearance of architectural precast concrete finishes. Test clean a small area to verify adequacy and safety of materials and methods.
- D. Leave in condition for application of water repellents specified in Section 07190.

3.5 PROTECTION

- A. Protect finished surfaces from soiling or damage.

END OF SECTION 03 45 00

SECTION 03 47 00

TILT-UP CONCRETE CONSTRUCTION

PART 1 - GENERAL

1.01 SCOPE

- A. Furnish all labor, materials, tools equipment and related items required for the complete installation of the Tilt-up Concrete Panel work (monolithic and insulated-sandwich panel) as indicated by the Contract Documents.
- B. Work, items and requirements specified elsewhere that apply and/or relate to this Section include:
 - 1. Quality Control - Division 1
 - 2. Drilled Piers - Section 316329
 - 3. Concrete Formwork - Section 031000
 - 4. Concrete Reinforcement - Section 032000
 - 5. Cast-in-place Concrete - Section 033000
 - 6. Structural Steel - Section 051000
 - 7. Steel Joists and Joist Girders - Section 052100
 - 8. Metal Deck - Section 053000

1.02 STANDARDS

- A. Meet requirements and recommendations of applicable portions of Standards listed.
 - 1. American Concrete Institute ACI
 - 2. American Society for Testing and Materials ASTM
 - 3. Concrete Reinforcing Steel Institute CRSI

1.03 SUBMITTALS

- A. Refer to Section 013400 - Shop Drawings, Product Data and Samples.
- B. Shop Drawings – Provide key plan and panel elevations that show size and shape of each panel, size and location of all inserts, strong backs, bracing and reinforcing. The contractor is responsible for providing inserts and any additional reinforcing that is necessary due to lifting. Include layout and type of wythe connectors and product data on insulation for sandwich panels.
- C. A sample panel, 4'-0"x4'-0", shall be prepared showing paint or tile reveal, and panels face finish.

1.04 QUALITY ASSURANCE

- A. Qualification of Contractor: The contract will be awarded only to a responsible sub-contractor, qualified by experience and in a financial position to do the work specified. In order to facilitate prompt award of the contract, the bidder shall submit with his proposal:
 - 1. Experience record showing the bidder's training and experience in similar work.
 - 2. List and brief description of similar work satisfactorily complete with location of project and date of contracts, together with names and addresses of Owners.
 - 3. List of facilities and equipment available to do work.
- B. Quality Control: Work shall be performed in a manner to assure the highest quality for this type of work. Any work not meeting the Architect's approval shall be removed and replaced or repaired in a manner to achieve results acceptable to the Architect.

1.05 DESIGN

- A. Wall panels as shown on the contract documents have been designed for in place loading of the completed structure. The contractor is responsible for the design to resist stresses due to lifting, erection and bracing and for the design of lifting and bracing reinforcement and accessories.

- B. Design units under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Texas.
- C. The building slab on grade has been designed to function as a floor for office and service type loading. The contractor shall be responsible for providing the construction engineering and structural modifications to the slab as necessary to accommodate construction loading during casting and erection. This shall include any necessary thickening or stiffening of the concrete slab, increases in slab reinforcement, increases in concrete strengths or use of high early strength concrete, and protection of the slab during casting and erection.

1.06 FIELD QUALITY CONTROL

- A. Concrete testing shall comply with Section 033000 Cast-in-Place Concrete.
- B. Testing and inspections of reinforcing steel shall comply with Section 032000 Concrete Reinforcement.
- C. Inspection of embedded items shall comply with Section 032000 Concrete Reinforcement and Division 1.

1.07 PRE-INSTALLATION MEETING

- A. Refer to Division 1 for coordination and meeting requirements.
- B. The Contractor shall conduct a pre-construction meeting to discuss the submittal process, casting, erection and bracing work, and inspection requirements. Attendance will be required by the Contractor, pertinent Sub Contractors, and the Testing Laboratory. Notify the Architect, Engineer and Owner one week prior to the meeting (their attendance will be optional).

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Refer to Sections 031000, 032000, and 033000 for materials and mix designs. Fly ash is not permitted in concrete used for tilt wall construction.
- B. Fine Aggregate: Clear, hard durable, uncoated natural aggregate, 1/8" to 1/4" in size max.
- C. Non-Shrink Cement Grout:
 - 1. Qualities: Premixed non-shrink grout requiring only addition of water. Non-metallic type grout where grout will be sight exposed. ASTM C 270.
 - a. Minimum compressive strength of 5000 PSI at 7 days and 7500 PSI at 28 days when placed at a plastic consistency of 115% flow factor.
 - b. Free of chlorides, sulphates or gas producing agents.
 - 2. Standards:
 - a. Overall Product: CRD - C-621.
 - b. Compressive Strength: ASTM C109, 2 inch cubes.
 - c. Bleed Performance: CRD - C-611.
 - d. Flow Factor: ASTM C230.
- D. Panel Face Finish: Finish shall be smooth on both sides.
- E. Form Release Agent: Non-wax, non-staining water insoluble coating agent.
 - 1. Sources: Magic Kote Symons Corp., Debond Form Coating by L & M Chemicals, Euco Release Agent by Euclid Chemical Co., or Clean Lift Bond Breaker by Burke Co.
- F. Elastomeric Bearing Pads Above Grade: Conform to AASHTO Standard Specification for Highway Bridges, Division 2, Section 25, Table B (Neoprene), minimum durometer 70.

PART 3 - EXECUTION

3.01 PANEL FABRICATION

- A. Concrete wall panels shall be cast face-down.
- B. Each panel shall be carefully formed for all necessary chamfers, lugs, reveals, projections and openings.
- C. Panels shall be square, true to line and fabricated to the tolerances:
 - 1. Maximum Out of Square: 1/8 inch in 10 feet, non-cumulative.
 - 2. Variation From Dimensions Indicated on [Shop] Drawings: Plus or minus 1/4 inch.
 - 3. Maximum Misalignment of Anchors, Inserts, Openings: 3/8 inch.
 - 4. Maximum Bowing of Units: Length of bow/ 360.
 - 5. Location of Reglets: 1/4 inch from true position.
- D. Forms shall be sprayed with form release agent before reinforcing steel is placed and concrete is poured. Forms shall be cleaned of any debris and scraps immediately before concrete is placed, by using compressed air jet or vacuum cleaner.
- E. Metal door frames shall be positioned accurately in formwork, square and level, and blocked sufficiently for being cast-in-place with panel.
- F. Form release coating material shall be sprayed on the floor slab and on forms.
- G. Reinforcing shall be placed accurately, with all appropriate accessories.
- H. Embeds and anchors that support beams, joists and joist girders shall be securely anchored in place and their location carefully checked prior to casting of panel. "Wet setting" or floating these embeds will not be allowed. Provide 1/4" diameter air holes in large embed plates, as shown on the embed plate schedule, to allow air to escape from under the plate during concrete placement. The remainder of embeds may be floated in concrete that is sufficiently plastic to allow for good consolidation and bond of concrete to the embed and headed studs.
- I. Concrete shall be placed in forms and vibrated into position. Carefully vibrate around the embeds to thoroughly consolidate concrete around headed studs and eliminate honeycombs. Inspect air holes to ensure that concrete is in contact with the back of plate.
- J. When concrete is poured to the proper thickness, it shall be screeded off, the reveal strips shall be accurately aligned and securely attached.
- K. Smooth finish areas shall be rubbed with a carborundum stone to a uniformly smooth, hard surface or remain as cast as directed by the Architect.
- L. Install all lifting attachments and accessories.
- M. Wythe Connectors: Accurately place and securely support stainless-steel anchors and connecting pins for sandwich panels.

3.02 ERECTION

- A. Panel concrete shall test not less than 3,000 psi at 7 days before panels are moved.
- B. Panels shall be set on grout as detailed, shimmed as necessary, placed in a true line, and braced with temporary diagonal bracing. Retain bracing until after the roof framing and metal deck have been completed and until after the floor framing has been completed and the floor concrete has attained design strength.

3.03 PANEL FINISHING

- A. After erection and roof steel is in place, pick-up inserts shall be grouted to match adjacent surfaces.

- B. Any honey combed surfaces or irregular edges of filled areas intended to be smooth and exposed to the building exterior shall be rubbed with a carborundum stone.
- C. Clean all panels with water and brushes immediately after panel is raised, as required to remove all sand and dirt.
- D. Any interior faces of panels, that are to be painted or subject to view, shall have a smooth even finish, free of any blemishes or marks.

3.04 FIELD ERECTION TOLERANCES

- A. Maximum Variation from Plane of Location: 1/4 inch in 10 feet and 3/8 inch in 100 feet, non-cumulative.
- B. Maximum Offset from True Alignment Between Two Connecting Units: 1/4 inch.
- C. Joint Tolerance: Plus or minus 1/4 inch.

3.05 FIELD QUALITY CONTROL

- A. Concrete testing shall comply with section 033000 Cast-in-Place Concrete.
- B. Testing and inspections of reinforcing steel and embeds shall comply with section 032000 Concrete Reinforcement.

END OF SECTION

SECTION 04 20 00

UNIT MASONRY

PART - GENERAL

1.1 SUMMARY

- A. This Section includes unit masonry assemblies consisting of the following:

1. Concrete masonry units, standard units.
3. Modular Face Brick
6. Integral Water Repellent.
7. Surface Applied Water repellent.
8. Mortar and grout.
9. Masonry joint reinforcement.
10. Ties and anchors.
11. Embedded flashing.
12. Miscellaneous masonry accessories.

1.2 SUBMITTALS

- A. Product Data: For each different masonry unit, accessory, and other manufactured product specified.

1.3 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1093 to conduct the testing indicated, as documented according to ASTM E 548.
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.
- D. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.
- E. Field Constructed Mock-Ups: Prior to installation and ordering of exterior prefinished masonry work, erect sample wall panels to further verify selections made for color and textural characteristics, under sample submittals of masonry units and mortar, and to represent completed masonry work for qualities of appearance, materials and construction; build mock-ups comply with the following requirements:
1. Locate mock-ups on site in locations indicated or, if not indicated, as directed by Architect.
 2. Build mock-ups for the following types of masonry in sized of approximately 6' long by 4' high by full thickness, including face and back-up wythes as well as accessories and representative control joint. Mockup to contain both split faced and smooth face units. Concrete masonry color selection may be changed upon review of mock-up.
 - a. Typical exterior masonry wall.
 - b. Retain mock-ups during construction as standard for judging completed masonry work. When directed, demolish mock-ups and remove from site.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
 - 1. Protect Type I concrete masonry units from moisture absorption so that, at the time of installation, the moisture content is not more than the maximum allowed at the time of delivery.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.5 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
 - 2. Where one wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to un-constructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from za
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in Section 2104.3 of the Uniform Building Code.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.

1. When ambient temperature exceeds 100 deg F or 90 deg F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. General: Provide shapes indicated and as follows:

1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
2. Provide bull nose units for interior outside corners, outside column cover corners, unless otherwise indicated.
3. Make any required cuts with motorized masonry saw, using abrasive or diamond blade.

B. Concrete Masonry Units Standard units, ASTM C 90 and as follows:

1. Weight Classification: Lightweight, unless otherwise indicated.
2. Provide Type I, moisture-controlled units.
3. Size (Width): Manufactured to the following dimensions:
 - a. 4 inches nominal, 3-5/8 inches actual unless otherwise indicated.
 - b. 6 inches nominal, 5-5/8 inches actual unless otherwise indicated.
 - c. 8 inches nominal; 7-5/8 inches actual unless otherwise indicated.
 - d. 12 inches nominal, 11-5/8 inches actual unless otherwise indicated.
4. Exposed Faces: Manufacturer's standard grey color and texture, unless otherwise indicated.

C. Integral Water Repellent where required: Liquid polymeric, integral water repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested as a wall assembly made with mortar containing integral water repellent manufacturer's mortar additive according to ASTM E 514, with test period extended to 24 hours, show no visible water or leaks on the back of test specimen.

1. Available Products:
 - a. Addiment Incorporated; Block Plus W-10.
 - b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block.
 - c. Master Builders, Inc.; Rheopel.

D. Surface applied water repellent: Concentrate water repellent, solvent-free blend of silanes and oliomeric alkoxysiloxanes mixed with water. See Division 07180 for additional notes.

1. Available Products:
 - a. Siloxane WB Concentrate by Prosoco or approved equal.
2. Follow manufacturer's printed literature for installation.
3. Test product before applying to verify if compatible with block manufactures integral water repellent. If not compatible provide comparable water repellent. If integral water repellent of block is an acrylic based admixture, use Prosoco Burnished Block Sealant.

2.2 BRICK

A. General: Provide shapes indicated and as follows:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

- B. Face Brick: ASTM C 216, Grade SW, Type FBS.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 5500 psi (37.9 MPa).
 - 2. Initial Rate of Absorption: Less than 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67.
 - 3. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
 - 4. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing per ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet (3 m).
 - 5. Size (Actual Dimensions): 3-1/2 inches (89 mm) wide by 2-1/4 inches (57 mm) high by 7-1/2 inches (190 mm) long or 3-5/8 inches (92 mm) wide by 2-1/4 inches (57 mm) high by 7-5/8 inches (194 mm) long.

2.3 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of Portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.
- D. Mortar Cement: ASTM C 1329.
- E. Masonry Cement: ASTM C 91.
- F. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
- G. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494, Type C, and recommended by the manufacturer for use in masonry mortar of composition indicated.
- H. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.
 - 1. Provide surface applied water repellent at all exterior walls.
- I. Water: Potable.

2.4 MASONRY JOINT REINFORCEMENT

- A. General: ASTM A 951 and as follows:
 - 1. Mill galvanized, ASTM A641, carbon-steel wire for interior walls.
 - 2. Hot-dip galvanized, ASTM A153, carbon-steel wire for exterior walls.
 - 3. Wire Size for Side Rods: W1.7 or 0.148-inch diameter.
 - 4. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter.
 - 5. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units where indicated and at all corners and intersections.
- B. For single-wythe masonry, provide either ladder or truss type with single pair of side rods and cross rods spaced not more than 16 inches o.c.
- C. For multi-wythe masonry, provide types as follows:

1. Two wire truss type with continuous diagonal cross rods spaced not more than 16 inches o.c. and 1 side rod for each face shell of hollow masonry units more than 3 inches in width. Integral dual eyelet projections and adjustable pintle ties for masonry veneer. Eyelets shall project sufficiently to accommodate thickness of insulation materials.

2.5 TIES AND ANCHORS, GENERAL

- A. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, unless otherwise indicated.
- B. Hot-Dip Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.
- C. Galvanized Steel Sheet: ASTM A 653/A 653M, G60, commercial-quality, steel sheet zinc coated by hot-dip process on continuous lines before fabrication.
- D. Steel Sheet, Galvanized after Fabrication: ASTM A 366/A 366M cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153.
- E. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.6 ADJUSTABLE WIRE TIES FOR CONNECTING VENEER MASONRY TO STEEL FRAME.

A. Adjustable Masonry-Veneer Anchors

1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
 - a. Structural Performance Characteristics: Capable of withstanding a 100-lbf (445-N) load in both tension and compression without deforming or developing play in excess of 0.05 inch (1.3 mm).
2. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section with integral "stand-off legs" when used with compressible sheathing.
 - a. Anchor Section: Rib-stiffened, sheet metal plate with screw holes top and bottom, and slotted holes for inserting wire tie.
 - b. Fabricate sheet metal anchor sections from 0.067-inch- (1.7-mm-) thick, steel sheet, galvanized after fabrication.
 - c. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.188-inch- (4.8-mm-) diameter, hot-dip galvanized steel wire.
 - d. Available Products:
 - 1) Dayton Superior Corporation, Dur-O-Wal Division; D/A 213 or D/A 210 with D/A 700-708.
 - 2) Heckmann Building Products Inc.; 315-D with 316.
 - 3) Hohmann & Barnard, Inc.; DW-10 DW-10HS or DW-10-X.
 - 4) Wire-Bond; 1004, Type III or RJ-711.

2.7 MISCELLANEOUS ANCHORS

- A. Bent Anchors: 1/4" thick x 2" wide with 2" bend at ends, length as required. Hot dipped galvanized conforming to ASTM A82.
- B. Anchor Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of diameter and length indicated and in the following configurations:
 1. Headed bolts.
 2. Non headed bolts, bent in manner indicated.

- C. Post installed Anchors: Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
1. Type: Chemical anchors.
 2. Type: Expansion anchors.
 3. Type: Undercut anchors.
 4. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).
 5. For Post installed Anchors in Concrete: Capability to sustain, without failure, a load equal to four times the loads imposed.
 6. For Post installed Anchors in Grouted Masonry Units: Capability to sustain, without failure, a load equal to six times the loads imposed.

2.8 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Fabricate from the following metal complying with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim" and below:
1. Stainless Steel: 0.0156 inch thick.
 2. Copper: 16 ounce per square foot.
- B. Contractor's Option for Concealed Flashing: For flashing partly exposed to the exterior, use metal flashing specified above. For flashing not exposed to the exterior, use one of the following, unless otherwise indicated:
1. Copper-Laminated Flashing: Manufacturer's standard laminated flashing consisting of 3-oz./sq. ft. sheet copper bonded with asphalt between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
 - a. Sandell Manuf. Corp.
 - b. Advanced Building Products, Inc.
 - c. Hohmann & Barnard, Inc.
 2. Asphalt-Coated Copper Flashing: Manufacturer's standard product consisting of 3 -oz./sq. ft. sheet copper coated with flexible asphalt. Use only where flashing is fully concealed in masonry.
- C. Solder and Sealants for Sheet Metal Flashings: As specified in Division 7 Section "Sheet Metal Flashing and Trim."
- D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by the flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.9 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Pre-molded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC.
- B. Preformed Control-Joint Gaskets: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
1. Styrene-Butadiene-Rubber Compound: ASTM D 2000, Designation M2AA-805.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 30 asphalt felt).

- D. Mortar/Grout Screen, ¼" square monofilament screen fabricated from high strength non-corrosive polypropylene polymers or 3.4 lb. sq. yard plaster metal lath..

2.10 CAVITY-WALL INSULATION

- A. Polyisocyanurate Board Insulation: Aluminum-foil-faced, glass-fiber-reinforced, rigid, cellular, polyisocyanurate thermal insulation complying with ASTM C 1289, Type I, Class 2.
 - 1. Equal to Atlas – Energy shield , ¾" thick, 5.4 R value, as reference standard.
- B. Adhesive: Type recommended by insulation board manufacturer for application indicated or mechanical type.

2.11 MASONRY CLEANERS

- A. Job-Mixed Detergent Solution: Solution of 1/2-cup dry measure tetrasodium polyphosphate and 1/2-cup dry measure laundry detergent dissolved in 1 gal. of water.

2.12 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Add cold-weather admixture (if used) at the same rate for all mortar, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Pre-blended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a pre-blended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification.
 - 1. Limit cementitious materials in mortar to Portland cement, mortar cement, and lime.
 - 2. Limit cementitious materials in mortar for exterior and reinforced masonry to Portland cement, mortar cement, and lime.
 - 3. For masonry below grade, in contact with earth, and where indicated, use Type S.
 - 4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Before installation, examine rough-in and built-in construction to verify actual locations of piping connections.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.
- D. Cut masonry units with motor-driven saws to provide clean, sharp, un-chipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction. Where possible, use full-size units without cutting. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
 - 1. Mix units from several pallets or cubes as they are placed.

3.3 CONSTRUCTION TOLERANCES

- A. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:
- B. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/4 inch in 20 feet, nor 1/2 inch maximum.
- C. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, nor 1/2 inch maximum.
- D. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than 1/4 inch in 20 feet nor 1/2 inch maximum.
- E. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
- F. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
 - 1. One-half running bond with vertical joint in each course centered on units in courses above and below.
- C. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.

- D. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.
- E. Fill space between hollow-metal frames and masonry solidly with mortar, unless otherwise indicated.
- F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
- G. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- H. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
 - 3. At fire-rated partitions, install firestopping in joint between top of partition and underside of structure above to comply with Division 7 Section "Firestopping."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow masonry units as follows:
 - 1. With full mortar coverage on horizontal and vertical face shells.
 - 2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
 - 3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
- B. Lay solid brick-size masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than the joint thickness, unless otherwise indicated. All joints above finish ceiling which are not exposed to view are to be tooled to bottom of roof structure. That is, all mortar joints shall be concave tooled over the entire expanse of the wall or partition both above and below ceilings.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.6 CAVITIES

- A. Keep cavities clean of mortar droppings and other materials during construction. Strike joints facing cavities flush.
 - 1. Use wood strips temporarily placed in cavity to collect mortar droppings. As work progresses, remove strips, clean off mortar droppings, and replace in cavity.

3.7 MASONRY JOINT REINFORCEMENT

- A. General: Provide continuous masonry joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c.

2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.
 - a. Reinforcement above is in addition to continuous reinforcement.

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.8 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.
2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches mm) o.c. horizontally.

3.9 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to wall framing with masonry-veneer anchors to comply with the following requirements:

1. Fasten anchors through sheathing to wall framing with metal fasteners of type indicated.
2. Embed tie sections in masonry joints. Provide not less than 1- 1/8 inches of air space between back of masonry veneer and face of sheathing or masonry.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 18 inches o.c. vertically and 24 inches o.c. horizontally, with not less than 1 anchor for each 2 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around the perimeter.

3.10 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joints in unit masonry where indicated on drawings and as indicated within this specification. Build-in related items as masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.

B. Form control joints in concrete masonry units as indicated on drawings or if not indicated by one of the following methods.

1. (Michigan Type), Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake joints in exposed faces.
2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake joint. Control joints are to continue up to top most bond beam. Unless otherwise noted, extend horizontal rebar reinforcement in bond beams thru control joints. Rake out 3/4" deep recess at bond beams vertical joints and fill with foam rod and sealant.
4. At horizontal joint reinforcement, stop wire reinforcement approximately 1/2" to 2" from each face of control joint.

- C. Form expansion joints in brick made from clay or shale as follows:
 - 1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints, if any.
 - 2. Form open joint of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Division 7 Section "Joint Sealants." Keep joint free and clear of mortar.
- D. Build in horizontal, pressure-relieving joints where indicated; construct joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 7 Section "Joint Sealants." In additions to joints locations shown on the drawings, provide control joints in concrete masonry units at the following conditions and locations for both interior and exterior walls.
 - 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.
 - 2. At abrupt changes in wall height, thickness or type of construction change.
 - 3. At inside corners of wall offsets.
 - 4. Within 20 feet of external corners.
 - 5. At wall intersections, see details 15, 16 – A711.
 - 6. At structural columns and wall pilasters.
 - 7. At both sides of all masonry openings. Coat bearing ends of steel lintels with mastic. Provide compressible foam fillers at ends of lintels and fill horizontal joint in front of lintel bearing with sealant.
 - 8. At 24'-0" maximum spacing along wall of cmu's.
 - 9. At masonry expansion joints. Expansion joints shall be fully compressible to permit movement to occur without distress from excessive or concentrated stresses. Do not allow mortar to bridge across expansion joints. Break joint reinforcing at expansion joints. Expansion joints shall be designed and located as not to impair the integrity of the wall.

3.11 LINTELS

- A. Install steel lintels where indicated or as indicated on drawings in lintel schedule for non-load bearing masonry walls.
- B. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
- C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.12 FLASHING, WEEP HOLES, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Unless otherwise indicated, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
- C. Install flashing as follows:
 - 1. At masonry-veneer walls, extend flashing from exterior face of veneer, through veneer, up face of sheathing at least 8 inches, and behind air-infiltration barrier or building paper.
 - 2. At lintels and shelf angles, extend flashing a minimum of 4 inches into masonry at each end. At heads and sills, extend flashing 4 inches at ends and turn flashing up not less than 2 inches to form a pan.

3. Extend sheet metal flashing 1/2 inch beyond face of masonry at exterior and turn flashing down to form a drip.
 4. Cut flashing off flush with face of wall after masonry wall construction is completed.
- D. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing and as follows:
1. Use open head joints to form weep holes.
 2. Space weep holes 32 inches o.c.
- 3.13 REPAIRING, POINTING, AND CLEANING AND WATER REPELLENT.
- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Contracting Officer's approval of sample cleaning before proceeding with cleaning of masonry.
 3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clear water.
- E. Application of Water Repellant. – After wall is cleaned and dry apply water repellent to all exterior surfaces of masonry split faced and burnished faced concrete masonry units according to manufacturers printed instructions.
- 3.14 MASONRY WASTE DISPOSAL
- A. Recycling: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site and legally dispose of off Owner's property.

END OF SECTION 04 20 00

SECTION 04 43 13.13
ANCHORED STONE MASONRY VENEER

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Stone masonry anchored to cold-formed metal framing and sheathing.
- B. Products Installed but Not Furnished under This Section Include:
 - 1. Steel lintels in unit masonry.
 - 2. Steel shelf angles for supporting unit masonry.
- C. Related Requirements:
 - 1. Section 042000 "Unit Masonry" for concealed flashing, horizontal joint reinforcement, and veneer anchors.

1.2 ACTION SUBMITTALS

- A. Product Data: For each variety of stone, stone accessory, and manufactured product.
- B. Samples:
 - 1. For each stone type indicated.
 - 2. For each color of mortar required.

1.3 FIELD CONDITIONS

- A. Protection of Stone Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work.
- B. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried.
- C. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 LIMESTONE (A2.01, A3.02, and A3.03 – refer to these sheets for material proposed)

- A. Material Standard: Comply with ASTM C 568/C 568M.

1. Classification: II Medium Density, except as follows: absorption, 5 percent by weight maximum; density, 150 lb/cu. ft. minimum; compressive strength, 8000 psi minimum; and modulus of rupture 800 psi minimum.
- B. Description: Dolomitic limestone.
- C. Varieties and Sources: Texas limestone quarried within 350 miles of the project site.
 1. Texas Limestone Grade and Color to be chosen by architect from contractor's selected supplier based on the installed allowance provided during the Value Engineering process.

2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or Type II, except Type III may be used for cold-weather construction; natural color or white cement may be used as required to produce mortar color indicated.
 1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Masonry Cement: ASTM C 91/C 91M.
- D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979/C 979M. Use only pigments with a record of satisfactory performance in stone masonry mortar.
- E. Aggregate: ASTM C 144 and as follows:
 1. For pointing mortar, use aggregate graded with 100 percent passing No. 16 sieve.
 2. Colored Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.
- F. Water: Potable.

2.3 VENEER ANCHORS

- A. Materials:
 1. Hot-Dip Galvanized-Steel Sheet: ASTM A 1008/A 1008M, cold-rolled, carbon-steel sheet, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M, Class B-2.
- B. Size: Sufficient to extend at least halfway, but not less than 1-1/2 inches, through stone masonry and with at least a 5/8-inch cover on exterior face.
- C. Adjustable Masonry-Veneer Anchors:
 1. General: Provide anchors that allow vertical adjustment but resist a 100-lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch.
 2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.105-inch- thick steel sheet, galvanized after fabrication

3. Fabricate wire ties from 0.25-inch-diameter, hot-dip galvanized-steel or stainless-steel wire unless otherwise indicated.
4. Fabricate wire connector sections from 0.25-inch-diameter, hot-dip galvanized-steel wire.
5. Contractor's Option: Unless otherwise indicated, provide any of the adjustable masonry-veneer anchors specified.

2.4 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with SMACNA's "Architectural Sheet Metal Manual, Section 076200 "Sheet Metal Flashing and Trim" and as follows:
 1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch (0.4 mm) thick.

2.5 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane, or PVC.
- B. Cementitious Dampproofing for Limestone: Cementitious formulation recommended by ILI and nonstaining to stone, compatible with joint sealants, and noncorrosive to veneer anchors and attachments.
- C. Weep/Vent Products: Use one of] the following unless otherwise indicated:
 1. Wicking Material: Absorbet rope, made from cotton or UV-resistant synthetic fiber, 1/4 to 3/8 inch in diameter, in length required to produce 2-inch exposure on exterior and 18 inches in cavity behind stone masonry. Use only for weeps.
 2. Round Plastic Tubing: Medium-density polyethylene, 3/8-inch OD by thickness of stone masonry.
 3. Mesh Weep Holes/Vents: Free-draining mesh; made from polyethylene strands, full width of head joint and 2 inches high by thickness of stone masonry; in color selected from manufacturer's standard.
- D. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
 1. Provide one of the following configurations:
 - a. Strips, full depth of cavity and 10 inches (250 mm) wide, with dovetail-shaped notches 7 inches (175 mm) deep that prevent mesh from being clogged with mortar droppings.

2.6 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar and grout stains, efflorescence, and other new construction stains from stone masonry surfaces without discoloring or damaging masonry surfaces; expressly approved for intended use by cleaner manufacturer and stone producer.

2.7 FABRICATION

- A. Split, or Select stone to produce pieces of thickness, size, and shape indicated, including details on Drawings and pattern specified in "Setting Stone Masonry" Article.
 - 1. Shape stone specified to be laid in three-course, random range ashlar pattern with [split] beds.
- B. Thickness of Stone: Provide thickness indicated, but not less than the following:
 - 1. Thickness: 4 inches plus or minus 1/4 inch (6 mm) Thickness does not include projection of pitched faces.
- C. Finish exposed stone faces and edges to comply with requirements indicated for finish and to match approved samples.
 - 1. Finish: Mixed split face, seam face, and rock face (pitched face).

2.8 MORTAR MIXES

- A. General: Do not use admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride.
 - 2. Use portland cement-lime or masonry cement mortar unless otherwise indicated.
 - 3. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar reaches required consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.
- B. Mortar for Stone Masonry: Comply with ASTM C 270, Proportion Specification.
 - 1. Mortar for Setting Stone: Type S or Type N.
 - 2. Mortar for Pointing Stone: Type N or Type O.
- C. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
 - 1. Pigments shall not exceed 10 percent of portland cement by weight.
 - 2. Pigments shall not exceed 5 percent of masonry cement by weight.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Accurately mark stud centerlines on face of weather-resistant sheathing paper before beginning stone installation.
- B. Coat concrete and unit masonry backup with asphalt dampproofing.

3.2 SETTING STONE MASONRY

- A. Perform necessary field cutting and trimming as stone is set.
 - 1. Use hammer and chisel to split stone that is fabricated with split surfaces. Make edges straight and true, matching similar surfaces that were shop or quarry fabricated.
 - 2. Pitch face at field-split edges as needed to match stones that are not field split.
- B. Sort stone before it is placed in wall to remove stone that does not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that is otherwise unsuitable for intended use.
- C. Arrange stones in three-course, random-range ashlar pattern with random course heights, random lengths (interrupted coursed), and uniform joint widths.
- D. Arrange stones with color and size variations uniformly dispersed for an evenly blended appearance.
- E. Maintain uniform joint widths except for variations due to different stone sizes and where minor variations are required to maintain bond alignment if any. Lay walls with joints not less than 3/8 inch at narrowest points or more than 5/8 inch at widest points.
- F. Provide sealant joints of widths and at locations indicated.
 - 1. Keep sealant joints free of mortar and other rigid materials.
 - 2. Sealant joints are specified in Section 07 92 00 "Joint Sealants."
- G. Install embedded flashing and weep holes at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
 - 1. At stud-framed walls, extend flashing through stone masonry, up sheathing face at least 16 inches, and behind weather barrier.
 - 2. At lintels and shelf angles, extend flashing full length of angles but not less than 6 inches into masonry at each end.
 - 3. At sills, extend flashing not less than 4 inches at ends.
 - 4. At ends of head and sill flashing, turn up not less than 2 inches to form end dams.
 - 5. Extend sheet metal flashing 1/2 inch beyond masonry face at exterior and turn flashing down to form a drip.
 - 6. Install metal drip edges beneath flexible flashing at exterior wall face. Stop flexible flashing 1/2 inch back from exterior wall face and adhere flexible flashing to top of metal drip edge.
 - 7. Install metal flashing termination beneath flexible flashing at exterior wall face. Stop flexible flashing 1/2 inch back from exterior wall face and adhere flexible flashing to top of metal flashing termination.
 - 8. Cut flexible flashing flush with wall face after completing masonry wall construction.
- H. Place weep holes and vents in joints where moisture may accumulate, including at base of cavity walls, above shelf angles, and at flashing.
 - 1. Use wicking material, round plastic tubing, or mesh weep holes/vents to form weep holes.
 - 2. Use wicking material to form weep holes above flashing in stone sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
 - 3. Space weep holes 24 inches o.c.
 - 4. Trim wicking material used in weep holes flush with exterior wall face after mortar has set.
 - 5. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

- I. Install vents in head joints at top of each continuous cavity at spacing indicated. Use round plastic tubing or mesh weep holes/vents to form vents.
- J. Coat limestone with cementitious dampproofing as follows:
 - 1. Stone at Grade: Beds, joints, and back surfaces to at least 12 inches above finish-grade elevations.
 - 2. Stone Extending below Grade: Beds, joints, back surfaces, and face surfaces below grade.

3.3 CONSTRUCTION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch in 40 feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.
- B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.
- C. Variation of Linear Building Line: For position shown in plan, do not exceed 1/2 inch in 20 feet or 3/4 inch in 40 feet or more.

3.4 INSTALLATION OF ANCHORED STONE MASONRY

- A. Anchor stone masonry to stud framing with adjustable, screw-attached veneer anchors unless otherwise indicated. Fasten anchors through sheathing to framing with two screws.
- B. Embed veneer anchors in mortar joints of stone masonry at least halfway, but not less than 1-1/2 inches, through stone masonry and with at least a 5/8-inch cover on exterior face.
 - 1. Install continuous wire reinforcement in horizontal joints and attach to seismic veneer anchors as stone is set.
- C. Space anchors not more than 16 inches o.c. vertically and 24 inches o.c. horizontally. Install additional anchors within 12 inches of openings, sealant joints, and perimeter at intervals not exceeding 12 inches.
- D. Set stone in full bed of mortar with full head joints unless otherwise indicated. Build anchors into mortar joints as stone is set.
- E. Provide 2-inch cavity between stone masonry and backup construction unless otherwise indicated. Keep cavity free of mortar droppings and debris.
 - 1. Slope beds toward cavity to minimize mortar protrusions into cavity.

3.5 POINTING

- A. Prepare stone-joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply pointing mortar in layers not more than 3/8 inch deep until a uniform depth is formed.

3.6 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean stone masonry as work progresses. Remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean stone masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on mockup; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before cleaning stone masonry.
 - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaner; remove cleaner promptly by rinsing thoroughly with clear water.
 - 5. Clean stone masonry by bucket and brush hand-cleaning method described in BIA Technical Note No. 20, Revised II, using job-mixed detergent solution.
 - 6. Clean stone masonry with proprietary acidic cleaner applied according to manufacturer's written instructions.
 - 7. Clean limestone masonry to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.7 EXCESS MATERIALS AND WASTE

- A. Excess Stone: Stack excess stone where directed by Owner for Owner's use.

END OF SECTION 04 43 13.13

SECTION 05 10 00

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Perform all work required to complete the Structural Steel work indicated by the Contract Documents and furnish all supplementary items necessary for its proper installation.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Test and Laboratory Control - Division 1
- B. Steel Joists and Joist Girder Framing - Section 05 21 00
- C. Metal Decking - Section 05 30 00
- D. Miscellaneous Metal – Section 05 50 00
- E. Metal Stairs – Section 05 51 00

1.03 QUALITY ASSURANCE

- A. The testing laboratory approved by the Architect shall inspect high strength bolted connections and welds and perform all tests in the shop and in the field and submit test reports to the Architect as hereinafter specified. The testing laboratory shall be responsible for conducting and interpreting the test, shall state in each report whether or not test specimens conform to all requirements of the Contract Documents, and shall specifically note any deviations therefrom. Corrective measures, including additional testing, which result from these tests, shall be the Contractor's responsibility.
- B. The testing agency shall furnish to the Architect five (5) certified copies of all test reports.

1.04 REQUIREMENTS OF REGULATORY AGENCIES

- A. Building Code shall mean Current Local Building Code.
- B. AISC Specifications for Structural Steel shall mean AISC Specification for Structural Steel Buildings, March 9, 2005.
- C. Specification for Structural Joints shall mean "Specifications for Structural Joints using ASTM A325 or A490 Bolts" June 30, 2004.
- D. AWS Building Code shall mean AWS "Code for Welding in Building Construction", latest edition.
- E. ASTM shall mean the appropriate specification of the American Society of Testing and Materials.
- F. Code of Standard Practice shall mean AISC Code of Standard Practice for Steel Buildings and Bridges, latest edition.

1.05 QUALIFICATIONS

- A. Steel Fabricator: Fabricator shall have not less than 10 years experience in the fabrication of structural steel.
- B. Steel Erector: Erector shall have not less than 10 years experience in the erection of structural steel.
- C. Welding procedures, welders, welding operations and tackers shall be qualified in accordance with the AWS Building Code. Certification of welders by the testing laboratory shall not be more than six

months old at the time of welding in the erection period.

1.06 SUBMITTALS

- A. Shop Drawings:
1. Submit shop drawings, indicating all shop and erection details, including cuts, copes, connections, holes, threaded fasteners, rivets, and welds.
 2. Schedule and submit shop drawings in a timely manner that allows the Architect and Engineer adequate time for review of the submittals. Refer to Division 1 for schedule and submittal requirements.
 3. Shop drawings shall not be made by using reproductions of contract drawings. This restriction also prohibits using electronic files or reproductions of electronic files of the contract documents.
 4. Dimensions to existing construction are based on the original construction documents and/or approximate field measurements. They are to be used for bid purposes only and not for shop drawing preparation or construction. The Contractor shall provide all field measurements required for proper fit up of members framing to and around existing construction.
 5. All welds, both shop and field, shall be indicated by AWS Welding Symbols.
 6. Highlight, encircle or otherwise identify deviations from the contract documents on submittals.
 7. Divide or subdivide work into packages of reasonable size, sequence, and order. Each package shall be complete, including dimensioned plans with piece marks, and all pertinent framing and erection details, fabrication drawings of individual pieces, and bills of materials. Clearly identify each submittal package. Highlight, encircle or otherwise identify portions of the work that have been omitted and are to be included in other submittals.
 8. Shop drawings shall be fully reviewed by the Contractor for completeness and conformance with the contract documents prior to submitting to the Architect. All submittals shall be stamped, initialed and dated by the Contractor. Submittals that have not been reviewed by the Contractor may be rejected without review.
 9. Submittals that do not include all of the specified information may be rejected without review.
 10. The Contractor shall fully coordinate the work of the fabricator with all other trades including the steel joist manufacturer. Provide joist placing drawings and lists to the steel fabricator for coordination of work prior to submittal of shop drawings to the Architect.
 11. When re-submittals are required, highlight, encircle or otherwise clearly identify all changes, revisions, additions, or deletions of information since the previous submittal. Re-submittals shall be numbered, dated and descriptively identified in the title block of each revised sheet.
 12. Any fabrication of material before approval of drawings will be at the risk of the Contractor.
 13. Failure to comply with submittal and re-submittal requirements will be cause for rejection.
- B. Erection Procedure: Submit descriptive data to illustrate the structural steel erection procedure, including sequence of erection and temporary staying and bracing.
- C. Welding Procedure: Submit qualification of flux-cored arc welding procedures in accordance with Article 502, AWS D1-1.
- D. Proof of Compliance for Materials:
1. Report of ladle analysis of all steel.
 2. Report of tensile properties for;
 - a. Steel shapes
 - b. Steel bars
 - c. Steel plates
 3. Mill Certifications.

1.07 PROPOSED SUBSTITUTIONS

- A. Substitutions of sections or modification of details, if proposed by the Contractor, shall be submitted for approval in sketch form prior to submission of shop drawings, and such substitutions shall be made only when approved by the Architect and Engineer. Refer to Division 1 for substitution submittal requirements.

1.08 PRODUCT HANDLING

- A. Delivery of materials to be installed under other sections:
 - 1. Anchor bolts and other anchorage devices which are embedded in cast-in-place concrete or masonry construction shall be delivered to the project site in time to be installed before the start of cast-in-place concrete operations or masonry work.
 - 2. Provide setting drawings, templates, and directions for the installation of the anchor bolts and other devices.
 - 3. The General Contractor shall check the correct positioning of anchor bolts before concrete is placed. Subsequent displacement of the anchor bolts will be the responsibility of the General Contractor.
- B. Storage of materials:
 - 1. Structural steel members which are stored at the project site shall be above ground on platforms, skids, or other supports.
 - 2. Steel shall be protected from corrosion.
 - 3. Other materials shall be stored in a weather-tight and dry place, until ready for use in the work.
 - 4. Packaged material shall be stored in their original unbroken package or container.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Structural Steel Shapes, Bars and Plates:
 - 1. W shapes shall conform to ASTM A992.
 - 2. All other steel shapes, bars and plates conform to ASTM A36.
- B. Pipes and Tubes:
 - 1. Structural Steel Pipe shall conform to ASTM A501 or ASTM A53, Types E or S, Grade B.
 - 2. Structural Steel Tube shall conform to ASTM A500, Grade B.
- C. Headed Stud Type Shear Connectors:
 - 1. Cold finished carbon steel, ASTM A108.
 - 2. Dimensions of shear connectors shall conform to Figure M-1 of AWS Building Code.
- D. Anchor Rods – provide material as indicated on drawings:
 - 1. ASTM F1554, grade as noted in drawings.
- E. High-Strength Threaded Fasteners: ASTM A325 or ASTM A490.
- F. Filler Metal for Welding:
 - 1. Shielded metal - arc welding - AWS A5.1 or A5.5.
 - 2. Submerged - arc welding - AWS A5.17.
 - 3. Flux-cored arc welding - AWS A5.20.
- G. Grout: Non-shrink grout "Embeco Pre-mixed Grout" by Master Builders or approved equal. The material shall be ready-to-use metallic aggregate product requiring only the addition of water at the job site, and shall produce a flowable grouting material having no drying shrinkage at any age. Compressive strength of grout (2"x2" cubes) shall be not less than 5000 psi at 7 days and 7500 psi at 28 days.
- H. Paint: Fabricators standard rust inhibiting primer conforming to SSPC Specifications.
 - 1. Standard interior protected conditions (SSPC Zone 1A): Fabricators standard rust inhibiting primer conforming to SSPC Specifications.
 - 2. Exterior exposures (all exterior exposures shall be treated as SSPC Zone 2A): Provide primer compatible with paint system and topcoats specified in Division 9, and SSPC Specifications.
 - 3. Crawl space exposures (all steel within the building crawl space): All steel within the building crawl space shall be treated as exterior exposure SSPC Zone 1B. Provide primer and top

coat (apply both coats at the shop) complying with SSPC Specifications, System A or B and as follows:

- a) For SSPC System A, Waterborne Acrylics: Provide two-coat waterborne acrylic latex (maintenance grade latex with at least 3 years documented service life, (e.g. SSPC Painting System 24.00).
 - b) For SSPC System B, Alkyd: Provide zinc-oxide alkyd primer (e.g. SSPC – Paint 25) plus alkyd or silicone-alkyd topcoat.
4. Architecturally Exposed Structural Steel (AESS): Treat AESS as having exterior exposure as noted above.
- I. Galvanizing: Conform to ASTM A123/A123M

2.02 FABRICATION

- A. Fabricate Structural Steel in accordance with the AISC Specification for Structural Steel.
1. All work shall be shop-assembled in so far as possible and delivered to the site ready for erection. Trusses shall be shop fabricated with field splices allowed only as indicated on the drawings or as approved in the substitution process. Material shall be properly marked and match-marked where field assembly is required. The sequence of shipments shall be such as to expedite erection and minimize field handling of material.
 2. Members to be milled shall be completely assembled before milling.
 3. Beams, girders, and trusses shall be cambered as indicated on the drawings. Specified camber shall be within a tolerance of minus zero to plus 1/8 inch per 10 feet of beam length. Members without specified camber shall be fabricated so that after erection any minor camber due to rolling or fabrication shall be upward.
- B. Shop connections shall be high-strength bolted or welded, as indicated on the structural drawings or as required.
- C. Field connections shall be high-strength bolted or welded, as indicated on the structural drawings or as required.
- D. High-strength Bolted Construction Assembly: Tightening shall be done by the calibrated wrench method or the turn-of-the-nut method in accordance with Section 8 (d) of the Specifications for Structural Joints for all friction connections. For all bearing type bolted connections, bolts shall be installed to a snug tight fit with all plies in a joint in firm contact.
- E. Welded Construction
1. All welding done in accordance with AWS D1.1.
 2. Welding process shall be limited to one or more of the following:
 - a. Manual shielded-arc.
 - b. Submerged-arc.
 - c. Flux-cored arc.
 3. Preheat and interpass temperature shall conform to Table 4.2, AWS D1.1.
 4. Welds not specified shall be continuous fillet welds, using minimum fillet as specified by AWS D1.1.
 5. Remove slag from welds and wire brush clean.
- F. No combination of bolts and welds shall be used for stress transmission in the same faying face of any connections.
- G. Bearing Plates:
1. Bearing plates shall be provided under beams, girders, and trusses resting on footings, piers, and walls.
 2. Bearing plates shall be either attached or loose.
- H. Elements identified on the drawings as AESS are Architecturally Exposed Structural Steel. Fabrication of these elements shall comply with the Code of Standard Practice for Architecturally Exposed

Structural Steel including the more restrictive tolerances for fabrication and appearance and with criteria noted on the drawings.

- I. Shop Painting:
 - 1. Apply shop coat of paint on steel surfaces except:
 - (a) Surfaces of members to be field welded, in immediate area of welds.
 - (b) Surfaces of members to receive sprayed-on fireproofing.
 - 2. Surface preparation to be as follows:
 - (a) For standard interior protected uses: SP3 – Power Tool Cleaning.
 - (b) For exterior exposures: SP6 – Commercial Blast Cleaning.
 - (c) For crawl space exposures: SP6 – Commercial Blast Cleaning.
 - (d) For Architecturally Exposed Structural Steel (AESS): SP6 – Commercial Blast Cleaning.
 - 3. Repairing steel defects for both exterior exposures and for Architecturally Exposed Structural Steel: Weld spatter and other steel defects (e.g., scabs, burns, and slivers) that become visible after blast cleaning should be removed by sanding or grinding. All sharp edges or rough surfaces should be ground to a smooth contour (normally a 1/8 inch radius). Repaired areas should be restored to the original cleanliness and profile. This may be accomplished by spot air blast cleaning or vacuum blasting the damaged area or by use of profile producing power tools.
- J. Galvanizing: Hot dip galvanize per ASTM A123/A 123M. Straighten steel after galvanizing to achieve specified tolerances.

2.03 SOURCE QUALITY CONTROL

The Steel fabricator shall provide certification of the following to the Testing Agency for their review:

- A. Check steel plates and shapes for conformance to specifications.
- B. Check High-strength threaded fasteners for conformance to the specifications.
- C. Check filler metal for conformance to the specifications.
- D. Determine chemical composition of all steel.
- E. Determine mechanical properties, in accordance with ASTM A370, of the following materials:
 - 1. Steel shapes.
 - 2. Bars and plates.
 - 3. Headed stud type shear connectors.
 - 4. Anchor bolts.
 - 5. High-strength threaded fasteners.
 - 6. Filler metal for welding.
- F. Qualification of shop bolting, welding, and stud welding and personnel:
- G. Inspection of shop welds shall be in accordance with Section 6 of AWS Building Code and as follows:
 - 1. Visual inspection of all shop welds in accordance with Article 605.
 - 2. Ultrasonic testing in accordance with ASTM E164 of all penetration welds.

PART 3 - EXECUTION

3.01 ERECTION

- A. Erect structural steel in accordance with the AISC Specifications for Structural Steel, and the Code of Standard Practice for Steel Buildings and Bridges.
- B. Selection of construction means, methods, techniques, sequences and/or procedures, as well as safety precautions and programs in connection with the Work, are solely the Contractor's rights and responsibilities. As such, any required construction engineering and/or design resulting from these

selections is the responsibility of the Contractor.

1. Temporary supports, such as temporary guys, braces, falsework, cribbing or other elements required for the erection operation will be determined, furnished, and installed by the erector. These temporary supports shall be capable of securing the steel framing, or any partly assembled steel framing, against loads comparable in intensity to those for which the structure was designed, resulting from wind, seismic forces and erection operations.
2. The lifting and erection of pre-assembled elements such as trusses or pre-fabricated framing are considered special erection conditions. The selection of lift points, and erection techniques are the responsibility of the Contractor. Locate and provide sufficient lift points to prevent overstress and/or distortion of any components within the assembly. Provide temporary strong-backs, stiffeners and/or lifting devices as required.
3. Temporary supports of existing framing required to complete modifications and additions as shown in the drawings, are the responsibility of the Contractor. Provide shoring, braces, jacks, etc. as required to complete the work. Engineering and design of the temporary supports shall be performed by a professional engineer, engaged by the Contractor, and registered in the state of the project, with experience in the design of these elements.

C. Column Bases and Bearing Plates:

1. Attached column bases and bearing plates for beams and similar structural members shall be aligned with wedges and shims.
2. Loose column bases which are too heavy to be placed without a derrick or crane shall be set and wedged or shimmed or as noted on the structural drawings.

D. Erection Tolerances:

1. Individual pieces shall be erected so that deviation from plumb, level and alignment shall not exceed that specified in the AISC Code of Standard Practice, nor the following:
 - a. The displacement of the centerline of columns adjacent to elevator shaft, from the established column line, shall be not more than 1 inch at any point.
 - b. The displacement of the centerline of exterior columns, from the established column line, shall be not more than 1 inch toward, nor 2 inches away from the building line at any point.
2. Elements identified on the drawings as AECS are Architecturally Exposed Structural Steel. Erection of these elements shall comply with the Code of Standard Practice for Architecturally Exposed Structural Steel (AECS) including the more restrictive tolerances for erection and appearance and with criteria noted on the drawings.

E. Field Assembly:

1. Structural steel frames shall be accurately assembled to the lines and elevations indicated, within the specified erection tolerances.
2. The Various members forming parts of a complete frame or structure after being assembled shall be aligned and adjusted accurately before being fastened.
3. Fastening of splices of compression members shall be done after the abutting surfaces have been brought completely into contact.
4. Bearing surfaces and surfaces which will be in permanent contact shall be cleaned before the members are assembled.
5. Splices shall be permitted only where indicated.
6. Drift pins shall not be used to enlarge unfair holes in main material. Holes that must be enlarged to admit bolts shall be reamed. Burning and drifting may be used to align unfair holes in secondary members only upon approval of the Architect.
7. Erection bolts used in welded construction may be either tightened securely and left in place or removed and the holes filled with plug welds.
8. Perform bolting and welding operations as specified in 2.02 Fabrication.

F. Gas Cutting: Field correcting of fabrication by gas cutting shall not be permitted on any major member in the structural framing without prior approval of the Architect.

G. Grouting of Base Plates and Bearing Plates: Plates shall be set and anchored to the proper line and elevation. Metal wedges, shims, and/or setting nuts shall be used for leveling and plumbing the structural members, including plumbing of columns. Concrete surfaces shall be rough, and shall be clean and free of oil, grease, and rust. The addition of water and mixing shall be in conformance with

the material manufacturer's instructions. Grout shall be mixed by using a mortar mixer. Batches shall be of size to allow continuous placement of freshly mixed grout. Placing shall be quick and continuous. Exposed surfaces shall have smooth, dense finish.

- H. Field Touch-up Painting: After erection of structural steel, touch-up field welds and abrasions in shop paint coating with same paint used for shop painting. Touch up welds in galvanized steel with a zinc rich paint.

3.02 FIELD QUALITY CONTROL: Testing agency shall perform the following:

- A. Check bracing.
- B. Check location and set of anchor bolts and other inserts.
- C. Prior to attaching steel, check adjustments to fit accuracies.
- D. Qualification of field bolting, welding, and stud welding procedures and personnel.
- E. Inspection of the erected structural framework for conformance with the requirements specified, including alignment, plumb, camber, etc.
- F. Inspection of Field Welds shall be in accordance with Section 6 of the AWS Building Code as follows:
 - 1. Visual inspection of all welds in accordance with Article 605, of AWS.
 - 2. All column-to-base plate field welds shall be inspected by ultrasonic testing in accordance with ASTM E164.
 - 3. All welds that fail shall be re-welded and retested until they pass the test. The cost of the initial test and all further testing on welds that fail shall be borne by the Contractor. All initial weld tests that pass will be paid by the Owner.
 - 4. All full and partial penetration welds shall be tested by ultrasonic testing.
- G. Inspection of high-strength bolted construction shall be in accordance with Section 9, AISC Specifications for Structural Joints, and as follows:
 - 1. Friction Connections
 - a. All high-strength bolted connections shall be visually inspected.
 - b. At least two bolts of every third connection between floor beams and girders shall be checked with a calibrated torque wrench for proper torque.
 - c. At least two bolts of every connection between girders and columns shall be checked as above.
 - d. All bolted connections that fail shall be corrected and all bolts in that connection tests that fail shall be paid by the Owner. The cost of retests on connections that fail shall be borne by the contractor.
 - 2. Bearing Connections
 - a. All high-strength bolted connections shall be visually inspected to ensure that all plies of the connected elements have been brought into snug contact.
- H. Field testing of welded stud shear connectors shall be in accordance with sections 4.29 and 4.30 of the AWS Structural Welding Code, and as follows:
 - 1. Visual inspection shall be made for all studs for proper number and quality of welds. Any studs that do not have a full 360 degree fillet weld shall be tested.
 - 2. In addition to defective studs visually observed, a prescribed pattern of selecting studs for testing shall be followed.
 - a. Any member having more than 20 studs shall have at least two studs tested.
 - b. Members having less than 20 studs shall be tested as a group. Select two studs randomly from each sample of 100 studs to be tested.
 - 3. Testing shall consist of bending the stud to an angle of 30 degrees from its original axis by striking the stud with a hammer.
 - 4. If failure occurs during testing, inspector shall test adjacent studs as required to determine extent of poor welding.
 - 5. Stud replacement or repair shall be in accordance with AWS Structural Welding Code sections 4.29 and 4.30.



END OF SECTION

SECTION 05 30 00

METAL DECKING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Provide Metal Decking work as indicated by the Contract Documents and furnish all supplementary items necessary for its proper installation.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Quality Control – Division 1.
- B. Structural Steel Framing – Section 05 10 00.
- C. Steel Joist and Joist Girder Framing – Section 05 21 00.

1.03 REFERENCES

- A. The work described in this section, unless otherwise noted on the drawings or herein specified shall be governed by the following codes or specifications.
 - 1. "Specifications for the Design of Cold-Formed Steel Structural Members": -AISI.
 - 2. "Code for Welding in Building Construction: - American Welding Society. AWS D1.1.
 - 3. "Basic Design Specifications": - Steel Deck Institute.
- B. These specifications shall be supplemented by the requirements of the Local Building Code.

1.04 QUALIFICATIONS

- A. Qualifications of welders and welding operators, filler metal, welding techniques and procedures shall be in accordance with AISC specification for the Design, Fabrication and Erection of Structural Steel for Buildings, and AWS Code for Welding in Building Construction.
- B. All field welders shall be certified by a testing laboratory employed by the Contractor. Certifications shall be valid during the time of welding in the erection period.

1.05 SUBMITTALS

- A. Shop drawings including erection sequences, procedures, diagrams, schedules and complete details shall be submitted to the Architect for review. Any fabrication of material before review of drawings will be at the risk of the contractor.

1.06 STORAGE OF MATERIAL

- A. Sheets shall be protected from the elements in transit. When stored at site, they shall be raised off the ground, and be provided with weatherproof covering. The Architect reserves the right to reject any material that has become damaged because of improper storage.

PART 2 - PRODUCTS

2.01 METAL DECK MATERIAL

- A. Shall be galvanized conforming to the requirements of ASTM A653 with a minimum yield strength of 33 ksi for roof deck and 50 ksi for composite floor deck.
- B. Type, gauge, depth and finish shall be as specified on the Drawings.
- C. Welding electrodes shall conform to ASTM A233 "Tentative Specifications for Iron and Steel air-

Welding Electrodes", and AWS A 5.1.

- D. Finish: Field welds shall be touched-up as approved using a prime coat conforming to TT-P-64 1D, Type 1.
- E. Accessories: Provide all accessories necessary to complete the entire installation, including cover plates required to cover all gaps where deck units abut or change direction, around columns, and to cover access holes used for welding.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Metal deck shall be installed in accordance with the manufacturer's recommendations. Refer to drawings for welding and attachment requirements.

3.02 OPENINGS

- A. Openings shall be provided where shown on the Drawings, along with any reinforcing required to strengthen the metal deck.
- B. Other openings and reinforcing not shown on Drawings, will be made and reinforced by other trades and are subject to Architect's approval.
- C. The Architect shall be immediately notified of any openings where supplemental framing is required but is not provided.

3.03 HANGING LOADS

- A. Ceilings, mechanical equipment or other loads shall not be hung from metal deck unless shown on the drawings or approved by the Architect. Method of attachment subject to approval.

3.04 FIELD QUALITY CONTROL

- A. The testing agency shall visually inspect the welding and screw attachment pattern for conformance to the Contract Documents.

END OF SECTION

SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes exterior non-load-bearing and load-bearing wall framing and accessories.

1.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions for the geographical location of the project:
 - 1. Design Loads: As follows:
 - a. Wind Loads: Per International Building Code, 2015 ed.
 - 2. Deflection Limits: Design framing systems to withstand without deflections greater than the following:
 - a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height.

1.3 SUBMITTALS

- A. Product Data: For each type of product and accessory indicated.
- B. Shop Drawings: Show layout, spacing, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 - 1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2. Indicate manufacturer engineer's recommendations for connection details, bracing, anchorage, etc. for a structurally complete installation.
- C. Welding certificates.
- D. Product test reports.

1.4 QUALITY ASSURANCE

- A. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements.
- B. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code--Sheet Steel."
- C. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
 - 1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."
- D. Comply with AISI's "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

PART 2 - PRODUCTS

2.1 MATERIALS

- A. A. Manufacturers: Subject to compliance with the requirements, provide load-bearing light gauge framing members as manufactured by one of the following:
 - 1. Cemco
 - 2. Clark Western
 - 3. Dietrich,
 - 4. Marino\Ware

2.2 MATERIALS

- A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so post-consumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.
- B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 - 1. Grade: As required by structural performance.
 - 2. Coating: G90 (Z275) or equivalent.

2.3 EXTERIOR LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0677 inch (1.72 mm).
 - 2. Flange Width: 1-5/8" minimum, or as recommended by the manufacturer's engineer.
 - 3. Depths: 6", 8", and 10", as recommended by the manufacturer's engineer.
 - 4. Spacing: 16" o.c. maximum, or as recommended by the manufacturer's engineer for conditions indicated.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and same minimum base-metal thickness as steel studs.
- C. Vertical Deflection Clips: Manufacturer's standard bypass and head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads.

2.4 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members, unless otherwise indicated.
- B. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

2.5 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035.
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Shims: Load bearing, high-density multi-monomer plastic, non-leaching.
- D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.
- B. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.2 INSTALLATION, GENERAL

- A. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.
- B. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.
- C. Install framing members in one-piece lengths.
- D. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- E. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.
- F. Install insulation, specified in Division 7 Section "Building Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- G. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

- H. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: 16 inches maximum and as indicated if smaller.
- C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single deflection tracks and anchor to building structure.
 - 2. Install double deflection tracks and anchor outer track to building structure.
 - 3. Connect vertical deflection clips to infill studs and anchor to primary building structure.
- E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches (1220 mm) apart. Fasten at each stud intersection.
 - 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches (305 mm) of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - a. Install solid blocking at centers indicated on Shop Drawings.
 - 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable curtain-wall-framing system.

3.4 FIELD QUALITY CONTROL

- A. Testing: If deemed necessary, the Owner may engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 40 00

SECTION 05 50 00
METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes the following metal fabrications:

1. Rough hardware.
2. Loose bearing and leveling plates.
3. Loose steel lintels.
4. Shelf and relieving angles.
5. Bollards
6. Masonry angle lateral bracing.

1.2 DEFINITIONS

- A. Definitions in ASTM E 985 for railing-related terms apply to this section.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for products used in miscellaneous metal fabrications, including paint products and grout.
- C. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other sections.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.
1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions.
 2. Allow for trimming and fitting.

PART 2 - PRODUCTS

2.1 FERROUS METALS

- A. Metal Surfaces, General: For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.
 - B. Steel Plates, Shapes, and Bars: ASTM A 36.
 - C. Steel Tubing: Product type (manufacturing method) and as follows:
 - 1. Hot-Formed Steel Tubing: ASTM A 501.
 - a. For exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A 53.
 - D. Uncoated Structural Steel Sheet: Product type (manufacturing method), quality, and grade, as follows:
 - 1. Hot-Rolled Structural Steel Sheet: ASTM A 570, grade as follows:
 - a. Grade 30, unless otherwise indicated or required by design loading.
 - E. Uncoated Steel Sheet: Commercial quality, product type (method of manufacture) as follows:
 - 1. Cold-Rolled Steel Sheet: ASTM A 366.
 - 2. Hot-Rolled Steel Sheet: ASTM A 569.
 - F. Galvanized Steel Sheet: Quality as follows:
 - 1. Structural Quality: ASTM A 446; Grade A, unless another grade required for design loading, and G90 coating designation unless otherwise indicated.
 - 2. Commercial Quality: ASTM A 526, G90 coating designation unless otherwise indicated.
 - G. Steel Pipe: ASTM A 53; finish, type, and weight class as follows:
 - 1. Black finish, unless otherwise indicated.
 - 2. Galvanized finish for exterior installations and where indicated.
 - 3. Type S, Grade B, standard weight (schedule 40), unless otherwise indicated, or another weight required by structural loads.
 - H. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
 - I. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.
 - J. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the metal alloy to be welded.
- 2.2 GROUT AND ANCHORING CEMENT
- A. Non-shrink Metallic Grout: Premixed, factory-packaged, ferrous aggregate grout complying with CE CRD-C 621, specifically recommended by manufacturer for heavy duty loading applications of type specified in this section.
- 2.3 FASTENERS

- A. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.
- C. Lag Bolts: Square head type, FS FF-B-561.
- D. Machine Screws: Cadmium plated steel, FS FF-S-92.
- E. Wood Screws: Flat head carbon steel, FS FF-S-111.
- F. Plain Washers: Round, carbon steel, FS FF-W-92.
- G. Drilled-In Expansion Anchors: Expansion anchors complying with FS FF-S-325, Group VIII (anchors, expansion, [non-drilling]), Type I (internally threaded tubular expansion anchor); and machine bolts complying with FS FF-B-575, Grade 5.
- H. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class, and style as required.
- I. Lock Washers: Helical spring type carbon steel, FS FF-W-84.

2.4 PAINT

- A. Shop Primer for Ferrous Metal: Manufacturer's or fabricator's standard, fast-curing, lead-free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure complying with performance requirements of FS TT-P-645.
- B. Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint-20.
- C. Zinc Chromate Primer: FS TT-P-645.

2.5 FABRICATION, GENERAL

- A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.
- B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- C. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.
 - 1. Temperature Change (Range): 100 deg F.
- D. Shear and punch metals cleanly and accurately. Remove burrs.

- E. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- F. Remove sharp or rough areas on exposed traffic surfaces.
- G. Weld corners and seams continuously to comply with AWS recommendations and the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.
- H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- I. Provide for anchorage of type indicated, coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
- J. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- K. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.
- L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.6 ROUGH HARDWARE

- A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 sections.
- B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.7 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

2.8 LOOSE STEEL LINTELS

- A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
- B. Weld adjoining members together to form a single unit where indicated.
- C. Size loose lintels for equal bearing of one inch per foot of clear span but not less than 8 inches bearing at each side of openings, unless otherwise indicated.

- D. Galvanize loose steel lintels located in exterior walls.

2.9 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports for applications indicated or which are not a part of structural steel framework, as required to complete work.
- B. Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.
 - a. Except as otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide x 1/4 inch x 8 inches long.
- C. Galvanize miscellaneous framing and supports in the following locations:
 - 1. Exterior locations.
 - 2. Interior locations where indicated.

2.10 SHELF AND RELIEVING ANGLES

- A. Fabricate shelf and relieving angles from steel angles of sizes indicated and for attachment to concrete framing. Provide slotted holes to receive 3/4 inch bolts, spaced not more than 6 inches from ends and not more than 24 inches o.c., unless otherwise indicated.
- B. For cavity walls, provide vertical channel brackets to support shelf/relieving angles from back-up masonry and concrete. Align expansion joints in angles with indicated expansion joints in cavity wall exterior wythe.
- C. Galvanize shelf angles to be installed on exterior concrete framing.

2.11 FIXED BOLLARDS

- A. Basis of Design: Standalone Fixed Bollard Assembly, BDS-M30FB-ST; as manufactured by Barrier Defense Systems.
 - 1. Foundation Requirements:
 - a. Depth: 30 inches (762 mm).
 - b. Concrete: 4500 psi (31026.4 kPa) concrete.
 - c. Rebar: No. 5 bar.
 - 2. Compliance:
 - a. ASTM F2656: M30 P1, 15000 lbs (6804 kg) at 30 mph (48.3 kph), less than 39.37 inch (1.0 m) penetration.
 - b. Welding: Conforms with AWS D1.1 standard.
 - 3. Bollard Height Above Finished Grade: 39 inches (991 mm); concrete topper is acceptable up to an additional 4 inches (102 mm).
 - 4. Maximum Bollard Spacing: As indicated on Drawings.
 - 5. Bollard Tops: Domed cap.
 - 6. Finish: Exterior powder coat, traffic yellow.

2.12 REMOVABLE BOLLARDS

- A. Basis of Design: Standalone Removable Bollard Assembly, BDS-M30RB-ST; as manufactured by Barrier Defense Systems.

1. Foundation Requirements:
 - a. Depth: 30 inches (762 mm).
 - b. Concrete: 4500 psi (31026.4 kPa) concrete.
 - c. Rebar: No. 5 bar.
2. Compliance:
 - a. ASTM F2656: M30 P1, 15000 lbs (6804 kg) at 30 mph (48.3 kph), less than 39.37 inch (1.0 m) penetration.
 - b. Welding: Conforms with AWS D1.1 standard.
 - c. Bollard Height Above Finished Grade: 39 inches (991 mm); concrete topper is acceptable up to an additional 4 inches (102 mm).
 - d. Maximum Bollard Spacing: as indicated on Drawings.
3. Bollard Tops: Domed cap.
4. Finish: Exterior powder coat, traffic yellow.

2.13 FINISHES, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
- B. Finish metal fabrications after assembly.

2.13 STEEL AND IRON FINISHES

- A. Galvanizing: For those items indicated for galvanizing, apply zinc-coating by the hot-dip process compliance with the following requirements:
 1. ASTM A 153 for galvanizing iron and steel hardware.
 2. ASTM A 123 for galvanizing both fabricated and un-fabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch (.076 cm.) thick and heavier.
- B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 1. Exteriors (SSPC Zone 1B): SSPC-SP6 "Commercial Blast Cleaning."
 2. Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning."
- C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finish or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting.
 1. Stripe paint all edges, corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.
- B. Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

3.2 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.
- E. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, and the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

3.3 SETTING LOOSE PLATES

- A. Clean concrete and masonry bearing surfaces of any bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
- B. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.
 - 1. Use metallic non-shrink grout in concealed locations where not exposed to moisture; use nonmetallic non-shrink grout in exposed locations, unless otherwise indicated.
 - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

- A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touch-up of field painted surfaces.
 - 1. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touch-Up Painting: Cleaning and touch-up painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metal is specified in Division 9 Section "Painting" of these specifications.
- C. For galvanized surfaces clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.



END OF SECTION 05 50 00

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
- B.
 - 1. Wood blocking and nailers.

ACTION SUBMITTALS

- C. Product Data: For each type of process and factory-fabricated product.

1.2 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- B. Evaluation Reports: For the following, from ICC-ES:
 - 1. Wood-preserved-treated wood.
 - 2. Fire-retardant-treated wood.
 - 3. Engineered wood products.
 - 4. Shear panels.
 - 5. Power-driven fasteners.
 - 6. Post-installed anchors.
 - 7. Metal framing anchors.

1.3 QUALITY ASSURANCE

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Any qualified manufacturer or supplier complying with the intent of plans and specifications.
- B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.

2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
 3. Dress lumber, S4S, unless otherwise indicated.
- C. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less
- D. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
1. Allowable design stresses, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 DIMENSION LUMBER FRAMING

- A. Framing Other Than Non-Load-Bearing Partitions: refer to structural construction documents
- B. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
 2. Nailers.
- C. Dimension Lumber Items: refer to structural construction documents for grade lumber.

2.3 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.4 FASTENERS

- A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide Type 304 stainless steel fasteners.
- B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- C. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 appropriate for the substrate.

2.5 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.

- B. Adhesives for Gluing Furring to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- D. Install shear wall panels to comply with manufacturer's written instructions.
- E. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- F. Do not splice structural members between supports unless otherwise indicated.
- G. Comply with AWPAC M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- H. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
 - 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
 - 3. ICC-ES evaluation report for fastener.

3.2 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 00

SECTION 06 16 00
SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Wall sheathing.
 - 2. Sheathing joint and penetration treatment.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preserved treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements.

1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For following products, from ICC-ES:
 - 1. Preservative-treated plywood.
 - 2. Fire-retardant-treated plywood.
 - 3. Foam-plastic sheathing.

1.4 Environmental Criteria

- 1. South Coast Air Quality Management District (SCAQMD) Rule 1168.
- 2. Green Seal Standard for Commercial Adhesives GS-36.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory."

2.2 WOOD PANEL PRODUCTS

- A. Emissions: Products shall meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Certified Wood: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
 - 1. Plywood.
 - 2. Oriented strand board.
 - 3. Particleboard underlayment.
 - 4. Hardboard underlayment.
- C. Plywood: DOC PS 1.
- D. Oriented Strand Board: DOC PS 2.

2.3 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2 for interior construction, Use Category UC3b for exterior construction.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat all plywood unless otherwise indicated.

2.4 FIRE-RETARDANT-TREATED PLYWOOD

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
 - 1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
 - 2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
- C. Kiln-dry material after treatment to a maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

- E. Application: Treat all plywood unless otherwise indicated.

2.5 WALL SHEATHING

- A. Plywood Wall Sheathing: Exposure 1 sheathing.
- B. Oriented-Strand-Board Wall Sheathing: Exposure 1 sheathing.
- C. Paper-Surfaced Gypsum Wall Sheathing: ASTM C 1396/C 1396M, gypsum sheathing; with water-resistant-treated core and with water-repellent paper bonded to core's face, back, and long edges.
1. Type and Thickness: Regular, 1/2 inch (13 mm), Type X, 5/8 inch (15.9 mm) thick.
- D. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.
1. Fiberglass-Mat Faced Gypsum Sheathing: ASTM C1177:
- a. Thickness: 1/2 inch.
 - b. Width: 4 feet.
 - c. Length: 8 feet.
 - d. Weight: 1900 pounds per M square feet.
 - e. Edges: Square.
 - f. Surfacing: Coated fiberglass mat on face, back, and long edges.
 - g. Racking Strength (Ultimate, not design value) (ASTM E72): Not less than 540 pounds per square foot, dry.
 - h. Flexural Strength, Parallel (ASTM C473): 80 lbf, parallel.
 - i. Humidified Deflection (ASTM C1177): Not more than 1/4 inch.
 - j. Permeance (ASTM E96): 23 perms.
 - k. R-Value (ASTM C518): 0.56.
 - l. Acceptable Products:
 - a. 1/2 inch DensGlass Gold, Georgia-Pacific Gypsum.
2. Fire-Rated Fiberglass-Mat Faced Gypsum Sheathing: ASTM C1177, Type X:
- a. Thickness: 5/8 inch.
 - b. Width: 4 feet.
 - c. Length: 8 feet.
 - d. Weight: 2500 pounds per M square feet.
 - e. Edges: Square.
 - f. Surfacing: Coated fiberglass mat on face, back, and long edges.
 - g. Racking Strength (Ultimate, not design value) (ASTM E72): Not less than 654 pounds per square foot, dry.
 - h. Flexural Strength, Parallel (ASTM C1177): 100 lbf, parallel.
 - i. Humidified Deflection (ASTM C1177): Not more than 1/8 inch.
 - j. Permeance (ASTM E96): Not more than 12 perms.
 - k. R-Value (ASTM C518): 0.67.
 - l. Acceptable Products:
 - a. 5/8 inch DensGlass Gold Fireguard, Georgia-Pacific Gypsum.
- E. Cementitious Backer Units: ASTM C 1325, Type A.
1. Thickness: As indicated.
- F. Extruded-Polystyrene-Foam Wall Sheathing: ASTM C 578, Type IV, with tongue-and-groove or shiplap long edges.

1. Thickness: As indicated.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roof and wall sheathing, provide fasteners of Type 304 stainless steel.

2.7 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Glass-Mat Gypsum Sheathing: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for application indicated and complying with requirements for elastomeric sealants specified in Division 07 Section "Joint Sealants."

- B. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches (50 mm) wide, 10 by 10 or 10 by 20 threads/inch (390 by 390 or 390 by 780 threads/m), of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

- C. Sheathing Tape for Foam-Plastic Sheathing: Pressure-sensitive plastic tape recommended by sheathing manufacturer for sealing joints and penetrations in sheathing.

2.8 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Framing: Formulation complying with ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

1. Adhesives shall have a VOC content of **50** g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
 - 3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's "International Residential Code for One- and Two-Family Dwellings."
- D. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.2 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to cold-formed metal framing with screws.
 - 2. Install boards with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
 - 3. Install boards with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Seal sheathing joints according to sheathing manufacturer's written instructions.
 - 1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
 - 2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

3.3 CEMENTITIOUS BACKER UNIT INSTALLATION

- A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

3.4 FOAM-PLASTIC SHEATHING INSTALLATION

- A. Comply with manufacturer's written instructions.
- B. Foam-Plastic Wall Sheathing: Install vapor-relief strips or equivalent for permitting escape of moisture vapor that otherwise would be trapped in stud cavity behind sheathing.
- C. Apply sheathing tape to joints between foam-plastic sheathing panels and at items penetrating sheathing. Apply at upstanding flashing to overlap both flashing and sheathing.

END OF SECTION 06 16 00

SECTION 07 21 00
THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Foam-plastic board insulation.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product test reports.
- C. Research/evaluation reports.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. DiversiFoam Products.
 - b. Dow Chemical Company (The).
 - c. Owens Corning.
 - d. Pactiv Building Products.
 - 2. Required equivalent R value for this project shall be R-30 minimum as indicated in the construction documents.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.2 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- C. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
 - 5. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

END OF SECTION 07 21 00

SECTION 07 27 26
FLUID-APPLIED WEATHER BARRIERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Fluid-applied, vapor permeable weather barrier membrane.
- B. Joint Treatment:
 - 1. Joint Tape.
 - 2. Joint Compound.
- C. Flashing:
 - 1. Vapor Permeable Fluid-Applied Elastomeric Flashing.
 - 2. Sheet Flashing.
- D. Sealant.
- E. Primers for flexible flashing and sheet flashing.

1.2 REFERENCES

- A. ASTM International
 - 1. ASTM C 1250 – Standard Test Method for Nonvolatile Content of Cold Liquid-Applied Elastomeric Waterproofing Membranes.
 - 2. ASTM D 412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension.
 - 3. ASTM D 2240 – Standard Test Method for Rubber Property – Durometer Hardness.
 - 4. ASTM D 4541 – Standard Test Method for Pull-off Strength of Coatings Using Portable Adhesion Testers.
 - 5. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 6. ASTM E 96 - Test Method for Water Vapor Transmission of Materials
 - 7. ASTM E 283 – Standard Test Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences Across the Specimen.
 - 8. ASTM E 331 – Standard Test Method for Water Penetration of Exterior Windows, Skylight, Doors and Curtain Walls by Uniform Static Air Pressure Differences.
 - 9. ASTM E 779 – Standard Test Method for Determining Air Leakage Rate by Fan Pressurization.
 - 10. ASTM E 783 – Standard Test Method for Field Measurement of Air Leakage through Installed Exterior Windows and Doors.
 - 11. ASTM E 1105 – Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
 - 12. ASTM E 1186 – Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems.
 - 13. ASTM E 1677 - Specification for Air Retarder Material or System for Framed Building Walls.

14. ASTM E 2178 – Standard Test Method for Air Permeance of Building Materials
15. ASTM E 2357 – Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.
16. ASTM G155 – Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials.
17. ASTM C 1305 – Standard Test Method for Crack Bridging Ability of Liquid-Applied Waterproofing Membrane.

B. AATCC – American Association of Textile Chemists & Colorists

1. Test Method 127 Water Resistance: Hydrostatic Pressure Test.

C. TAPPI

1. Test Method T-460; Air Resistance of Paper (Gurley Hill Method).

1.3 SUBMITTALS

A. Refer to Section 01 33 00 Submittal Procedures.

B. Product Data: Submit manufacturer's current technical literature for each component.

C. Quality Assurance Submittals:

1. Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements.
2. Manufacturer Instructions: Provide manufacturer's written installation instructions.
3. Manufacturer's Field Service Reports: Provide site reports from authorized field service representative, indicating observation of weather barrier system installation.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Installer shall have experience with installation of commercial fluid-applied weather barrier assemblies under similar conditions.
2. Installer shall be trained and certified for installation by manufacturer.

B. Installation shall be in accordance with manufacturer's installation guidelines and recommendations.

C. Source Limitations: Provide weather barrier and accessory materials produced by single manufacturer.

D. Mock-up:

1. Install mock-up using approved weather barrier system including membrane, flashing, joint and detailing compound and related weather barrier accessories according to weather barrier manufacturer's current printed instructions and recommendations.
 - a. Mock-up size: 10 feet by 10 feet.
 - b. Mock-up Substrate: Match wall assembly construction, including window opening.
 - c. Mock-up may remain as part of the work.

2. Contact manufacturer's designated representative prior to weather barrier system installation, to perform required mock-up visual inspection and analysis as required for warranty.

E. Pre-installation Meeting

1. Hold a pre-installation conference, two weeks prior to start of weather barrier installation. Attendees shall include Contractor, Architect, certified installer, Owner's Representative, and weather barrier manufacturer's designated field representative.
2. Review all related project requirements and submittals, status of substrate work and preparation, areas of potential conflict and interface, availability of weather barrier system materials and components, installer's training requirements, equipment, facilities and scaffolding, and coordinate methods, procedures and sequencing requirements for full and proper installation, integration and protection.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Refer to Section 01 60 00 Product Requirements.
- B. Deliver weather barrier materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Store weather barrier materials as recommended by manufacturer.

1.6 SCHEDULING

- A. Review requirements for sequencing of installation of weather barrier system with installation of windows, doors, louvers and flashings to provide a weather-tight barrier system.
- B. Schedule installation of exterior cladding within nine months of weather barrier system installation.

PART 2 - PRODUCTS

2.1 WEATHER BARRIER

- A. Manufacturer: DuPont Building Innovations; 4417 Lancaster Pike, Chestnut Run Plaza 728, Wilmington, DE 19805; 1.800.44TYVEK (8-9835); <http://weatherization.tyvek.com>
 1. Description: A single-component, low VOC, 25 mil thick synthetic polymer fluid-applied product with superior elasticity and flexibility providing resistance to air flow, bulk water and wind driven rain yet allows moisture vapor to escape.
 2. Basis of Design: DuPont™ Tyvek® Fluid Applied WB System; including DuPont™ Tyvek® Fluid Applied WB, DuPont™ Tyvek® Fluid Applied Flashing and Joint Compound, DuPont™ Tyvek® Fluid Applied Flashing – Brush Grade and DuPont™ Sealant for Tyvek® Fluid Applied Systems.
- B. Performance Characteristics:
 1. Air Penetration Resistance (Material):
 - a. 0.0002 cfm/ft² at 75 Pa, when tested in accordance with ASTM E 2178.

- b. Air infiltration greater than 10,000 seconds per 100cc, when tested in accordance with TAPPI Test Method T-460.
 2. Air Penetration Resistance (System / Assembly):
 - a. ≤ 0.01 cfm/ft² at 75 Pa, when tested in accordance with ASTM E 2357.
 - b. ≤ 0.01 cfm/ft² at 75 Pa, Type I Air Barrier, when tested in accordance with ASTM E 1677.
 3. Water Vapor Transmission: 25 perms, when tested in accordance with ASTM E 96, Method B at 25 mils DFT (Dry Film Thickness).
 4. Water Penetration Resistance: Greater than 1000 cm when tested in accordance with AATCC Test Method 127. No leakage at 15 psf when tested in accordance with ASTM E 331.
 5. Tensile Strength: Minimum 169 lbs/in², when tested in accordance with ASTM D 412.
 6. Estimated Elongation: 420% in accordance with ASTM D 412.
 7. Hardness: Passes at a Shore A hardness of 71, when tested in accordance with ASTM D 2240.
 8. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E 84. Flame Spread: 25, Smoke Developed: 25.
 9. UV Resistance: 9 months
 10. Volatile Organic Content (VOC): Less than 2% (25-30 g/L) when measured in accordance with ASTM C 1250.
 11. Adhesion Strength (Concrete): Greater than 33 psi when measured in accordance with ASTM D 4541.
 12. Low Temperature Crack Bridging: Pass, when tested in accordance with ASTM C 1305.

2.2 ACCESSORIES

- A. Joint Treatment:
 1. Joint Tape:
 - a. Product: Self-adhered fiberglass mesh tape as recommended by weather barrier manufacturer.
 2. Joint Compound: Fluid-applied, vapor permeable, elastomeric flashing material; trowel applied.
 - a. Product: DuPont™ Tyvek® Fluid Applied Flashing and Joint Compound
- B. Flashing:
 1. Vapor permeable fluid-applied elastomeric flashing:
 - a. Product: DuPont™ Tyvek® Fluid Applied Flashing and Joint Compound.
 2. Sheet flashing with butyl adhesive layer.
 - a. Product: DuPont™ StraightFlash™.
- C. Sealant: Elastomeric; non-vapor permeable sealant; compatible with weather barrier.
 1. Product: DuPont™ Sealant for Tyvek® Fluid Applied Systems.
- D. Primers for flexible flashing and sheet flashing:
 1. Provide flashing manufacturer recommended primer to assist in adhesion between substrate and flashing.
 2. Products:
 - a. 3M High Strength 90

- b. Denso Butyl Spray

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories.

3.2 PREPARATION

- A. Complete surface preparation, priming, flashing and detailing of openings, cracks, and material transitions prior to beginning installation of fluid-applied weather barrier system.
- B. Surfaces shall be clean and free of frost, oil, grease, mold and efflorescence prior to application of fluid-applied weather barrier system.

3.3 INSTALLATION - DETAILING

- A. Corners: Apply primer to outside and inside corners, extend 2 inches on each side of corner. Center sheet flashing over corner and press firmly in place per manufacturer's recommendations.
- B. Joint treatment:
 - 1. Sheathing:
 - a. Joints shall be prepared per manufacturer's approved joint treatment details.
 - b. Apply joint tape as recommended by fluid-applied weather barrier manufacturer.
 - 1) No joint treatment required for joints up to 1/16 inch.
 - 2) Joints 1/16 to 1/4 inch: Fluid-applied joint compound applied to form a 1 inch width on each side of sheathing joint; smooth joint compound across sheathing joint. Thickness shall be 15 to 25 mils.
 - 3) Joints 1/16 to 1/2 inch: Apply joint tape to bridge both sides of joint equally. Apply fluid-applied joint compound and trowel smooth embedding joint compound uniformly into joint tape to form a 1 inch width on each side of sheathing joint at a consistent thickness of 15 to 25 mils.
 - 4) Joints 1/2 to 1 inch: Apply sheet flashing primer above and below sheathing joint. Center sheet flashing over sheathing joint and press firmly in place per manufacturer's recommendations.
 - 2. Non-movement joints in masonry and transitions to columns and beams:
 - a. Joints 1/4 inch wide or less: Apply fluid-applied joint compound a minimum of 2 inches wide by 60 mils thick to each side of joint or crack.
 - b. Joints 1/4 to 1/2 inch: Apply primer 2 inches on each side of joint. Center sheet flashing over joint and press firmly in place per manufacturer's recommendations.
- C. Apply fluid-applied joint compound to cladding anchors prior to installation of weather barrier membrane per manufacturer's instructions.

- D. Apply fluid-applied joint compound around penetrations in exterior walls forming a fillet bead minimum ½ inch onto each surface.
- E. Installation – Vapor permeable fluid-applied elastomeric flashing at openings:
 - 1. At jambs and head of rough opening: Apply 25 mil thickness of fluid-applied flashing to full depth of opening and 2 inches onto outside face of opening.
 - 2. At sills: Apply primer to substrates as recommended by manufacturer. Cut sheet flashing to fit directly between jambs of opening. Install sheet flashing to full width of sill opening and down onto outside face of opening a minimum of 2 inches. Cover sheet flashing with 25 mil thickness of vapor permeable fluid-applied elastomeric flashing per fluid-applied weather barrier manufacturer's instructions.
- F. Allow Fluid-Applied Flashing, Joint Compound and Sealant to cure for minimum 24 hours before coating with Fluid-applied Weather Barrier.

3.4 INSTALLATION - FLUID-APPLIED WEATHER BARRIER

- A. Install fluid-applied weather barrier prior to installation of windows, doors, and louvers.
- B. Mask and protect any adjacent finished surfaces from fluid-applied weather barrier material.
- C. Install fluid-applied weather barrier over exterior face of required exterior wall substrates in accordance with weather barrier manufacturer recommendations and instructions.
- D. Install fluid-applied weather barrier by power-rolling method to achieve 25 mils providing a consistent and uniform thickness.
- E. Repair any voids, holidays, or non-uniform installations or damage by other trades to proper mil thickness prior to installation of final cladding assemblies.

3.5 FIELD QUALITY CONTROL

- A. Notify weather barrier manufacturer's designated representative to obtain periodic observations of weather barrier system installation.
- B. Inspections: Weather barrier materials, accessories, and installation are subject to inspection for compliance with performance requirements.
- C. Weather barriers assemblies will be considered defective upon failure of inspections and specific project testing required.
 - 1. Apply additional fluid-applied weather barrier material, in accordance with manufacturer's instructions, where inspection results indicate insufficient thickness, voids, skips, pinholes or other defects as recommended by weather barrier manufacturer.
 - 2. Remove and replace deficient weather barrier system components for retesting as specified above.
- D. Repair damage to weather barriers caused by destructive testing; follow manufacturer's written instructions.

3.6 PROTECTION AND CLEANING

- A. Protect weather barrier from contact with incompatible materials and sealants not approved per weather barrier manufacturer's recommendation.
- B. Protect installed weather barrier system from damage during construction prior to cladding installation.
 - 1. If damaged or exposed to UV beyond nine (9) months, clean and prepare surfaces and install additional, full-thickness, fluid-applied weather barrier application in accordance with weather barrier manufacturer's instructions.
- C. Remove masking materials and adjacent protection after weather barrier installation.

END OF SECTION 07 27 26

SECTION 07 41 15
METAL WALL AND SOFFIT PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes preformed, prefinished metal wall and soffit panels.

1.2 REFERENCES

- A. American Society for Testing Materials (ASTM): Latest editions of applicable standards for materials indicated.

1.3 SYSTEM DESCRIPTION FOR WALL PANELS

- A. Concealed fastener metal wall panels as part of the assembly described below.
- B. Metal Wall Panels over Multi-Component Framed Wall System:
 - 1. Single-skin concealed fastener metal wall panels applied as exterior rainscreen cladding over wall framing specified in Division 05 Section "Cold-Formed Metal Framing" with exterior sheathing specified in Division 06 Section "Sheathing", an applied membrane that provides air, moisture, and water vapor control specified in Division 07 Section "Air Barriers", and insulation within the framing specified in Division 07 Section "Thermal Insulation". Metal wall panel installation specified in this Section includes [secondary metal subgirt framing and] mounting clips for panel attachment.
 - 1. Air, moisture, and water vapor control membrane is provided under Division 07 Section "Air Barriers."

1.4 PERFORMANCE REQUIREMENTS

- A. General:
- B. Air Infiltration: Maximum 0.06 cfm/sq. ft. (0.3 L/s per sq. m) per ASTM E 283 at a static-air-pressure difference of 1.57 lbf/sq. ft. (75 Pa), using minimum 10-by-10 foot (3050-by-3050 mm) test panel that includes side joints.
- C. Water Penetration, Static Pressure: No uncontrolled water penetration per ASTM E 331 at a minimum static differential pressure of 6.24 lbf/sq. ft. (299 Pa), using minimum 10-by-10 foot (3050-by-3050 mm) test panel that includes side joints.
- D. Structural Performance: Provide metal wall panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated, per ASTM E 72:
 - 1. Wind Loads: Determine loads based on uniform pressure, importance factor, exposure category, and basic wind speed indicated on drawings.
 - 2. Limits of Deflection: Metal wall panel assembly shall withstand scheduled wind pressure with the following allowable deflection:
 - a. Maximum allowable deflection limited to L/180 deflection of panel perimeter normal to plane of wall with no evidence of failure.

3. Secondary Metal Framing: Design secondary metal framing for metal wall panel assembly according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."

1.5 THERMAL MOVEMENTS

- A. Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction.

1.6 SUBMITTALS

- A. Product Data: Submit duplicate copies of manufacturer's product information including installation instructions for each required materials.
- B. Samples: Submit duplicate samples of manufacturer's materials for profile and finish verification and approval.

1.7 QUALITY ASSURANCE

- A. Provide metal wall panels and soffit panels and panel accessories from a single manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials and accessories to site in manufacturer's original unopened packages, with labels intact, legible and identifying manufacturer and product name, grade and color on each package.
- B. Store materials inside in a dry and ventilated space, protected from damage; comply with manufacturer's recommendations.

1.9 WARRANTY

- A. Submit manufacturer's standard written 20-year warranty covering factory applied finish and quality of materials.
- B. Submit joint Contractor/Application's written two-year warranty covering workmanship and weathertightness. Warranty is to cover all labor and materials for repair calls made on the project within the two year period after issuance of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide products complying with requirements equal to those manufactured by one of the following:
 1. McElroy Metal, Bossier City, Louisiana (800) 562-3576
 2. CENTRIA, Moon Township, PA (800) 759-7474
- B. Request for substitutions will be considered in accordance with provisions of Section 01 25 00 and 01 25 19.

2.2 MATERIALS

- A. Steel for Painting/Coating: Hot-dip zinc coated steel sheet, ASTM 792-AZ50, Grade 50, except as otherwise indicated, G90 zinc coating, surface treated for maximum coating performance.

2.3 FABRICATED METAL WALL PANELS

- A. Preformed Metal Panels:
 - 1. Horizontal Metal Panels (as indicated on drawings – RE: A2.01 and A2.02).
 - a. 24 gauge, panel to be installed horizontally as a concealed fastener system as a hook and cleat interlocking panel.
 - b. Basis of Design is McElroy Metal, Wave – concealed fastener wall panel.
 - c. Panel Coverage: 16 inches.
 - d. Panel Height: 0.75 inch.
 - 2. Vertical Metal Panels (as indicated on drawings – RE: A2.01 and A2.02).
 - a. 22 gauge, panel to be installed vertically as a concealed fastener system.
 - b. Basis of Design is McElroy Metal, Marquee-Lok – concealed fastener wall panel.
 - c. Panel Coverage: 12 inches.
 - d. Panel Height: 1 inch.
- B. Metal Soffit Panel:
 - 1. Description: 24 gauge, prefinished steel panels, 12" wide, nominal.
 - 2. Color: As selected by the Architect from the manufacturer's full range of colors including metallic colors.
 - 3. Style: Equal to: "McElroy" – MCP (McElroy Canopy Panel)
 - a. "MBCI" - Artisan I, Liz
 - b. "Berridge" – Thin-line Panel
 - c. "Petersen" - Flush Panel
 - 4. Fastening: Concealed.

2.4 ACCESSORIES

- A. Accessories:
 - 1. Subgirts ½": Hat or zee shaped and formed from G-90 (1.25 oz.) coated steel in 16 or 18 gauge. Subgirts shall be located at each structural support and not more than 16".
 - 2. Fasteners: Shall be a self-tapping #14 Type A for sheet-to-sheet and self-tapping #14 Type B for sheet-to-structural steel. Fasteners shall be cadmium plated or stainless steel with metal and neoprene bonded washer; color coated to match metal panels.
 - 3. Flashing: Factory formed from the same substrate gauge and finish as the wall panels.
 - 4. Closures: Made from closed cell pre-molded neoprene or polyethylene foam or metal and provided where required to seal ends of panel corrugations.
- B. Provide other accessories as needed for a complete installation including trim, copings, fascia, gravel stops, mullions, sills, flashing, corner units, clips, seam closures, battens, gutters, downspouts, louvers, gaskets, sealants and similar items.

2.5 FABRICATION

- A. Fabricate and finish panels and accessories at factory to the greatest extent possible to required profile and dimensional requirements.
- B. Apply 20-year finish to exterior panels using one of the following topcoats:
 - 1. Fluoropolymer Coating: Baked on coating system utilizing Kynar 500 resins with dry film thickness .70 mil for topcoat.
 - 2. Polyester Coating: Dry film thickness of .70 mil for topcoat.
 - 3. Silicone-Modified Acrylic Coating: Dry film thickness of .70 mil for topcoat.
- C. Strippable Film: Supply prefinished panels with factory applied protective film. Film shall be removed immediately after panel installation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Before starting work, verify governing dimensions at building; examine, clean, repair, if necessary, any adjoining work on which this work in any way is dependent for its proper installation.

3.2 INSTALLATION

- A. Comply with manufacturer's instructions for anchorage, joint sealers, flashing and trim for the proper and permanent installation of panels with provisions for thermal expansion, erected in panel pattern indicated.
- B. Separate aluminum sheets from contact with wood, masonry and steel (structure, panels or fasteners) by either a 15 mil coating of fibrated asphalt paint or by tapes or gaskets of type recommended by panel manufacturer. Except as otherwise recommended by the manufacturer, fasten aluminum work with non-magnetic stainless steel fasteners, gasketed where needed for waterproof or vapor proof performance.
- C. Items not covered in this specification or special details required to complete the installation whether or not shown on the Drawings shall be a part of the contract.

3.3 ADJUSTING/CLEANING

- A. Upon completion (general roofing, installation, cleaning) contractor shall clean all exterior and interior metal panels; wash down if necessary to remove fingerprints and soiled areas, remove all scrap materials.
- B. Replace any metal panels damaged during construction activities.

END OF SECTION 07 41 15

SECTION 07 61 130
STANDING SEAM SHEET METAL ROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes preformed roof panels including flashings, trim and matching accessories.

1.2 RELATED SECTIONS

- A. Section 06 10 00: Rough Carpentry
- B. Section 07 92 00: Joint Sealants

1.3 REFERENCES

- A. SMACNA (Sheet Metal and Air Conditioning Association, Inc.): Architectural Sheet Metal Manual.
- B. NRCA (The National Roofing Contractors Association): Roofing and Waterproofing Manual (including Construction Details), and Handbook of Accepted Roofing Knowledge.
- C. Manufacturer's Handbook of Construction Details.

1.4 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's descriptive literature and data.
 - 2. Manufacturer's standard color chart.
- B. Shop Drawings:
 - 1. Submit small scale layout of roof plan, indicating the extent of work to be performed. Include cut through sections of roof, fascia, walls, siding, and soffits, for each condition, detailing flashings and trims for various conditions, such as edge, outside/inside corners, ridge, valleys, gutters, end wall terminations, closures, etc., to provide a full and complete installation.
 - 2. Distinguish between factory furnished and field-assembled work.
- C. Samples: Submit 2'0" long sample panel indicating the metal, gauge, color, texture, and finish proposed. Include batten and enough of standing edge to fully illustrate panel joint.

1.5 QUALITY ASSURANCE

- A. Installation: By a roofing contractor with a minimum of five years experience with this type of construction, and with documentation indicating successful completion of contracts for projects of similar size, scope, and materials.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Unload panels by hand to prevent damage. Do not use forklifts.
- B. Inspect delivered materials; file freight claim for panels damaged during shipment, and order replacement panels without delay. Do not install damaged panels.
- C. Store materials on pallets and protect from damage. Prevent interference to/by other trades, and any other adverse job conditions.

1.7 WARRANTY

- A. Submit manufacturer's written 20 year standard finish warranty, providing for non-prorated material and replacement cost. Panels shall be warranted by the manufacturer for 20 years against rupture and perforation.
- B. Provide installer's written warranty for two years from the date of final completion and acceptance, guaranteeing materials and workmanship for watertightness, weathertightness, and against all leaks. During the two years period, the installer shall fix all leaks without any cost to the owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide products complying with requirements equal to those of the following:
 - 1. MBCI, Dallas, Texas (800) 653-6224
 - 2. Berridge Manufacturing Co., San Antonio, Texas (800) 231-8127
 - 3. Petersen Aluminum Corporation, Tyler, Texas (800) 441-8661
 - 4. McElroy Metal, Bossier City, Louisiana (318) 773-5699
- B. Request for substitutions will be considered in accordance with provisions of Section 01630.

2.2 MATERIALS

- A. Panels: 24 gauge G-90 hot-dipped galvanized steel, ASTM A-446 Grade C, 40 KSI yield point. Nominal width 24" with 2" nominal standing edges.
- B. Mechanically field seamed, vertical leg standing seam metal roof system designed for concealed mechanical attachment of panels to roof substrate/deck/structural framing/purlins/etc.
 - 1. Style: Equal to; MBCI – Double-Lok (24"), or McElroy - Master-Lok-FS (24")
 - 2. Texture: Smooth striated.
 - 3. Color: To be selected by Architect from manufacturers' full range of standard and special colors with emphasis on cool roofs/energy star approved/etc. options.

2.3 FABRICATION

- A. Panel Construction: Uniformly dimensioned, roll-formed to exact lengths to avoid field-cutting. The panel systems shall be anchored as recommended by the manufacturer. All fasteners shall be concealed.
- B. Flashings and Trim: All exposed standard or special flashings, trim, and such other brake-formed shapes like ridge caps, valleys, eave/sill flashings, copings, etc. shall be either factory or field-formed in 24 gauge steel in finish and color to match the panels furnished with strippable protective coating.
- C. Accessories such as clips, closures, fasteners, etc. shall be as recommended by the manufacturer. Note: Provide clips with bearing plate for use with 2" insulation board over metal deck.

2.4 FACTORY FINISHING

- A. Provide one of the following:
 - 1. Full strength 70% Kynar 500 fluorocarbon (polyvinylidene fluoride, PVF) baked-on coating, factory-applied prior to roll-forming. The treatment shall be a two-coat system: A single coat of corrosion-resistant epoxy-base primer followed by a finish coat of 70% Kynar: film thickness of

- 1.0 mil + 0.2 mil. The reverse side of the panels shall be treated with an epoxy-base primer, followed by a washcoat.
2. Single coat of siliconized polyester baked on over a layer of epoxy-base corrosion-resistant primer on the finish side with a single coat primer and washcoat on the underside. Film thickness 1.0 mil. + 0.2 mil.
 3. Manufacturer's standard coating system supporting 20-year warranty

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify substrate is uniform, even and symmetrical. Inspect to assure that all purlins or structural framing members are flat, so when the metal panel is applied, it will not appear wavy or distorted.
- B. Provide written report of discrepancies or variations in the substrate.
- C. Do not begin installation until unsatisfactory conditions are corrected.
- D. Beginning of installation shall signify acceptance of substrate and adjacent conditions as being proper and acceptable.

3.2 INSTALLATION

- A. The metal panel system shall be installed plumb, level, and straight over a layer of roof underlayment with a minimum 6" for horizontal lap and 12" for end lap.
- B. The standing seam shall be equidistant and shall align from corners, hips, valleys, mullions, and columns in accordance with architectural design parameters as shown on the Drawings.
- C. Installation shall be made in accordance with manufacturer's recommended procedures and layout drawings. Manufacturer's Handbook of Construction Details and NRCA Roofing and Waterproofing Manual and Handbook of Roofing Knowledge shall be used as guides and for details wherever applicable.
- D. All sheet metal work shall conform to standards set forth in the SMACNA architectural sheet metal manual.
- E. No face penetrations or perforations shall be made in metal panels by fasteners without architect's prior approval. Fasteners shall be concealed as provided by the manufacturer.
- F. End lap all flashings and trim at least 3"; Soldered areas shall be counter flashed or painted to match.
- G. Exercise proper care during installation to avoid damage or scratching of the panels. Avoid walking over the metal roof after installation is completed.

3.3 FIELD QUALITY CONTROL

- A. Before authorizing fabrication by the manufacturer, the contractor shall take field measurements of the structure and substrates indicated and specified to ensure that panel lengths and brake-formed flashings and their stretchouts are dimensioned accurately to facilitate easy installation. Fabrication shall not be authorized until field conditions have been verified. Allow for sufficient trimming of panel units where final dimensions cannot be established prior to fabrication.

3.4 CLEANING AND PROTECTION

- A. Peel off any strippable film on flashings as they are installed.
- B. Fully sweep newly installed roof sections at the end of each work day to remove metal trimmings, shavings, and other installation debris.
- C. Only minor scratches and abrasions shall be allowed to be touched up. Any other damage material shall be replaced.
- D. Leave work areas clean and remove all debris resulting from work of this Section.

END OF SECTION 07 61 13

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes flashings, counter flashings, copings, cover caps, fascias, clips, drips, and reglets.

1.2 RELATED SECTIONS

- A. Section 04 20 00 – Unit Masonry.
- B. Section 07 92 00 - Joint Sealers.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM) Standards: As listed hereinafter by Designation numbers.
- B. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA): Architectural Sheet Metal Manual, latest edition.

1.4 SUBMITTALS

- A. SHOP DRAWINGS: Include complete erection layouts, details, materials, installation instructions, and name and type of thru-wall flashing.
- B. Twenty (20) year Pre-Finished Metal Warranty.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Galvanized Sheet Steel: Minimum 22-gauge, conforming to ASTM A-526 commercial quality with ASTM A 525 G 90 coating designation.
 - 1. Locations:
 - a) Flashing required which will not be apparently visible in the building elevations.
 - b) Including but not limited to: Metal clips, Two piece metal flashing, Metal cleats, Counter flashing and Cap flashing.
- B. Prefinished Galvanized Sheet Steel: Minimum 22 gauge flat stock, prefinished with Kynar 500 or Hylar 5000 finish meeting ASTM-A-446, forty-five and one-half inches to forty-eight inches width by one hundred twenty inches in length (45-1/2" - 48" x 120").
 - 1. Color: As selected by the Architect from Manufacturer=s custom colors.
 - 2. Location:
 - a) Metal Fascia, Metal Flashing, Metal Counter Flashing, Metal Coping, Metal Gutters and Downspouts, Metal Cap Flashing, Metal Clips (which are visible in building elevations) and Metal AGravel= Stops
- C. Stainless Steel: QQ-S-766, Class 301, 302, 304, or 316; or ASTM-A-167, Type 301, 302, 304, or 316, form and condition most suitable for the purpose.
- D. Flashing: Base, Thru-Wall, Parapet, Door Head and Windows; 5oz. Laminated Copper Fabric Flashing; acceptable manufacturers: Advanced Building Products, Inc. and Hohmann & Barnard, Inc.
 - 1. Two layers of dense glass fabric and asphalt laminated to copper core.

2. 36" width rolls
 3. Provide appropriate termination bars, masonry reglets and fasteners as required by manufacturer.
- E. Solder: QQ-S-571 composition best suited for purpose; use high tin content, minimum 60/40, for stainless steel and monel alloy.
- F. Vinyl Flashing: PVC with plasticizers and modifiers, formed into a 20-mil flexible sheet. flashing
- G. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of work, matching or compatible with material being installed, non-corrosive, size, and gauge required for performance.
- H. Fasteners: Same metal as flashing/sheet metal, or other non-corrosive metal as recommended by sheet manufacturer and SMACNA. Match finish of exposed heads with material being fastened. Provide hot-dip galvanized roofing nails for nail fastening.

2.2 FABRICATION

- A. Provide fabrications meeting the following requirements:
1. Flashings, Counterflashings, Fascia: .0271" minimum thickness galvanized metal.
 2. Copings and Cover Caps: .0276" minimum thickness galvanized metal.
 3. Cleats and Clips: .0276" minimum thickness galvanized metal. Furnish expansion joints with 6" wide back-up plates of same contour, except bend lower edge to form stop attachment clip.
- B. Fabricate sheet metal with flat-lock seams; if required by manufacturer, solder with type solder and flux, where required for strength, rivet seams and joints.
- C. Coat back-side of fabricated sheet metal with 15-mil sulfur-free bituminous coating, FS TT-C-494 or SSPC-Paint 12, where required to separate metals from corrosive substrates including cementitious materials, wood or other absorbent materials; or provide other permanent separation.
- D. Provide for thermal expansion of running sheet metal work by overlaps or expansion joint in fabricated work. Where required for water-tight construction, provide hooked flanges filled with polyisobutylene mastic for 1" embedment of flanges. Conceal expansion provisions where possible.
- E. Provide splice/drainage plates under all joints in parapet coping flashing. Fabricate with hemmed edges to catch and divert water entering through coping joints. Turn pans down at each side of parapet with vertical leg matching bottom edges of coping.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. First class and to comply with SMACNA manuals unless specified otherwise herein. Make sections uniform with joints at corners and angles mitered. Solder and bead exposed edges or return both for strength and appearance. Fit sheet metal closely and neatly to cores and framework. Provide necessary ribs, cleats, stiffeners and other reinforcement required to make all sections rigid and substantial. Lap vertical joints 3" minimum.

3.2 INSTALLATION

- A. Unless specified elsewhere, Install a continuous underply of 20 mil vinyl flashing covering the top of all parapets. Fold flashing over each side of parapet and anchor to blocking. Extend flashing a minimum distance of 6 inch over the face of the parapet construction unless exposed, then trim flashing flush with anchor cleat or leg of parapet coping.

- B. Anchor work in place with noncorrosive fasteners, adhesives, setting compounds, tapes and other materials and devices as recommended by manufacturer of each material or system. Comply with recommendations of "Architectural Sheet Metal Manual" by SMACNA.
- C. Seal moving joints in metal work with elastomeric sealants.
- D. Clean metal surfaces of soldering flux and other substances which could cause corrosion.
- E. Nail flanges of expansion joint units to substrates at spacing of 6" o.c.
- F. No touch up paint of any kind allowed on pre-finished materials. Any damaged material shall be replaced. If marred, scuffed, scratched, dented, bent, rust, etc. replace item(s).

END OF SECTION 07 62 00

SECTION 07 71 00
ROOF SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Roof-edge drainage systems.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for wood nailers, curbs, and blocking.
 - 2. Section 07 61 13 "Standing Seam Metal Roofing" for roof requirements.
 - 3. Section 07 62 00 "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
 - 4. Section 07 92 00 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.

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.
- B. Shop Drawings: For roof specialties.
 - 1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
 - 2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
 - 3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
 - 4. Detail termination points and assemblies, including fixed points.
 - 5. Include details of special conditions.
- C. Samples: For each type of roof specialty and for each color and texture specified.
- D. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.
- E. Samples for Verification:
 - 1. Include Samples of each type of roof specialty to verify finish and color selection, in manufacturer's standard sizes.

2. Include roof-edge specialties, roof-edge drainage systems made from 12-inch lengths of full-size components in specified material, and including fasteners, cover joints, accessories, and attachments.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Certificates: For each type of roof specialty.
- C. Product Test Reports: For roof-edge flashings, for tests performed by a qualified testing agency.
- D. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.
- B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.
- B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.8 WARRANTY

- A. Roofing-System Warranty: Roof specialties are included in warranty provisions in Section 07 61 13 – Standing Seam Metal Roofing.
- B. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.
- C. Metal Roof Curbs: Roof curbs to be over/under type curbs. Roof curbs shall be approved by roof panel manufacturer or manufactured by roof panel manufacturer so as to be an integral part of the roof assembly and to ensure compliance with required weathertight warranty for entire roof assembly.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 ROOF-EDGE DRAINAGE SYSTEMS

- A. Gutters: Manufactured in uniform section lengths not exceeding 12 feet, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.
 1. Aluminum Sheet: 0.040 inch thick.
 2. Gutter Profile: As indicated on drawings and according to SMACNA's "Architectural Sheet Metal Manual."
 3. Corners: Factory mitered and mechanically clinched and sealed watertight.
 4. Gutter Supports: Gutter brackets with finish matching the gutters.
 5. Gutter Accessories: Continuous hinged leaf guard of solid metal designed to shed leaves.
- B. Downspouts: Plain rectangular with sizes per those indicated on drawings complete with smooth-curve elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.
 1. Formed Aluminum: 0.040 inch thick.
- C. Aluminum Finish: Two-coat fluoropolymer.
 1. Color: As selected by Architect from manufacturer's full range.

2.3 MATERIALS

- A. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

2.4 MISCELLANEOUS MATERIALS

- A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
 - 1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
 - 2. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
- B. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Coil-Coated Aluminum Sheet Finishes:
 - 1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - b. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.
- C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

- E. Proceed with roof specialty installation only when penetrating work has been completed, substrate is dry and weather conditions are favorable.
- F. Provide all blocking and framing required to support specialties as required by the manufacturer.

3.2 INSTALLATION, GENERAL

- A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.
 - 1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Provide uniform, neat seams with minimum exposure of solder and sealant.
 - 3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
 - 4. Torch cutting of roof specialties is not permitted.
 - 5. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Coat concealed side of uncoated aluminum roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.
- C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
 - 1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise indicated on Drawings.
 - 2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.
- D. Fastener Sizes: Use fasteners of sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.
- F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.
- G. Submit product design Shop Drawings for review and approval by the Architect.
- H. The installer shall furnish mechanical fasteners consistent with the roof requirements.

3.3 ROOF-EDGE DRAINAGE-SYSTEM INSTALLATION

- A. General: Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.
- B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 24 inches apart. Attach ends with rivets and seal with sealant to make watertight. Slope to downspouts.
 - 1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet apart. Install expansion-joint caps.
 - 2. Install continuous leaf guards on gutters with noncorrosive fasteners, hinged to swing open for cleaning gutters.
- C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c.
 - 1. Provide elbows at base of downspouts at grade to direct water away from building.
 - 2. Connect downspouts to underground drainage system indicated.

3.4 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.
- D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 71 00

SECTION 07 92 00
JOINT SEALERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes joint sealers for the following locations:
1. Exterior joints in vertical surfaces and nontraffic horizontal surfaces as indicated below.
 - a. Control and expansion joints in cast-in-place concrete.
 - b. Control and expansion joints in unit masonry.
 - c. Joints between different materials listed above.
 - d. Perimeter joints between materials listed above and frames of doors and windows.
 - e. Other joints as indicated.
 2. Exterior joints in horizontal traffic surfaces as indicated below:
 - a. Control, expansion, and isolation joints in cast-in-place concrete slabs for floors and paving.
 - b. Tile control and expansion joints.
 - c. Joints between different materials listed above.
 - d. Other joints as indicated.
 3. Interior joints in vertical surfaces and horizontal nontraffic surfaces as indicated below:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Tile control and expansion joints.
 - d. Perimeter joints between interior wall surfaces and frames of interior doors and windows, Perimeter joints of toilet fixtures.
 - e. Joints between cabinet surfaces and walls
 - f. Other joints as indicated.
 4. Interior joints in horizontal traffic surfaces as indicated below:
 - a. Control and expansion joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in tile flooring.
 - c. Other joints as indicated.
- B. Sealing joints related to flashing and sheet metal for roofing is specified in Division-7 Section: "Flashing and Sheet Metal."
- C. Sealants for glazing purposes are specified in Division-8 Section "Glass and Glazing."
- D. Sealing concealed perimeter joints of gypsum drywall partitions to reduce sound transmission characteristics is specified in Division-9 Section "Gypsum Drywall."
- E. Sealing tile joints is specified in Division-9 Section "Tile."

1.2 SYSTEM PERFORMANCES

- A. Provide joint sealers that have been produced and installed to establish and maintain watertight and airtight continuous seals.

P

- A. Product Data from manufacturers for each joint sealer product required, including instructions for joint preparation and joint sealer application.
- B. Samples for Initial Selection Purposes: Manufacturer's standard bead samples consisting of strips of actual products showing full range of colors available, for each product exposed to view.

CD

- C. In regards to all materials requiring color selection, the User Agency shall sign/date color selection(s) with copy to FP&C prior to ordering materials. Colors must be from “standard” line of manufacturer’s colors.

1.4 QUALITY ASSURANCE

- A. Single Source Responsibility for Joint Sealer Materials: Obtain joint sealer materials from a single manufacturer for each different product required.
- B. Environmental Reference Standards:
 - 1. South Coast Air Quality Management District (SCAQMD): Comply with requirements of Rule 1168 – Adhesive and Sealant Applications.
 - a. Adhesive VOC Content: 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Green Seal Standard for Commercial Adhesives: Comply with requirements of GS-36 – Aerosol Adhesives
 - 3. Code of Federal Regulations (CFR)
 - a. 40 CFR, Part 59, Subpart D-2001: National Volatile Organic Compound Emission Standards for Architectural Coatings.
- C. Guarantee:
 - 1. The sealant guarantee shall be a Ten (10) Year from the date of acceptance of the project material and labor guarantee/warranty, furnished by the manufacturer of the materials.
 - 2. The contractor shall be a certified contractor approved by the waterproofing material manufacturer, to conduct necessary testing and inspections as required by the waterproofing material manufacturer to obtain said guarantee.
 - 3. The guarantee shall not require the Owner’s signature to be effective, shall not be DL/pro-rated, nor state the manufacturer will not honor the warranty until the waterproofing contractor, the supplier, and/or the manufacturer have been paid in full. The sample form of the guarantee shall be delivered to the Owner, and said guarantee shall be approved by the Owner prior to any ordering of materials.
 - 4. The manufacturer’s labor and material guarantee shall guarantee, at the manufacturer’s own cost and expense, to make or cause to be made such re-application of, and to correct any and all faulty installations/applications. All riders or attachments noting changes to the original guarantee shall be so noted on the face of the original guarantee. Any legal action to be in the Nineteenth Judicial Court in and for the Parish of East Baton Rouge, State of Louisiana, and so noted in the guarantee/rider.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle materials in compliance with manufacturers' recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of joint sealers under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturers.
 - 2. When joint substrates are wet due to rain, frost, condensation, or other causes.
- B. Joint Width Conditions: Do not proceed with installation of joint sealers where joint widths are less than allowed by joint sealer manufacturer for application indicated.
- C. Joint Substrate Conditions: Do not proceed with installation of joint sealers until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.7 SEQUENCING AND SCHEDULING

- A. Sequence installation of joint sealers to occur not less than 21 nor more than 30 days after completion of waterproofing, unless otherwise indicated.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealers, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. Colors: Provide color of exposed joint sealers indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.

2.2 ELASTOMERIC JOINT SEALANTS (Exterior Use)

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses.
- B. One-Part Nonacid-Curing Silicone Sealant: Type S (single component), Grade NS (nonsag), Class 25, and complying with the following requirements for Uses and additional joint movement capability:
 - 1. Uses NT(nontraffic), M(multicomponent), G, A, and, as applicable to joint substrates indicated, O
 - 2. Additional capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the following percentage changes in joint width as measured at time of application and remain in compliance with other requirements of ASTM C 920 for Uses indicated:
 - a. 35 percent movement in both extension and compression for a total of 70 percent movement.
- C. One-Part Mildew-Resistant Silicone Sealant: Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide; intended for sealing interior joints with nonporous substrates and subject to in-service exposure to conditions of high humidity and temperature extremes.

- D. Available Products: Subject to compliance with requirements, elastomeric sealants which may be incorporated in the Work include, but are not limited to, the following:

1. One-Part Nonacid-Curing Silicone Sealant:
 - a. "Dow Corning 795"; Dow Corning Corp.
 - b. "Rhodorsil 6B"; Rhone-Poulenc Inc.
 - c. "Rhodorsil 70"; Rhone-Poulenc Inc.
 - d. "OmniSeal"; Sonneborn Building Products Div., Rexnord Chemical Products Inc.
2. One-Part Mildew-Resistant Silicone Sealant:
 - a. "Dow Corning 786"; Dow Corning Corp.
 - b. "SCS 1702 Sanitary"; General Electric Co.
 - c. "863 #345 White"; Pecora Corp.
 - d. "Rhodorsil 6B White"; Rhone-Poulenc Inc.
 - e. "Proglaze White"; Tremco Corp.
 - f. "OmniPlus"; Sonneborn Building Products Div., Rexnord Chemical Products Inc.
3. One-Part Pourable Urethane Sealant for Use T (Traffic):
 - a. "Chem-Calk 950"; Bostik Construction Products Div.
 - b. "Vulkem 45"; Mameco International, Inc.
 - c. "NR-201 Urexpan"; Pecora Corp.
 - d. "Sonolastic SL-1"; Sonneborn Building Products Div., Rexnord Chemical Products Inc.

2.3 LATEX JOINT SEALANTS (Interior use)

- A. Acrylic-Emulsion Sealant: Manufacturer's standard, one part, nonsag, mildew-resistant, acrylic-emulsion sealant complying with ASTM C 834, formulated to be paintable and recommended for exposed applications on interior and on protected exterior locations involving joint movement of not more than plus or minus 5 percent.
- B. Available Products: Subject to compliance with requirements, latex joint sealants which may be incorporated in the Work include, but are not limited to, the following:
1. Acrylic-Emulsion Sealant:
 - a. "Chem-Calk 600"; Bostik Construction Products Div.
 - b. "AC-20"; Pecora Corp.
 - c. "Sonolac"; Sonneborn Building Products Div.; Rexnord Chemical Products, Inc.
 - d. "Tremco Acrylic Latex 834"; Tremco Inc.

2.4 MISCELLANEOUS JOINT SEALANTS

- A. Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.

2.5 FIRE-RESISTANT JOINT SEALERS

- A. General: Provide manufacturer's standard fire-stopping sealant, with accessory materials, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.

2.6 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type which are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

- A. Primer: Provide type recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealer-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Provide nonstaining, chemical cleaners of type which are acceptable to manufacturers of sealants and sealant backing materials, which are not harmful to substrates and adjacent nonporous materials, and which do not leave oily residues or otherwise have a detrimental effect on sealant adhesion or in-service performance.
- C. Masking Tape: Provide nonstaining, nonabsorbent type compatible with joint sealants and to surfaces adjacent to joints.
- D. Accessory Materials for Fire-Stopping Sealants: Provide forming, joint fillers, packing and other accessory materials required for installation of fire-stopping sealants as applicable to installation conditions indicated.

2.8 JOINT FILLERS FOR CONCRETE PAVING

- A. General: Provide joint fillers of thickness and widths indicated.
- B. Bituminous Fiber Joint Filler: Preformed strips of composition below, complying with ASTM D 1751:
 - 1. Asphalt saturated fiberboard.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealers, with Installer present, for compliance with requirements for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealer performance. Do not proceed with installation of joint sealers until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements:
 - 1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; old joint sealers; oil; grease; waterproofing; water repellants; water; surface dirt; and frost.
 - 2. Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or a

combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.

3. Remove laitance and form release agents from concrete.
4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile; and other nonporous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.

- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on preconstruction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's recommendations. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALERS

- A. General: Comply with joint sealer manufacturers' printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C 962 for use of joint sealants as applicable to materials, applications and conditions indicated.
- C. Latex Sealant Installation Standard: Comply with requirements of ASTM C 790 for use of latex sealants.
- D. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- E. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant movement capability.
 - a. Do not leave gaps between ends of joint fillers.
 - b. Do not stretch, twist, puncture, or tear joint fillers.
 - c. Remove absorbent joint fillers which have become wet prior to sealant application and replace with dry material.
 2. Install bond breaker tape between sealants and joint fillers, compression seals, or back of joints where adhesion of sealant to surfaces at back of joints would result in sealant failure.
 3. Install compressible seals serving as sealant backings to comply with requirements indicated above for joint fillers.
- F. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.
- G. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess

sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 6A in ASTM C 962, unless otherwise indicated.
 - a. Use masking tape to protect adjacent surfaces of recessed tooled joints.

- H. Installation of Fire-Stopping Sealant: Install sealant, including forming, packing, and other accessory materials to fill openings around mechanical and electrical services penetrating floors and walls to provide fire-stops with fire resistance ratings indicated for floor or wall assembly in which penetration occurs. Comply with installation requirements established by testing and inspecting agency.

3.4 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and installations with repaired areas indistinguishable from original work.

END OF SECTION 07 92 00

SECTION 08 11 13
HOLLOW METAL DOORS & FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes hinged type steel doors and frames as indicated and scheduled on drawings.
- B. Finish hardware is specified elsewhere in Division-8.

1.2 QUALITY ASSURANCE

- A. Provide doors and frames complying with Steel Door Institute "Recommended Specifications: Standard Steel Doors and Frames" (SDI-100) and as herein specified.
- B. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated or required, (within all fire rated partitions as indicated on floor plans, even if not scheduled), provide fire-rated door and frame assemblies that comply with NFPA 80 "Standard for Fire Doors and Windows", and have been tested, listed, and labeled in accordance with ASTM E 252 "Standard Methods of Fire Tests of Door Assemblies" by a nationally recognized independent testing and inspection agency acceptable to authorities having jurisdiction.
 - 1. Where sizes of doors exceed tested sizes, provide a door and frame manufactured to fire rating specifications.
- C. Smoke rated Assemblies: Where indicated on the floor plans where partition are constructed to resist the passage of smoke, all doors and frames within these assemblies are to be tested according to UL 1784, Air Leakage & Door Assemblies and NFPA 105.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data substantiating that products comply with requirements.
- B. Shop Drawings: Submit for fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.
 - 1. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.
 - 2. Indicate coordinate of glazing frames and stops with glass and glazing requirements.
 - 3. Frame Detail for each frame type including dimensioned profiles.
 - 4. Use same reference designations indicated on Drawings in preparing schedule for doors and frames.
- C. Label Construction Certification: For door assemblies required to be fire-rated and exceeding sizes of tested assemblies, submit manufacturer's certification for that each door and frame assembly has been constructed to conform to design, materials and construction equivalent to requirements for labeled construction.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work packaged or crated to provide protection during transit and job storage. Provide additional sealed plastic wrapping for factory-finished doors.

- B. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.
- C. Store doors and frames at building site under cover. Place units on minimum 4" high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4" spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 569 and ASTM A 568.
- B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 366 and ASTM A 568.
- C. Galvanized Steel Sheets: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A526, with ASTM A 525, G90 zinc coating, mill phosphatized.
- D. Supports and Anchors: Fabricate of not less than 18-gage galvanized sheet steel.
- E. Inserts, Bolts, and Fasteners: Manufacturer's standard units, except hot-dip galvanize items to be built into exterior walls, complying with ASTM A 153, Class C or D as applicable.
- F. Steel doors and frame Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work included, but are not limited to the following:
 - 1. Amweld Building Products, Inc.
 - 2. Ceco Door Products.
 - 3. Curries Company.
 - 4. Republic Builders Products.
 - 5. Steelcraft, a Division of Ingersol-Rand.

2.2 FABRICATION, GENERAL

- A. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assembly at project site. Comply with SDI-100 requirements as follows:
 - 1. Interior Doors: SDI-100, Grade III, extra heavy-duty, Model 2, flush panel, minimum 16-gauge faces.
 - 2. Exterior Doors: SDI-100, Grade III, extra heavy-duty, Model 2, flush panel, minimum 16-gauge faces.
- B. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers and moldings from either cold-rolled or hot-rolled steel (at fabricator's option).
- C. Fabricate exterior doors, panels, and frames from galvanized sheet steel. Close top and bottom edges of exterior doors as integral part of door construction or by addition of minimum 16-gage inverted steel channels.

- D. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat Phillips heads for exposed screws and bolts.
- E. Finish Hardware Preparation: Prepare doors and frames to receive mortised and concealed finish hardware in accordance with final Finish Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A115 series specifications for door and frame preparation for hardware.
 - 1. For concealed overhead door closers, provide space, cutouts, reinforcing and provisions for fastening in top rail of doors or head of frames, as applicable.
- F. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied finish hardware may be done at project site.
- G. Locate finish hardware as indicated on final shop drawings or, if not indicated, in accordance with "Recommended Locations for Builder's Hardware", published by Door and Hardware Institute.
- H. Finish:
 - 1. Dress tool marks and surface imperfections to smooth surfaces.
 - 2. Chemically treat and clean.
 - 3. Apply prime shop coating; give anchors requiring no further painting 2 shop coats.
- I. Edge Clearances: Dimensions maximum with tolerances of plus or minus 1/32":
 - 1. Between door and frame at head and jamb: 1/8".
 - 2. At sills with threshold: 1/4" between door and threshold.
 - 3. Between meeting edges of pair of doors: 1/8".
- J. All exterior doors and indicated interior doors are to be insulated with Polyurethane solid cores. Insulated fire rated doors to have fiberglass cores.

2.3 STANDARD STEEL DOORS

- A. Provide metal doors of types and styles indicated on drawings or schedules.

2.4 STANDARD STEEL FRAMES

- A. Welded Frames: Required for all frames:
 - 1. Thickness:
 - a. Interior Openings: 16 gage, 14 ga. for openings over 4'-0" in width.
 - b. Exterior Openings: 14 gage.
 - c. Dust covers: 26 gage.
 - d. Loose glazing stops: 20 ga. cold rolled steel.
 - 2. Weld to form rigid, neat, square and true units free of defects, warp or buckle; integrally reinforce with 18 gage minimum channel section, mitered. Close corner joints tight with trim faces mitered and continuously welded.
 - 3. Rigidly attach steel brace to both feet of jambs for handling and shipping.
- B. Fire-Rated Frames:
 - 1. Construct equal to frames hereinbefore specified, except augment as required to attain required fire rating and maximum temperature rise.
 - 2. Labels: Furnish with attached U.L. labels of Class called for on drawings.
 - 3. Maximum Temperature Rise: 450 Degrees F. above ambient at end of 30 minute fire test exposure.
- C. General - All Type Frames:
 - 1. Anchors: Manufacturers Standard for type of construction:

- a. Masonry T-Type: Minimum Number required for frames up to 7'-6" 3 per jamb; 7'-6" to 8' 4 per jamb; over 8' provide 1 for each 2' of jamb or fraction thereof. Fabricate from not less than .042 inch thick electrolytic zinc coated or metallic coated steel sheet.
 2. Dust Cover/Plaster Guard: Provide minimum 26 gage metal at each hardware mortise welded to frame, at back of finish hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.
 3. Rubber Bumpers: Except on weather-stripped frames, provide manufacturers' standard; single doors 3 in strike jamb, pairs of doors 2 in head.
- E. Inserts, Bolts and Fasteners: Manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A 153/A, Class C or D as applicable.

2.5 GLAZING STOPS

- A. Manufacturer's standard, formed from 0.032 inch thick steel sheets.
1. Provide screw- applied remove glazing stops on inside of glass in door or window.
 2. Provide non-removable stops on outside of exterior doors and on secure side of interior doors for glass.
 3. Stops for window glazing to be minimum 5/8" high. Glass to be glazed in fire rated partition with glazing putty.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install standard steel doors, frames, and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.
- B. Placing Frames: Comply with provisions of SDI-105 "Recommended Erection Instructions for Steel Frames", unless otherwise indicated.
1. Except for frames located at in-place concrete or masonry and at drywall installations, place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.
 2. In masonry construction, locate 3 wall anchors per jamb at hinge and strike levels. Completely fill frames in masonry walls with mortar as wall is being laid up.
 3. At in-place concrete or masonry construction, set frames and secure to adjacent construction with machine screws and masonry anchorage devices.
 4. Install fire-rated frames in accordance with NFPA Std. No. 80.
 5. In metal stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In open steel stud partitions, place studs in wall anchor notches and wire tie. In closed steel stud partitions, attach wall anchors to studs with tapping screws.
- C. Door Installation:
1. Fit hollow metal doors accurately in frames, within clearances specified in SDI-100.
 2. Place fire-rated doors with clearances as specified in NFPA Standard No. 80, 80A, and 101 as applicable.

3.2 ADJUST AND CLEAN

- A. Cleaning: Remove all mortar and make ready for field painting.
- B. Prime Coat Touch-up: Immediately after erection, sand smooth any rusted or damaged areas of

prime coat and apply touch-up of compatible air-drying primer.

- C. Protection Removal: Immediately prior to final inspection, remove protective plastic wrappings from pre-finished doors.
- D. Final Adjustments: Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

END OF SECTION 08 11 13

SECTION 08 41 13
ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 – GENERAL

1.1 SUMMARY

- A. Aluminum entrance and storefront types required for the project include:
 - 1. Storefront type framing system.
- B. Glazing: Refer to "Glass and Glazing" section of Division 8 for glazing requirements for aluminum entrances and storefronts to be factory-preglazed.

1.2 SYSTEM DESCRIPTION

- A. Performance Requirements: Provide aluminum entrance and storefront assemblies that comply with specified performance characteristics. Each system shall be tested by a recognized testing laboratory or agency in accordance with specified test methods. Provide certified test results.
- B. Thermal Movement: Provide systems capable of withstanding thermal movements resulting from an ambient temperature range of 120 deg. F, that could cause a metal surface temperature range of 180 deg. F within the framing system.
- C. Wind Loading: Provide assemblies capable of withstanding a uniform test pressure of 20 psf inward and 20 psf outward when tested in accordance with ASTM E 330.
- D. Fixed Framing Transmission Characteristics: Provide aluminum entrance and storefront framing system that complies with requirements indicated for transmission characteristics.
 - 1. Air Infiltration: Provide framing system with an air infiltration rate of not more than 0.06 CFM per sq. ft. of fixed area when tested in accordance with ASTM E 283 at an inward test pressure differential of 6.24 psf.
 - 2. Water Penetration: Provide framing systems with no water penetration HARDas defined in the test method when tested in accordance with ASTM E 331 at an inward test pressure differential of 8 lb. per sq. ft.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's product specifications, technical product data, standard details, and installation recommendations for each type of entrance and storefront product required. Include the following information:
 - 1. Fabrication methods.
 - 2. Finishing.
 - 3. Accessories.
 - 4. Shop Drawings: Submit shop drawings for fabrication and installation of entrances and storefronts, including the following:
 - 5. Elevations.
 - 6. Detail sections of typical composite members.
 - 7. Anchorages and reinforcements.
 - 8. Expansion provisions.

9. Glazing details.

- B. Samples: Submit pairs of samples of each type and color of aluminum finish, on 12" long sections of extrusions or formed shapes and on 6" square sheets. Where color or texture variations are anticipated, include 2 or more units in each set of samples indicating extreme limits of variations.
- C. Certification: Provide certified test results showing that entrance and storefront systems have been tested by a recognized testing laboratory or agency and comply with specified performance characteristics.

1.4 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide entrance and storefront produced by a single manufacturer capable of showing prior production of units similar to those required.
- B. Design Criteria: Drawings are based on one manufacturer's entrance and storefront system. Another manufacturer's system of a similar and equivalent nature will be acceptable when, in the Architect's sole judgment, differences do not materially detract from the design concept or intended performance.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Check openings by field measurement before fabrication to ensure proper fitting of work; show measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay in the work. Where necessary, proceed with fabrication without field measurements, and coordinate fabrication tolerances to ensure proper fit.

1.6 MANUFACTURERS

- A. Approved Manufacturers: Subject to compliance with the requirements, provide tubular aluminum framing systems as designed and manufactured by one of the following:
 - 1. Kawneer, Trifab 451 Series or other section as recommended by the manufacturer for the application.
 - 2. U.S. Aluminum.
 - 3. Tubelite.
 - 4. Vistawall.
 - 5. Manko.
 - 7. YKK.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum Members: Provide alloy and temper recommended by the manufacturer for strength, corrosion resistance, and application of required finish; comply with ASTM B 221 for extrusions and ASTM B 209 for sheet or plate.
- B. Fasteners: Provide fasteners of aluminum, nonmagnetic stainless steel, or other materials warranted by the manufacturer to be noncorrosive and compatible with aluminum components, anchors and other components.
 - 1. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125" thick, reinforce the interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard noncorrosive pressed-in splined grommet nuts.

2. Exposed Fasteners: Do not use exposed fasteners.
- C. Concealed Flashing: Provide 26 gage minimum dead-soft stainless steel, or 0.026" minimum extruded aluminum of alloy and type selected by manufacturer for compatibility with other components.
- D. Brackets and Reinforcements: Where feasible, provide high-strength aluminum brackets and reinforcements; otherwise provide nonmagnetic stainless steel or hot-dip galvanized steel complying with ASTM A 386.
- E. Concrete/Masonry Inserts: Provide concrete and masonry inserts fabricated from cast-iron, malleable iron, or hot-dip galvanized steel complying with ASTM A 386.
- F. Compression Weatherstripping: Provide the manufacturer's standard replaceable compressible weatherstripping gaskets of molded neoprene complying with ASTM D 2000 or molded PVC complying with ASTM D 2287.
- G. Sliding Weatherstripping: Provide the manufacturer's standard replaceable weatherstripping of wool, polypropylene, or nylon woven pile, with nylon fabric or aluminum strip backing, complying with AAMA 701.2.
- H. Glass and Glazing Materials: Glass and glazing materials shall comply with requirements of "Glass and Glazing" section of these specifications.

2.2 COMPONENTS

- A. Storefront Framing System: Provide inside-outside matched resilient flush-glazed storefront framing system with provisions for glass replacement. Shop-fabricate and preassemble frame components where possible.
 1. Frame: 2" x 4.5"
 2. Glazing: Fabricate window to facilitate replacement thickness of glass as indicated in drawings.
 3. Warranty: 2 years from Substantial Completion.
 4. Center glazed.
 5. Color: "Clear" by Kawneer, or approved equal.

2.3 FABRICATION

- A. General: Sizes frame units, and profile requirements, are indicated on drawings. Variable dimensions are indicated, with maximum and minimum dimensions required to achieve design requirements and coordination with other work.
- B. Prefabrication: Before shipment to the project site, complete fabrication, assembly, finishing, and other work to the greatest extent possible. Disassemble components only as necessary for shipment and installation.
 1. Pre-glaze frame units to greatest extent possible.
 2. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work to prevent damage to exposed finish surfaces.
- C. Welding: Comply with AWS recommendations; grind exposed welds smooth and restore mechanical finish.

- D. Reinforcing: Install reinforcing as required and necessary for performance requirements, sag resistance and rigidity.
- E. Dissimilar Metals: Separate dissimilar metals with zinc chromate primer, bituminous paint, or other separator that will prevent corrosion.
- F. Continuity: Maintain accurate relation of planes and angles, with hairline fit of contacting members.
 - 1. Uniformity of Finish: Abutting extruded aluminum members shall not have an integral color or texture variation greater than half the range indicated in the sample pair submittal.
- G. Fasteners: Conceal fasteners wherever possible.

2.5 FINISHES

- A. Color Anodized Finish: Provide NAAMM AA-M12C22A41/A44, Class I (non-specular as fabricated mechanical finish; chemical etch, medium matte; minimum thickness 0.7 mil) integrally or electrolytically deposited colored anodic coating.
 - 1. Color: Provide "Clear aluminum anodized" by Kawneer or approved equal anodized finish color unless otherwise indicated.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's instructions and recommendations for installation.
- B. Set units plumb, level, and true to line, without warp or rack of framing members, or panels. Provide proper support and anchor securely in place.
 - 1. Separate aluminum and other corrodible metal surfaces from sources of corrosion of electrolytic action at points of contact with other materials. Comply with requirements specified under paragraph "Dissimilar Materials" in the Appendix to AAMA 101-85.
- C. Set sill members and other members in bed of sealant as indicated, or with joint fillers or gaskets as indicated to provide weathertight construction. Comply with requirements of Division 7 for sealants, fillers, and gaskets.
- D. Refer to "Glass and Glazing" section of Division 8 for installation of glass and other panels indicated to be glazed into framing, and not pre-glazed by manufacturer.

3.2 CLEANING

- A. Clean the completed system, inside and out, promptly after installation, exercising care to avoid damage.
- B. Clean glass surfaces after installation, complying with requirements contained in the "Glass and Glazing" section for cleaning and maintenance. Remove excess glazing and sealant compounds, dirt and other substances from aluminum surfaces

3.3 PROTECTION

- A. Institute protective measures required throughout the remainder of the construction period to ensure that aluminum storefronts will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF SECTION 08 41 13

SECTION 08 71 00
DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical door hardware.
 - 3. Automatic operators.
 - 4. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Section 06 10 00 – Rough Carpentry
 - 2. Section 08 11 13 – Hollow Metal Doors, Frames, and Windows
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards:
 - 1. ANSI A156.1 – Butts and Hinges
 - 2. ANSI A156.2 – Bored Locks and Latches
 - 3. ANSI A156.3 – Exit Devices
 - 4. ANSI A156.4 – Door Controls – Door Closers
 - 5. ANSI A156.5 – Auxiliary Locks and Associated Products
 - 6. ANSI A156.6 – Architectural Door Trim
 - 7. ANSI A156.7 – Template Hinge Dimensions
 - 8. ANSI A156.8 – Door Controls – Overhead Holders
 - 9. ANSI A156.13 – Mortise Locks and Latches
 - 10. ANSI A156.15 – Closer Holder Release Devices

11. ANSI A156.16 – Auxiliary Hardware
12. ANSI A156.18 – Material and Finishes
13. ANSI A156.26 – Continuous Hinges
14. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
- C. The Architectural Hardware Consultant retained by the successful bidder shall develop final hardware sets and include all components required by applicable codes for a fully functioning facility. The Final Schedule is subject to review and approval by the Architect. Provide ADA-compliant lever handles at all lock / latch sets.
 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- D. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.
- E. Informational Submittals:

1. Windstorm Openings: Provide copy of current State of Florida Product Approval or Metro-Dade County Notice of Acceptance (NOA) as proof of compliance that doors, frames and hardware for exterior opening assemblies have been tested and approved for use at the wind load level requirements specified for this project.
 2. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.
- G. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum [5] years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Installer Qualifications: Installers, trained by the primary product manufacturers, with a minimum[3] years documented experience installing both standard and electrified builders hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor in good standing by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
1. Scheduling Responsibility: Preparation of door hardware and keying schedules.
- D. Source Limitations: Obtain each type and variety of Door Hardware specified in this Section from a single source, qualified supplier unless otherwise indicated.
1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- E. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the model building code including, but not limited to, the following:

1. NFPA 70 "National Electrical Code", including electrical components, devices, and accessories listed and labeled as defined in Article 100 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 2. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1 as follows:
 - a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
 - b. Door Closers: Comply with the following maximum opening-force requirements indicated:
 - 1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
 - 2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.
 3. NFPA 101: Comply with the following for means of egress doors:
 - a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
 - b. Thresholds: Not more than 1/2 inch high.
 4. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252 (neutral pressure at 40" above sill) or UL-10C.
 - a. Test Pressure: Positive pressure labeling.
- F. Keying Conference: Keying Conference to be held at Owner's convenience for the discussion of the project keying – RE: Section 2.5.E) Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
1. Function of building, purpose of each area and degree of security required.
 2. Plans for existing and future key system expansion.
 3. Requirements for key control storage and software.
 4. Installation of permanent keys, cylinder cores and software.
 5. Address and requirements for delivery of keys.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.
- C. Door and Frame Preparation: Related Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods:
 - 1. Ten years for mortise locks and latches.
 - 2. Ten years for extra heavy duty cylindrical (bored) locks and latches.
 - 3. Seven years for heavy duty cylindrical (bored) locks and latches.
 - 4. Five years for standard duty cylindrical (bored) locks and latches.
 - 5. Five years for exit hardware.
 - 6. Ten years for manual door closers.
 - 7. Two years for electromechanical door hardware.

1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

1.9 PROJECT CONDITIONS

- A. Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for the proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents.
- B. Review Shop Drawings for doors and entrances to confirm that adequate provisions will be made for the proper installation of hardware.

PART 2 - PRODUCTS

2.1 DOOR HARDWARE

- A. General: The Architectural Hardware Consultant retained by the successful bidder shall develop final hardware sets and include all components required by applicable codes for a fully functioning facility. The Final Schedule is subject to review and approval by the Architect. Provide ADA-compliant lever handles at all lock / latch sets.
- B. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.
 - a. Permanent cylinders, cores, and keys to be installed by Owner.
- C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

- A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles as specified in the Door Hardware Sets.
 - 1. Quantity: Provide the following hinge quantity, unless otherwise indicated:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
 - 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

- a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing hinges unless Hardware Sets indicate heavy weight.
4. Hinge Options: Comply with the following where indicated in the Hardware Sets or on Drawings:
 - a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:
 - 1) Out-swinging exterior doors.
 - 2) Out-swinging access controlled doors.
5. Acceptable Manufacturers:
 - a. Hager Companies (HA).
 - b. McKinney Products (MK).
 - c. Stanley Hardware (ST).

2.3 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified automatic, self-latching, and manual flush bolts and surface bolts. Manual flush bolts to be furnished with top rod of sufficient length to allow bolt location approximately six feet from the floor. Furnish dust proof strikes for bottom bolts. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
 1. Acceptable Manufacturers:
 - a. McKinney Architectural Hardware (MK).
 - b. Rockwood Manufacturing (RO).
 - c. Trimco (TC).
- B. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified below or in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
 1. Push/Pull Plates: Minimum .050 inch thick, 4-inches wide by 16-inches high, with square corners and beveled edges, secured with exposed screws unless otherwise indicated.
 2. Straight Pull Design: Minimum 1-inch round diameter stainless steel bar or tube stock pulls with 2 1/2-inch projection from face of door unless otherwise indicated.
 3. Offset Pull Design: Minimum 1-inch round diameter stainless steel bar or tube stock pulls with 2 1/2-inch projection and offset of 90 degrees unless otherwise indicated.
 4. Push Bars: Minimum 1-inch round diameter horizontal push bars with minimum clearance of 2 1/2-inch projection from face of door unless otherwise indicated.
 5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

- a. Acceptable Manufacturers:
 - 1) McKinney Architectural Hardware (MK).
 - 2) Rockwood Manufacturing (RO).
 - 3) Trimco (TC).

2.4 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.
- C. Cylinders: Original manufacturer cylinders complying with the following:
 - 1. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
 - 2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 - 3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
 - 4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
- D. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
- E. Keying System: Each type of lock and cylinders to be factory keyed. Conduct specified "Keying Conference" to define and document keying system instructions and requirements. Incorporate decisions made in keying conference, and as follows:
 - 1. Master Key System: Cylinders are operated by a change key and a master key.
 - 2. Grand Master Key System: Cylinders are operated by a change key, a master key, and a grand master key.
 - 3. Great-Grand Master Key System: Cylinders are operated by a change key, a master key, a grand master key, and a great-grand master key.
 - 4. Existing System: Master key or grand master key locks to Owner's existing system.
 - 5. Keyed Alike: Key all cylinders to same change key.
- F. Key Quantity: Provide the following keys:
 - 1. Top Master Key: One (1)
 - 2. Change Keys per Cylinder: Two (2)
 - 3. Master Keys (per Master Key Group): Two (2)
 - 4. Grand Master Keys (per Grand Master Key Group): Two (2)
 - 5. Construction Control Keys (where required): Two (2)
 - 6. Permanent Control Keys (where required): Two (2)
- G. Construction Keying: Provide construction master keyed cylinders or temporary keyed construction cores where specified. Provide construction master keys in quantity as required by project Contractor. Replace construction cores with permanent cores. Furnish permanent cores for installation as directed under specified "Keying Conference".

2.5 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified mortise locksets furnished in the functions as specified in the Hardware Sets. Locksets to be manufactured with a corrosion resistant, stamped 12 gauge minimum formed steel case and be field-reversible for handing without disassembly of the lock body. Lockset trim (including knobs, levers, escutcheons, roses) to be the product of a single manufacturer. Furnish with standard 2 3/4" backset, 3/4" throw anti-friction stainless steel latchbolt, and a full 1" throw stainless steel bolt for deadbolt functions.
 - 1. Mortise locks to be certified Security Grade 1 and include vandal resistant heavy gauge escutcheon or sectional type trim.
 - 2. Acceptable Manufacturers:
 - a. Stanley Best (BE) – 47H Series.
- B. Lock Trim Design: As specified in Hardware Sets.
- C. Windstorm Compliance: Provide appropriate hurricane or tornado resistant products that have been independent third party tested, certified and labeled to meet state and local windstorm building codes applicable to project.

2.6 ELECTRIC STRIKES

- A. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with combined products having unlimited lifetime warranty.

2.7 EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
 - 1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
 - 2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
 - a. Fire Exit Removable Mullions: Provide keyed removable mullions for use with fire exit devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252. Mullions to be used only with exit devices for which they have been tested.
 - 3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

4. Flush End Caps: Provide heavy weight impact resistant flush end caps made of architectural metal in the same finish as the devices as in the Hardware Sets. Plastic end caps will not be acceptable.
 5. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty trim with cold forged escutcheons, beveled edges, and four threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets. Provided free-wheeling type trim where indicated.
 - b. Where function of exit device requires a cylinder, provide an interchangeable core type keyed cylinder (Rim or Mortise) as specified in Hardware Sets.
 6. Vertical Rod Exit Devices: Provide and install interior surface and concealed vertical rod exit devices as Less Bottom Rod (LBR) unless otherwise indicated.
 7. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
 8. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
 9. Rail Sizing: Provide exit device rails factory sized for proper door width application.
 10. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Mounting rails to be formed from smooth stainless steel, brass or bronze architectural materials no less than 0.072" thick, with push rails a minimum of 0.062" thickness. Painted or aluminum metal rails are not acceptable. Exit device latch to be investment cast stainless steel, pullman type, with deadlock feature.
1. Acceptable Manufacturers:
 - a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
 - b. Sargent Manufacturing (SA) - 80 Series.
 - c. Yale Commercial Hardware (YA) - 7000 Series.

2.8 ELECTROMECHANICAL CONVENTIONAL EXIT DEVICES

- A. Electrified Options: As indicated in hardware sets, provide electrified exit device options including: electric latch retraction, electric dogging, outside door trim control, exit alarm, delayed egress, latchbolt monitoring, lock/unlock status monitoring, touchbar monitoring and request-to-exit signaling. Unless otherwise indicated, provide electrified exit devices standard as fail secure.

2.9 EGRESS EXIT DEVICES

- A. General: Subject to same compliance standards and requirements as mechanical exit devices, devices to be of type and design as specified below.

2.10 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
 2. Standards: Closers to comply with UL-10C and UBC 7-2 for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
 3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1 provisions for door opening force and delayed action closing.
 4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 - a. Where closers are indicated to have mechanical dead-stop, provide heavy duty arms and brackets with an integral positive stop.
 - b. Where closers are indicated to have mechanical hold open, provide heavy duty units with an additional built-in mechanical holder assembly designed to hold open against normal wind and traffic conditions. Holder to be manually selectable to on-off position.
 - c. Where closers are indicated to have a cushion-type stop, provide heavy duty arms and brackets with spring stop mechanism to cushion door when opened to maximum degree.
 5. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates, and through-bolt or security type fasteners as specified in the door Hardware Sets.
- B. Door Closers, Surface Mounted (Commercial Duty): ANSI/BHMA 156.4, Grade 1 certified surface mounted, institutional grade door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck, closing sweep, and latch speed control valves. Provide non-handed units with high impact, non-corrosive plastic covers standard.
1. Acceptable Manufacturers:
 - a. Corbin Russwin Hardware (RU) - DC6000 Series.
 - b. Norton Door Controls (NO) - 8500 Series.
 - c. Sargent Manufacturing (SA) - 1431 Series.
 - d. Yale Commercial Hardware (YA) - 3500 Series.

2.11 SURFACE MOUNTED CLOSER HOLDERS

- A. Closer Holder Release Devices: ANSI A156.15 certified closer holder release devices designed to hold open fire or smoke rated doors until interruption of signal from fire alarm, smoke detector or remote release switch. . Pull side, push side, or double egress mounting applications available

with non-handed track and closer body and dual voltage input (24V/120V). Voltage to be 24VDC unless otherwise specified. Where optional detector is required, provide integral photo electric type with LED indicator. Auxiliary door stops are required at hold open point.

1. Acceptable Manufacturers:

- a. Norton Door Controls (NO) - 7700PT(D) Series.
- b. Rixson Door Controls (RF) - Smok-Chek VI Series.
- c. Sargent Manufacturing (SA) -351 EHT(D) Series.

B. Multi-Point Closer Holders with Motion Sensor: ANSI A156.15, Grade 1 certified multi-point, closer holder devices designed to keep doors in a held-open position if presence is detected within the opening. Push side or pull side mounting applications having a maximum opening of 180° (hold open to 175°) and dual voltage input (24V /120V). Voltage to be 24VDC unless otherwise specified. Units are fail safe, closing the door in the event of fire alarm system or electrical power interruption.

1. Safe Zone Detection: Closer holders units to have an integral motion sensor device monitoring a "zone of safety" at the door opening. Safe zone detection prevents the door from closing in event of movement within the adjustable sensing field. Movement is detectable in both directions with selectable closer hold open time and sensor sensitivity. Provide optional handheld device for programming safe zone sensor settings.

2. Acceptable Manufacturers:

- a. Norton Door Controls (NO) - 7100SZ Series.

2.12 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Metal Protection Plates: ANSI/BHMA A156.6 certified metal protection plates (kick, armor, or mop), beveled on four edges (B4E), fabricated from the following.
 - a. Stainless Steel: .050-inch thick, with countersunk screw holes (CSK).
 - b. Brass or Bronze: .050-inch thick, with countersunk screw holes (CSK).
 - c. Laminate Plastic or Acrylic: 1/8-inch thick, with countersunk screw holes (CSK).
4. Fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets.
5. Metal Door Edging: Door protection edging fabricated from a minimum .050-inch thick metal sheet, formed into an angle or "U" cap shapes, surface or mortised mounted onto edge of door. Provide appropriate leg overlap to account for protection plates as required. Height to be as specified in the Hardware Sets.

6. Acceptable Manufacturers:
 - a. McKinney Architectural Hardware (MK).
 - b. Rockwood Manufacturing (RO).

2.13 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Acceptable Manufacturers:

- a. McKinney Architectural Hardware (MK).
 - b. Rockwood Manufacturing (RO).

- C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Acceptable Manufacturers:

- a. Rixson Door Controls (RF).
 - b. Rockwood Manufacturing (RO).
 - c. Sargent Manufacturing (SA).

2.14 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and UBC 7-2, Fire Tests of Door Assemblies.

- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Acceptable Manufacturers:
 - 1. McKinney Weatherstripping Products (MW).
 - 2. Pemko Manufacturing (PE).

2.15 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.16 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- D. Antimicrobial Finishes: Where specified, finishes on locksets, latchsets, exit devices and push/pull trim to incorporate an FDA recognized. Silver Ion, antimicrobial coating (MicroShield™) listed for use on equipment as a suppressant to the growth and spread of a broad range of bacteria, algae, fungus, mold and mildew.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. and provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 SCHEDULE OF FINISH HARDWARE

- A. The Architectural Hardware Consultant retained by the successful bidder shall develop final hardware sets and include all components required by applicable codes for a fully functioning facility. The Final Schedule is subject to review and approval by the Architect. Provide ADA-compliant lever handles at all lock / latch sets. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
- B. General guide for room functions is as follows:
 - 1. Exterior Entry/Exit Doors: Continuous hinges, removable mullion, exit device, rim cylinder, mortise cylinder, closer, drop plate, door pulls, threshold, weatherseals. Protection plates at non-storefront type doors.

END OF SECTION 08 71 00

SECTION 08 80 00
GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Storefront framing.

1.2 DEFINITIONS

- A. Manufacturer: A firm that produces primary glass or fabricated glass as defined in referenced glazing publications.
- B. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- C. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.
- D. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
- E. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F ambient; 180 deg F material surfaces.
- C. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 1/4" thick.

2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units with lites 1/4" thick and a nominal 1/2-inch wide interspace..
4. Center-of-Glass U-Values: NFRC 100 methodology using LBL-35298 WINDOW 4.1 computer program, expressed as Btu/ sq. ft. x h x deg F.
5. Center-of-Glass Solar Heat Gain Coefficient: NFRC 200 methodology using LBL-35298 WINDOW 4.1 computer program.
6. Solar Optical Properties: NFRC 300.

- D. DAPAM 190-51 Compliance: Where applicable and stipulated by the LANG as required by Target Analysis, provide "bullet-resistant" glazing to meet UL-752, Level III for a higher level of protection. Comply with UFC 4-010-01 Standard 10.

1.4 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- C. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations for Clear Glass: Obtain clear float glass from one primary-glass manufacturer.
- C. Source Limitations for Tinted Glass: Obtain tinted, heat-absorbing, and light-reducing float glass from one primary-glass manufacturer for each tint color indicated.
- D. Source Limitations for Coated Glass: Obtain coated glass from one manufacturer for each type of coating and each type and class of float glass indicated.
- E. Source Limitations for Insulating Glass: Obtain insulating-glass units from one manufacturer using the same type of glass and other components for each type of unit indicated.
- F. Source Limitations for Laminated Glass: Obtain laminated-glass units from one manufacturer using the same type of glass lites and interlayers for each type of unit indicated.
- G. Source Limitations for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.
- H. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.
 1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
- I. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA'S "Glazing Manual" and "Laminated Glass Design Guide."2. SIGMA Publications: SIGMA TM-3000, "Vertical Glazing Guidelines," and SIGMA TB-3001, "Sloped Glazing Guidelines."
- J. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following inspecting and testing agency:
 1. Insulating Glass Certification Council.
 2. Associated Laboratories, Inc.
 3. National Accreditation and Management Institute.
- 1.6 DELIVERY, STORAGE, AND HANDLING
 - A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- 1.7 PROJECT CONDITIONS
 - A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F.
- 1.8 WARRANTY
 - A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
 - B. Manufacturer's Special Warranty on Laminated Glass: Written warranty, made out to Owner and signed by laminated-glass manufacturer agreeing to furnish replacements for laminated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 1. Warranty Period: Five years from date of Substantial Completion.
 - C. Manufacturer's Special Warranty on Insulating Glass: Written warranty, made out to Owner and signed by insulating-glass manufacturer agreeing to furnish replacements for insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PRIMARY FLOAT GLASS

- A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), Quality q3 (glazing select); class as indicated in schedules at the end of Part 3.

2.2 HEAT-TREATED FLOAT GLASS

- A. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
- B. Fabrication Process: By vertical (tong-held) or horizontal (roller-hearth) process, at manufacturer's option, except provide horizontal process where indicated as tongless or free of tong marks.
- C. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent glass, flat); Quality q3 (glazing select); class, kind, and condition as indicated in schedules at the end of Part 3.

2.3 LAMINATED GLASS

- A. Laminated Glass: Comply with ASTM C 1172 for kinds of laminated glass indicated and other requirements specified, including those in the Laminated-Glass Schedule at the end of Part 3.
- B. Interlayer: Interlayer material as indicated below, clear or in colors, and of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.
 - 1. Interlayer Material: (Fragmentation layer) .060" thick Polyvinyl butyral sheets or cured resin.
- C. Laminating Process: Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets as follows:
 - 1. Laminate lites with polyvinyl butyral interlayer in autoclave with heat plus pressure.
 - 2. Laminate lites with laminated glass manufacturer's standard cast-in-place and cured transparent resin interlayer.
 - a. 1" thick insulated glass shall have exterior side of glass to be heat strengthen, Inner side of glass shall be .060" Polyvinyl Butyral sheet laminated between two layers of 1/8" thick heat-strengthened Glass.
 - b. 1/4" thick glass shall have .060" Polyvinyl Butyral sheet laminated between two layers of 1/8" thick heat strengthened Glass, for a total actual thickness of 5/16", (Noted 5/16" or 1/4" on drawings).
 - c. 9/16" thick laminated glass shall have .090" Polyvinyl Butyral sheet laminated between two layers of 1/4" heat strengthened Glass, for a total actual thickness of 1/4".

2.4 INSULATING GLASS

- A. Insulating-Glass Units: Preassembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in the Insulating-Glass Schedule at the end of Part 3.
 - 1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in "Performance Requirements" Article.
- B. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated in the Insulating-Glass Schedule at the end of Part 3 are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
- C. Sealing System: Dual seal, with primary and secondary sealants as follows:
 - 1. Manufacturer's standard sealants.

D. Spacer Specifications: Manufacturer's standard spacer material and construction.

1. Corner Construction: Manufacturer's standard corner construction.

2.5 ELASTOMERIC GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As selected by Contracting Officer from manufacturer's full range for this characteristic.

B. Elastomeric Glazing Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied, chemically curing sealant in the Glazing Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.

2.6 COATED GLASS

A. Silicone Coated Spandrel Glass:

1. ASTM C1048, Kind HS or FT, Condition B, Type I, Quality q3 with silicone coating applied over glass surface.
2. Pattern - none.
3. Basis of color on outboard of insulating-glass units shall be "Beach Bronze" – ICD Color Name.

2.7 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tape: Closed-cell, PVC foam tape; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:

1. Type 1, for glazing applications in which tape acts as the primary sealant.
2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.8 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.9 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.
- B. Grind smooth and polish exposed glass edges.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep system.
 - 3. Minimum required face or edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or

other imperfections that, when installed, could weaken glass and impair performance and appearance.

- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where the length plus width is larger than 50 inches as follows:
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant where required for weathertight seal.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.5 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.

- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 PROTECTION AND CLEANING

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

3.8 MONOLITHIC FLOAT-GLASS SCHEDULE

- A. Uncoated Clear Float Glass: Where glass as designated below is indicated, provide Type I (transparent glass, flat), Class 1 (clear) glass lites complying with the following:
 - 1. Uncoated Clear Annealed Float Glass: Annealed or Kind HS (heat strengthened), Condition A (uncoated surfaces) where heat strengthening is required to resist thermal stresses induced by differential shading of individual glass lites and to comply with performance requirements.
 - 2. Uncoated Clear Heat-Strengthened Float Glass: Kind HS (heat strengthened).

- B. Uncoated Tinted Float Glass: Where glass as designated below is indicated, provide Class 2 (tinted, heat-absorbing, and light-reducing) glass lites complying with the following:

1. Tint Color: PPG Solarban 60 (2) Optigray + Clear
2. Visible Light Transmittance: 50%
3. Solar Heat Gain Coefficient (SHGC): Winter 0.29/ Summer 0.27
4. Light to Solar Gain Ratio(LSG): 1.67

3.9 OBSCURE-GLASS SCHEDULE

- A. Frosted Glass: Where glass of this designation is indicated, provide frosted monolithic-glass lites.

3.10 LAMINATED-GLASS SCHEDULE

- A. Laminated Glass: Where glass of this designation is indicated, provide glass lites complying with the following:

1. Outer Lite: Type I (transparent glass, flat) float glass.
 - a. Class 2 (tinted).
 - 1) Tint Color: PPG Solarban 70 (2) Solarbronze + Clear.
2. Plastic Interlayer:
 - a. Interlayer Color: Clear.

3.11 INSULATING-GLASS SCHEDULE

- A. Insulating Glass: Where glass of this designation is indicated, provide uncoated insulating-glass units complying with the following:

1. Overall Unit Thickness and Thickness of Each Lite: 1" and minimum 1/4"
2. Interspace Content: Dry Air, or approved neutral inert gas.
3. Indoor Lite: Type I (transparent glass, flat), Class 1 (clear) float glass.
 - a. Laminated Kind.
4. Outdoor Lite: Type I (transparent glass, flat) float glass.
 - a. Class 2 (tinted).
 - 1) Tint Color: PPG Solarban 70 (2) Solarbronze + Clear.
 - b. Laminated Kind HS (heat strengthened), Condition A (uncoated surfaces)
5. Visible Light Transmittance: 39%
6. Solar Heat Gain Coefficient (SHGC): .20
7. Light to Solar Gain (LSG) ratio: 1.95

3.12 GLAZING SEALANT SCHEDULE

- A. Low-Modulus Nonacid-Curing Silicone Glazing Sealant: Where glazing sealants of this designation are indicated, provide products complying with the following:

1. Type and Grade: S (single component) and NS (nonsag).
2. Class: 25.
3. Additional Movement Capability: 50 percent movement in extension and 50 percent movement in compression for a total of 100 percent movement.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.a. Use O Glazing Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, and wood.

- B. Medium-Modulus Neutral-Curing Silicone Glazing Sealant: Where glazing sealants of this designation are indicated, provide products complying with the following:

1. Type and Grade: S (single component) and NS (nonsag).
 2. Class: 25.
 3. Use Related to Exposure: NT (nontraffic).
 4. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.a. Use O Glazing Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, and wood.
- C. Medium-Modulus Neutral-Curing Silicone Glazing Sealant GS-#: Where glazing sealants of this designation are indicated, provide products complying with the following:
1. Type and Grade: S (single component) and NS (nonsag).
 2. Class: 25.
 3. Additional Movement Capability: 50 percent movement in extension and 50 percent movement in compression for a total of 100 percent movement.
 4. Use Related to Exposure: NT (nontraffic)
 5. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.a. Use O Glazing Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, and wood.

END OF SECTION 08 80 00

SECTION 09 90 00
PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Surface preparation.
- B. Field application of paints, stains, varnishes, and other coatings.
- C. Concrete Floor Sealers / Hardener.
- D. See Schedule - Surfaces to be Finished, at end of Section.

1.2 REFERENCES

- A. ASTM D 16 - Standard Terminology Relating to Paint, Varnish, Lacquer, and Related Products; 1995.
- B. ASTM D 4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 1992.
- C. Floor Sealers., ISO 9001/90022 and ANSI Registered.

1.3 DEFINITIONS

- A. Conform to ASTM D 16 for interpretation of terms used in this section.

1.4 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on all finishing products.
- C. Manufacturer's Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.
- D. In regards to all materials requiring color selection, the User Agency shall sign/date color selection(s) with copy to FP&C prior to ordering materials. Colors must be from "standard" line of manufacturer's colors.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the work of this section with minimum 3 years experience.

1.6 REGULATORY REQUIREMENTS

- A. Conform to applicable code for flame and smoke rating requirements for products and finishes.

1.7 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 7 degrees C (45 degrees F) and a maximum of 32 degrees C (90 degrees F), in ventilated area, and as required by manufacturer's instructions.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- C. Minimum Application Temperatures for Latex Paints: 7 degrees C (45 degrees F) for interiors; 10 degrees C (50 degrees F) for exterior; unless required otherwise by manufacturer's instructions.
- D. Minimum Application Temperature for Varnish Finishes: 18 degrees C (65 degrees F) for interior or exterior, unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 860 lx (80 ft candles) measured mid-height at substrate surface.
- F. Other Considerations:
 - 1. Install prior to adhesively applied flooring and wall covering.
 - 2. Install prior to carpet and acoustical material.
 - 3. Schedule installation to minimize accumulation of air contaminants that cannot be removed prior to occupancy.
 - 4. Air out construction with 100% outside air.
 - a. Do not recirculate prior to occupancy.
 - b. Ventilate during installation. Seal return air ducts and use direct exhaust to outdoors.

1.9 EXTRA MATERIAL

- A. Deliver extra material to Owner. Furnish extra paint materials that match products as described below, packaged with protective covering for storage and identified with labels clearly describing contents. Contractor shall provide an amount equal to 2% of the installed material provided within the Scope of the Work (provide amount for each color used on project). Surplus material is a requirement of the Work and Final Payment will not be issued until all material is provided to the Owner.

PART 2 - PRODUCTS

2.1 PAINTS AND COATINGS - GENERAL

- A. Material Quality: Provide the manufacturer's best-quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.

B. Paints and Coatings: Ready mixed, except field-catalyzed coatings. Prepare pigments:

1. To a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
2. For good flow and brushing properties.
3. Capable of drying or curing free of streaks or sags.

2.2 PAINT SYSTEMS - EXTERIOR

A. Concrete/Masonry, Opaque, Acrylic, 3 Coats:

1. One coat of block filler.
2. Semi-gloss: Two coats of Acrylic enamel.

B. Ferrous Metals, Unprimed, Acrylic, 3 Coats:

1. One coat of Acrylic primer.
2. Gloss: Two coats of Acrylic enamel.

C. Ferrous Metals, Primed, Acrylic, 2 Coats:

1. Touch-up with zinc chromate primer.
2. Gloss: Two coats of Acrylic enamel.

D. Galvanized Metals, (Other than Steel Roof Decking), Acrylic, 3 Coats:

1. One coat galvanized primer.
2. Gloss: Two coats of Acrylic enamel.

E. Pavement Marking Paint: Acrylic resin type, traffic marking paint, ready mixed, complying with Section 1015.12 (a) of the Louisiana Department of Transportation, (LaDOTD), Louisiana Standard Specifications for Roads and Bridges, (LSSRB – Latest Edition).

F. Stained Wood, Wood Trim and Fencing:

1. Exterior, Opaque Acrylic Wood Stain. (2 coats)

2.3 PAINT SYSTEMS - INTERIOR

A. Wood, Opaque, Acrylic, 3 Coats:

1. One coat Acrylic primer sealer.
2. Semi-gloss: Two coats of Acrylic enamel.

B. Wood, Transparent, Varnish, Stain:

1. One coat of stain.
2. One coat sealer.
3. Satin: One coat of varnish or polyurethane, (satin).

C. Paint CI-OP-3A - Concrete/Masonry, Opaque, Acrylic, 3 Coats:

1. One coat of block filler.

D. Paint MI-OP-3A - Ferrous Metals, Unprimed, Acrylic, 3 Coats:

1. One coat of Acrylic primer.
 2. Gloss: Two coats of Acrylic enamel.
- E. Ferrous Metals, Primed, Acrylic, 2 Coats:
1. Touch-up with Acrylic primer.
 2. Gloss: Two coats of Acrylic enamel.
- F. Galvanized Metals, Acrylic, 3 Coats:
1. One coat galvanized primer.
 2. Gloss: Two coats of Acrylic enamel.
- G. Exposed galvanized steel roof, Acrylic, 3 Coats:
1. One coat galvanized primer.
 2. Gloss: ONE coat of Acrylic enamel
- H. Concrete/Masonry, Epoxy Enamel, 3 Coats:
1. One coat of catalyzed epoxy primer.
 2. Gloss: Two coats of catalyzed epoxy enamel.
- I. Paint GI-OP-2A - Gypsum Board/Plaster, Acrylic, 2 Coats: (Semigloss)
1. One coat of Acrylic primer sealer.
- J. Concrete Floor Sealer / Hardener:
1. Euco Diamond Hard, Euclid Chemical Company, 19218 Redwood Road, Cleveland, Ohio, 1-800-321-7628.
 - a. Meets VOC content of 400 g/l, in accordance with EPA 40 CFR Part 59, Table 1, Subpart D for concrete protective coatings.
 - b. VOC Content: 0 g/l.
 - c. Ultraviolet resistant, blush resistant, non-yellowing, No odor, penetrating.
 - d. Follow manufactures printed literature for installation
- 2.4 ACCESSORY MATERIALS
- A. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified; commercial quality.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are ready to receive Work as instructed by the product manufacturer.

- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Plaster and Gypsum Wallboard: 12 percent.
 - 2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
 - 3. Interior Wood: 15 percent, measured in accordance with ASTM D 4442.
 - 4. Concrete Floors: 8 percent.

3.2 PREPARATION

- A. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- B. Surfaces: Correct defects and clean surfaces which affect work of this section. Remove or repair existing coatings that exhibit surface defects.
- C. Marks: Seal with shellac those which may bleed through surface finishes.
- D. Impervious Surfaces: Remove mildew by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- E. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- F. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
- H. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with non-petroleum based solvent. Apply coat of etching primer.
- I. Uncoated Steel and Iron Surfaces to be Painted whether or not colors are designated in schedules: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent, comply with recommendations of the Steel Structures Painting Council, (SSPC).
 - 1. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.
 - 2. Blast steel surfaces clean as recommended by the paint system manufacturer's and according to requirements of SSPC specifications SSPC-SP 10.
- J. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
- K. Interior Wood Items to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

- L. Interior Wood Items to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.
- M. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with tinted primer.
- N. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.3 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.
- B. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
- E. Sand wood and metal surfaces lightly between coats to achieve required finish.
- F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- G. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

3.4 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Painting mechanical and electrical work is limited to items exposed in mechanical and electrical equipment rooms and in occupied spaces.
- B. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- C. Mechanical items to be painted include, but are not limited to the following:
 - 1. Piping, pipe hangers and supports in mechanical rooms and occupied areas.
 - 2. Heat exchangers.
 - 3. Tanks.
 - 4. Ductwork
 - 5. Insulation
 - 6. Supports.
 - 7. Motors and mechanical Equipment.
 - 8. Accessory Items.
 - 9. Paint shop-primed items occurring in finished areas.
- D. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.
- E. Electrical items to be painted include, but are not limited to the following:

1. Conduit and fittings.
2. Switchgear.

- F. Plywood electrical and communication wall boards. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
- G. Paint interior surfaces of ducts, where visible through register or grilles, with a flat, non-specular black paint.
- H. Paint all unpainted, unprimed bear steel pipe supports and exposed steel and ironwork

3.5 CLEANING

- A. Collect waste material which may constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.6 SCHEDULE - SURFACES TO BE FINISHED

- A. Do Not Paint or Finish the Following Items:
1. Items fully factory-finished unless specifically noted.
 2. Fire rating labels, Factory Mutual labels, performance rating labels, equipment serial number and capacity labels.
 3. Finished Mechanical and electrical equipment unless specifically noted.
 4. Light fixtures.
 5. Switchgear.
 6. Distribution Cabinets.
 7. Anodized aluminum.
 8. Stainless Steel and Chromium plate.
 9. Copper, bronze and Brass
 10. Operating parts not to be painted include moving parts of operating equipment, such as the following:
 - a. Valve and Damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
 - e. Acoustical material.

- B. Paint the surfaces described below under Schedule - Paint Systems.

3.7 SCHEDULE - PAINT SYSTEMS

- A. Concrete, Concrete Block, Brick Masonry: Finish all surfaces exposed to view.
1. Exterior: CE-OP-3A, flat.
 2. Interior: CI-OP-3L, semi-gloss.
- B. Gypsum Board: Finish all surfaces exposed to view.
1. Interior Ceilings and Bulkheads: GI-OP-3L, flat.
 2. Interior Walls: GI-OP-3A, semi-gloss.
- C. Wood: Finish all surfaces exposed to view.
- D. Wood Cabinets: Finish all exposed and semi-exposed surfaces.

1. Outside Surfaces: WI-TR-VS, gloss.
 2. Inside Surfaces: WI-OP-2A, semi-gloss.
- E. Wood Doors: WI-TR-VS.
- F. Steel Fabrications: Finish all surfaces exposed to view.
- G. Galvanized Steel: Finish all surfaces exposed to view.
- H. Shop-Primed Metal Items: Finish all surfaces exposed to view.
1. Finish the following items:
 - a. Exposed surfaces of lintels.
 - b. Elevator pit ladders.
 - c. Exposed surfaces of steel stairs and railings.
 - d. Mechanical equipment.
 - e. Electrical equipment.
- I. Exterior Pavement Markings: Paint as indicated on Architectural Site Drawings.

END OF SECTION 0 9 90 00

SECTION 31 31 16
TERMITE CONTROL

PART 1- GENERAL

1.1 SUMMARY

- A. Section includes treatment of new buildings for termite control.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and application instructions.
- B. Warranty: Furnish written certification that applied soil poisoning treatment will prevent infestation of subterranean termites and that if subterranean termite activity is discovered during warranty period, Contractor will re-treat soil and repair or replace damage caused by termite infestation.
 - 1. Provide warranty for a period of five (5) years from date of treatment, signed by applicator and Contractor.
 - 2. Perform annual inspections of the building at no additional cost to the Owner to monitor treatment adequacy as required to maintain the warranty.

1.3 QUALITY ASSURANCE

- A. Engage a Texas licensed professional pest control operator, for application of soil treatment solution.

PART 2 - PRODUCTS

2.1 MIXES

- A. Soil Treatment Solution: Use emulsible concentrate insecticide for dilution with water, specially formulated to prevent termite infestation. Use only solutions approved by EPA, DEQ and other regulating authorities. Use only soil treatment solutions which are not injurious to planting.
- B. Working Solution: Solutions shall contain any one of the following chemicals at the listed minimum concentration:
 - 1. Cypermethrin .25%- 1.00%
 - 2. Permethrin .5% - 2.00%
 - 3. Imidacloprid .05%- .10%
 - 4. Bifenthrin .06%- .12%

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not apply soil treatment solution until excavating, filling and grading operations are completed, except as otherwise required in construction operations.
- B. Apply treatment solution directly to exposed areas prior to installation of finishes, except as otherwise required in construction operations.

3.2 PREPARATION

- A. Trench around the entire perimeter of the structure(s) to be treated 4" to 6" deep adjacent to the foundation walls.
- B. Remove foreign matter which could decrease effectiveness of treatment on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and foundations. Toxicant may be applied before placement of compacted fill under slabs, if recommended by toxicant manufacturer.

3.3 APPLICATION

- A. Apply soil treatment to soil at all locations required to prevent termite infestation.
- B. Apply treatment one gallon per five linear feet of trench. As soil is replaced, apply again at a rate of one gallon per ten linear feet.
- C. Apply soil treatment solution at rates recommended by soil toxicant manufacturer.
- D. To insure penetration, do not apply soil treatment to frozen or excessively wet soils or during inclement weather. Comply with handling and application instructions of soil toxicant manufacturer.
- E. Apply chemical to exposed plumbing trap areas in sufficient amounts to flood the trap area. Where traps are not accessible and providing access is impractical, treat by drilling through the concrete slab and pressure treat.
- F. Rod under or pressure treat through the slab and thoroughly treat all areas below expansion joints, cracks, or other voids in the slab. When the slab is drilled, the holes must be no more than 24" apart along the area being treated. Repair all drills openings to match finish conditions
- F. Reapply soil treatment solution to areas disturbed by subsequent excavation or other construction activities following application.
- H. Allow not less than 12 hours for drying after application, before beginning concrete placement or other construction activities.

3.4 PROTECTION

- A. Post signs in areas of application warning workers that soil poisoning has been applied. Remove signs when areas are covered by other construction.

END OF SECTION 31 31 16

SECTION 32 17 23
PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes painting and marking of pavements, curbs, guard posts, and light pole bases.

1.2 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation (AASHTO)
 - 1. AASHTO M248 - Ready-Mixed White and Yellow Traffic Paints
- B. ASTM International (ASTM)
 - 1. ASTM D4414 - Standard Practice for Measurement of Wet Film Thickness by Notched Gauges.
- C. Federal Specifications (FS)
 - 1. FS A-A-2886 - Paint, Traffic, Solvent Based (supersedes FS TT-P-85 and FS TT-P-115, Type I)
 - 2. FS TT-P-1952 - Paint, Traffic and Airfield Marking, Waterborne

1.3 PROJECT CONDITIONS

- A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize flagmen, barricades, warning signs, and warning lights as required.

1.4 QUALITY ASSURANCE

- B. Use trained and experienced personnel in applying the products and operating the equipment required for properly performed work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Paint shall be waterborne or solvent borne, colors as shown or specified herein. Pavement marking paints shall comply with applicable state and local laws enacted to ensure compliance with Federal Clean Air Standards. Paint materials shall conform to the restrictions of the local Air Pollution Control District.
- B. Waterborne Paint: Paints shall conform to FS TT-P-1952,
- C. Solvent Borne Paint: Paint shall conform to FS A-A-2886 or AASHTO M248. Paint shall be non-bleeding, quick-drying, and alkyd petroleum base paint suitable for traffic-bearing surface and be mixed in accordance with manufacturer's instructions before application for colors White, Yellow, Blue, and Red.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the work area and correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

- A. Sweep and clean surface to eliminate loose material and dust.
- B. Where existing pavement markings are indicated on Construction Drawings to be removed or would interfere with adhesion of new paint, a motorized abrasive device shall be used to remove the markings. Equipment employed shall not damage existing paving or create surfaces hazardous to vehicle or pedestrian traffic. Within public rights-of-way, appropriate governing authority shall approve method of marking removal.
- C. New pavement surfaces shall be allowed to cure for not less than 30 days before application of marking materials.

3.3 CLEANING EXISTING PAVEMENT MARKINGS

- A. In general, markings shall not be placed over existing pavement marking patterns. Existing pavement markings, which are in good condition but interfere or conflict with the newly applied marking patterns, shall be removed. Deteriorated or obscured markings that are not misleading or confusing or do not interfere with the adhesion of the new marking material do not require removal. Whenever grinding, scraping, sandblasting or other operations are performed, the work shall be conducted in such a manner that the finished pavement surface is not damaged or left in a pattern that is misleading or confusing. When these operations are completed the pavement surface shall be blown off with compressed air to remove residue and debris resulting from the cleaning work.

3.4 APPLICATION

- A. Apply pavement markings in strict accordance with manufacturer's instructions. Do not apply marking paint when weather is foggy or rainy, or ambient or pavement temperatures are below 50 deg. F. nor when such conditions are anticipated during eight hours after application.
- B. Immediately before applications, paint shall be agitated and mixed thoroughly to a uniform consistency, free from lump or agglomerates. Paint shall be kept covered to retain volatiles. Paint shall not be thinned without approval.
- C. Apply two coats of paint at manufacturer's recommended rate, without addition of thinner, with maximum of 100 square feet per gallon or as required to provide a minimum wet film thickness of 15 mils and dry film thickness of 7 ½ mils per coat. Paint shall be applied for a total dry film thickness of 15 mils. Apply with mechanical equipment to produce uniform straight edges. At sidewalk curbs and crosswalks, use straightedge to ensure uniform, clean, and straight stripe.
- D. Install pavement markings according to manufacturer's recommended procedures for the specified material.
- E. Tolerances of + ½ inch and – 1/8 inch from the specified widths will be allowed, provided the variation is gradual. Segments shall be squared off at each end without mist or drip.

F. Following items shall be painted with colors noted below:

1. Pedestrian Crosswalks: White
2. Exterior Sidewalk Curbs, Light Pole Bases, and Guard posts: Yellow
3. Fire Lanes: Red or per local code
4. Lane Striping where separating traffic moving in opposite directions: Yellow
5. Lane Striping where separating traffic moving in the same direction: White
6. ADA Symbols: Blue or per local code
7. ADA parking space markings as shown on the drawings: Blue
8. Parking Stall Striping: White, unless otherwise noted on Construction Drawings
9. Associate Parking Area: White, unless otherwise noted on Construction Drawings

3.5 FIELD QUALITY CONTROL

- A. Inspection: After the paint has thoroughly dried, visually inspect the entire application and touch up as required to provide clean, straight lines and surfaces throughout.
- B. Testing: Testing of wet film thickness shall be performed a minimum of two times on each parking row (including striped islands) and pedestrian cross walks, and a minimum of one test on each lane/alignment striping. At least one test shall be performed after refilling paint striping machine, changing operators of striping machine, and changing paint types, brands, etc. This shall be performed in addition to the testing stated above. These tests shall be performed on each coat applied. Testing shall be performed in accordance with ASTM D4414.

3.6 CLEANING

- A. Waste materials shall be removed at the end of each workday. Upon completion of the work, all containers and debris shall be removed from the site. Paint spots upon adjacent surfaces shall be carefully removed by approved procedures that will not damage the surfaces and the entire job left clean and acceptable.

END OF SECTION 32 17 23

PROJECT MANUAL AND SPECIFICATIONS

EV BUS PARKING, BUS CANOPIES AND ROADWAY

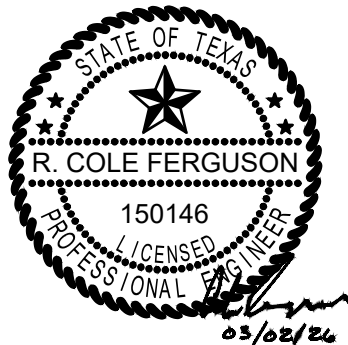
PROJECT

CONTRACT NO. 21-287



CITY OF PORT ARTHUR
PORT ARTHUR TRANSIT

MARCH 2026



ITEM 260500

COMMON WORK RESULTS FOR ELECTRICAL

1. DESCRIPTION

1.1 SECTION INCLUDES

A. This item is intended to supplement the specifications for the Electrical requirements of this contract. It is the intent and meaning of the Plans and Specifications that the Contractor shall provide an electrical installation that is operational and complete, including all items and appurtenances necessary, reasonably incidental or customarily included, even though each and every item is not specifically called out or shown.

B. Installations and construction under these provisions shall be coordinated with the Construction Manager. Specification requirements for approvals, reviews, or other involvements of the Engineer shall be transmitted by the Contractor through the Construction Manager to the Engineer.

1.2 APPLICABLE CODES AND STANDARDS.

A. Codes. All electrical work shall conform with the requirements and recommendations of the latest edition of the National Electrical Code. In conflicts among drawings, specifications and codes, the most stringent requirements shall govern.

B. Standards. The specifications and standards of the following organizations are by reference made part of these specifications and all electrical work, unless otherwise indicated, shall comply with their requirements and recommendations wherever applicable.

1. Institute of Electrical and Electronic Engineers (IEEE)
2. American National Standards Institute (ANSI)
3. American Society for Testing and Materials (ASTM)
4. Insulated Power Cable Engineers Association (ICEA)
5. National Institute of Standards and Technology (NIST).
6. National Electrical Contractor's Association (NECA)
7. National Electrical Manufacturer's Association (NEMA)
8. National Fire Protection Association (NFPA)
9. Underwriter's Laboratories, Inc. (UL)
10. National Electrical Safety Code (NESC)

1.3 REQUIREMENTS OF REGULATORY AGENCIES

A. All equipment and materials, covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification, when requested by the Engineer.

B. The requirements and recommendations of the latest edition of the Occupational Safety and Health Act are by reference made a part of these specifications and all electrical work shall comply with their requirements and recommendations wherever applicable.

1.4 WORKMANSHIP AND PERSONNEL REQUIREMENTS

A. All electrical work shall be performed by workmen skilled in the electrical trade and licensed for the work either by City of Port Arthur or State of Texas. The Engineer will recognize the

credentials of Master Electricians with valid current licenses from City of Port Arthur or the State of Texas. Credentials will be recognized of Journeyman Electricians with valid current licenses from City of Port Arthur or other licensing entities having established reciprocal agreements with these municipalities.

B. A licensed Master Electrician will be required for the issuance of a building permit for constructing, installing, altering, maintaining, repairing or replacing any electrical wiring, apparatus, or equipment on any voltage level in the jurisdiction of Port Arthur.

C. A licensed Master Electrician or a licensed Journeyman Electrician is required to be on the job site whenever any electrical work is performed. Any electrical work or associated electrical installations shall be accomplished under the direct supervision of a licensed Journeyman Electrician.

D. To ensure compliance with Paragraph "c" above, only a documented Electrical work force with a ratio of a maximum ration of 3 licensed Apprentices for each licensed Journeyman Electrician shall be allowed to work on the electrical systems.

E. Contractor shall prepare documentation associated with the electrical work force confirming adherence to the requirements of Paragraph "d" above. These documents shall be submitted to the Construction Manager for approval. Also, any work force changes or revisions which affect compliance with paragraph "d" above shall also be submitted to the Construction Manager for approval.

F. All circuits will be handled throughout the installation process by qualified licensed electrical personnel.

G. Every cable splicer shall be qualified in making cable splices and terminations on cables rated above 1,000 volts A.C. The Contractor shall submit for approval of the Construction Manager proof of the qualifications of each proposed cable splicer for the cable type and voltage level to be worked on. Cable splicing/terminating personnel shall have a minimum of three (3) years continuous experience in terminating/splice medium voltage cable.

H. At least thirty (30) days prior to performing any cable splicing/terminating, Contractor shall submit to the Construction Manager a written list of proposed cable splicing/terminating personnel, including written evidence that the proposed personnel have had a minimum of eight (8) hours of technical training by authorized splice/termination kit manufacturer personnel. Approved training shall include a thorough review of kit components and splicing/terminating techniques and procedures. Field splices shall only be installed by technicians approved by the Construction Manager and the Engineer.

I. In addition, each trained cable splicer shall be required to install a splice and a connector on type and size of the cable to be used under this contract. Sample connections shall be accomplished in accordance with the manufacturer's instructions and in the presence of the Construction Manager.

J. All communications work shall be performed under the direct supervision of a Building Industry Consulting Service International, Inc. (BICSI) registered Cabling Installer/Technician level.

K. The Contractor performing construction on the electrical and/or communication system shall have a minimum of 5 years of experience on construction of projects of similar type of work and of similar size and complexity. The owner will require all Electrical Contractors

bidding on this project to submit proof of experience that they have successfully completed at least two projects of comparative size and complexity within the past 5 years.

1.5 EQUIPMENT, MATERIAL AND INSTALLATION REQUIREMENTS

A. The Contractor shall furnish and install all materials, equipment, accessories, connections and incidental items in accordance with the approved recommendations of the manufacturer and the best practices of the trade to provide a complete installation ready for use and operational by the Owner.

B. All equipment and materials shall be new, unless specifically noted otherwise, and shall bear the manufacturer's name, trademark and ASME, UL, and/or other labels in every case where a standard had been established for the particular item.

C. The Contractor shall promptly notify the Construction Manager in writing of any conflict between any requirements of the Contract Documents and equipment manufacturer's directions and shall obtain written instructions from the Construction Manager before proceeding with the work. Should the Contractor perform any work that does not comply with the manufacturer's directions or such written instructions from the Construction Manager, Contractor shall bear all costs arising in correcting deficiencies.

D. After review of equipment submittals, and instructions by the Engineer to proceed, equipment installations may require arrangements or connections different from those shown on the drawings. It is the responsibility of the Contractor to install the equipment to operate properly. The Contractor shall provide any additional equipment and/or materials required for installations to operate in accordance with the intent of the drawings and specifications.

E. It is the responsibility of the Contractor to insure that items installed fit the space available with adequate room for proper equipment operation and maintenance. Contractor shall make field measurements to ascertain space requirements, including those for connections, and shall furnish and install such sizes and shapes of equipment that the final installation provides a complete and operational system that complies with the requirements of the drawings and specifications.

F. The Contractor shall be responsible for coordinating proper location of roughing in and connections by other trades. Changes associated with coordination requirements shall be made at no increase in the Contract amount or additional costs to other trades.

G. The Contractor shall support work and equipment plumb, rigid and true to line. The Contractor shall determine how equipment, fixtures, conduit, etc., are to be installed, as required by codes, drawings and specifications. Foundations, bolts, inserts, stands, hangers, brackets and accessories required for proper support shall be provided by the Contractor, whether or not specifically indicated on the drawings.

1.6 SUBMITTALS

A. Submit manufacturer's data or shop drawings of the following items giving full information as to the dimensions, materials, and other information required to define compliance with the specifications. Other items to be submitted are listed in the specification sections.

Handholes/Manholes/ Pull Boxes and Accessories	S-1 Plug Cutouts and Cabinet
Ductbanks	Constant Current Regulator
Conduit	

Support Hardware	Multi-hole Adapter Ring
#10 Copper Cable	Fixture Bases, and accessories
#6 Copper Cable	Shop Drawings
Support Hardware	Tape 3/8+ -
Cadweld	Identification Tags
316 Stainless Steel Bolts	Ground Rods
Fixture Installation and Location	Grounding

B. When requested by the Engineer, samples of these items shall be submitted for approval. Equipment/installation diagrams shall also be submitted for approval, as required by project specifications and/or requested by the Engineer.

C. Contractor submittal package shall include a typewritten list indicating each bid item, with a breakdown of all item components and all parts that are assembled or associated with bid item installation.

D. Submittal package list shall indicate: (1) Bid item number, (2) Part numbers of associated item components, as required and (3) Reference page number where item and components information is located in the submittal package. The contractor shall organize submittals so that common components to multiple bid items are not duplicated in the submittals.

E. Checking of submittals by the Engineer is done only as an aid to the Contractor and approval of submittals shall not relieve Contractor of responsibility for any errors or omissions in the submittals, nor shall it relieve the Contractor of total responsibility for proper and complete execution of the job.

2. PRODUCTS

2.1 Not used

3. EXECUTION

3.1 INSPECTION AND TESTING

A. All work performed by the Contractor shall be subject to periodic inspections by the Engineer, the Owner's Representative, and the Owner's Construction Manager to verify that the installation is in compliance with the applicable requirements of these specifications.

3.2 INSTALLATION PROVISIONS

A. To enhance personnel safety and avoid contractual problems, the Contractor shall comply with the provisions indicated below.

3.3 ELECTRICAL WORK PROVISIONS.

A. Existing Underground Utilities. At least forty-eight (48) hours prior to beginning any excavation, locations of all utility lines in the construction area will be identified and marked with surveyor flags by appropriate utility personnel. The Contractor shall be responsible for maintaining the location flags. Any flags displaced shall be replaced by the Contractor. The

Contractor shall coordinate with Construction Manager any additional prior notification time required during weekend and/or holiday work periods.

B. Also at least forty-eight (48) hours prior to beginning any excavation, the contractor shall request the construction manager to have staff identify circuits in proposed excavation areas. The Contractor shall coordinate with Construction Manager any additional prior notification time required during weekend and/or holiday work periods.

C. The above noted line identification information shall not relieve the Contractor of the responsibility of pinpointing underground lines to avoid unplanned disruptions or disturbing of installation or operation of underground lines in construction areas. Contractor shall use cable tracing equipment or other methods approved by the Construction Manager at his disposal, to pinpoint line locations. Excavation shall not proceed until all underground lines have been identified to the satisfaction of the Construction Manager.

D. Repair of underground lines damaged by the Contractor shall be the sole responsibility of the Contractor.

3.4 TEMPORARY AND BYPASS CIRCUIT PROVISIONS

A. During construction, temporary or bypass wiring or cable installations may be required to maintain operation of certain equipment, as indicated in Construction Documents and/or as specified. Temporary/bypass circuit installations shall adhere to provisions indicated below.

1. General Requirements. Contractor shall review the requirements in the specifications and Construction Documents, including, but not restricted to: Phasing and Sequencing Plans, Demolition Plans and Wiring Diagrams. Contractor shall determine locations, sizes and quantities of temporary/bypass wiring and conduits required for project construction.
2. At least 14 days prior to commencement of installation of temporary/bypass wiring, the Contractor shall submit a layout of proposed temporary/bypass conduits and circuits to the Construction Manager for review and approval, including proposed installation protection provisions.
3. Equipment and Materials. Temporary/bypass wiring shall meet the requirements of Section 260543 – Underground Electrical Duct Banks and Conduit (Item 260543), and shall also conform to the Construction Plans. Temporary/bypass wiring shall be identified at junction points with brass tags as approved by the Construction Manager.
4. Installation. Temporary/bypass circuits shall be installed with due consideration to personnel safety and circuit protection against physical damage. All damage to existing circuits as a result of Contractor action or inaction shall be corrected accordingly at the Contractor's expense and corrective action approved by the Owner.
5. Temporary/bypass, high voltage lighting system cables shall be protected from damage by vehicles with suitable fencing, barriers and/or adequately sized boards or timbers.
6. Temporary/bypass circuits shall be removed immediately upon completion of construction or purpose for which the wiring was installed. Upon removal of boards or timbers fastened to the pavement surface to protect temporary/bypass circuits, the Contractor shall repair the pavement with materials and methods approved by the Construction Manager. Temporary/bypass cable and counterpoise shall be removed and discarded by the Contractor.

3.5 EXISTING ELECTRICAL EQUIPMENT AND MATERIALS

A. The Contractor shall remove all existing wiring and electrical equipment made unnecessary by the new installation. All materials removed shall become property of the Contractor and

disposed of by the Contractor. The Contractor shall list materials according to type, class and/or size, and store or dispose of materials as directed by the Construction Manager.

3.6 POWER SERVICE CONTINUITY

A. Provide labor, materials and supervision required to maintain full capacity power service continuity when connection or modifications are made to existing systems and facilities. Do not interrupt service without prior consent of the Construction Manager, with a definite understanding of time and duration of outage. All outages will take place at a time for minimum disruption of facility activity. Coordinate with Owner.

3.7 AS-BUILT DRAWINGS

A. The Contractor shall maintain a set of as-built drawings on the job site as required the General Provisions of the Contract. Contractor shall mark on the as-built drawings all work details, alterations installed to meet site conditions and changes made by Change Notices. As-built drawings shall be kept available for inspection by the Construction Manager and/or the Engineer at all times.

B. Wiring verification diagrams shall be maintained throughout the project and later submitted to the City of Port Arthur. These field wiring diagrams shall depict the exact routing and number of cables installed in each conduit originating from and extending to each manhole, handhole, pullbox, sign, and lighting fixture for each new circuit or circuit revision.

4. MEASUREMENT AND PAYMENT

4.1 There is no separate measurement or payment for this section. Payment for items included in this section will be incidental with the item in which they are installed.

ITEM 260519 WIRE AND CABLE

1. GENERAL

1.1 SECTION INCLUDES

A. Wire and cable, including:

1. Power, control and lighting systems.
2. Grounding.
3. Wiring connections and terminations.

B. Related Documents:

1. Review these documents for coordination with additional requirements and information that apply to work under this section.

1.2 REFERENCES

A. General:

1. The following documents form part of the specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
2. Unless otherwise notes, the edition of the referenced code or standard that is current at the time of the "date of record" for the work shall be considered the effective code or standard for the duration of the project.

B. ANSI/NFPA 70 – National Electrical Code.

C. ASTM International

D. Insulated Cable Engineers Association (ICEA)

E. Institute of Electrical and Electronics Engineers. (IEEE).

F. NEMA – National Electrical Manufacturer's Association:

1. NEMA WC 70 Non shielded Power Cables rated 2000V or Less for the distribution of electrical energy.

G. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

H. NFPA – National Fire Protection Association:

1. Standard for Electrical Safety in the Workplace (NFPA 70E).

I. UL – Underwriter's Laboratories.

1.3 QUALITY ASSURANCE

- A. Products shall be tested, approved and labeled/listed by Underwriters Laboratories, Inc., or by a nationally recognized testing laboratory (NRTL) as listed in Division 26, Section 260500, Common Worker Results for Electrical.
- B. Electrical equipment and materials shall be new and within one year of manufacture, complying with all the latest codes and standards. No used, re-built, refurbished and/or re-manufactured electrical equipment and materials shall be furnished on this project.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to site in unopened cartons, reels, or bundles as appropriate, clearly identified with manufacturer's name, Underwriter's or other approved label, grade or identifying number.
- B. Store in clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect equipment and material from dirt, water, construction debris, and traffic.

2. MANUFACTURERS

2.1 Manufacturers include but are not limited to those listed. All proposed components and materials are subject to the approval of the engineer.

- A. Wire and Cable:
 - 1. Carol.
 - 2. Southwire.
 - 3. Triangle PWC, Inc.
- B. Connectors:
 - 1. Burndy.
 - 2. T & B.
 - 3. 3M.
- C. Power Distribution Blocks:
 - 1. IlSCO.
 - 2. Square D.

2.2 UNDERGROUND WIRE

- A. Thermoplastic-Insulated Wire
- B. Service Entrance Conductors, Feeders, Branch Circuits No. 6 AWG and Smaller: Copper conductor, 600-volt insulation, THW, THHN/THWN; smaller than No. 8 AWG, solid conductor.
- C. Grounding Wires No. 10 AWG: Bare copper solid conductor.
- D. Wiring types BX and MC will not be acceptable for use on this project.

3. EXECUTION

3.1 WIRING CONNECTIONS AND SPLICES

- A.** Connect and splice wire No. 8 AWG and smaller with self-insulating, wire nut connectors.
- B.** Terminate and splice all No. 6 AWG and larger copper conductors, except for load side lugs on Class I and II switchboards, panelboards, circuit breakers, transformers and with high conductivity, wrought copper, color-keyed compression connector similar to T & B Series 54100 for terminal connection; Series 54500 for two-way copper-to-copper splices; and Series 54700 for tapping and pigtail copper conductors.
- C.** Set screw type connectors are only acceptable on the load side lugs of Class I and II switchboards, panelboards and circuit breakers.

3.2 GENERAL WIRING METHODS

- A.** Use no wire smaller than No. 12 AWG for power and lighting circuits, and no smaller than No. 14 AWG for control wiring. Provide minimum of No. 12 AWG for all switch legs. Provide neutral conductor of the same size as the phase conductors to which it is associated.
- B.** Use No. 10 AWG conductor minimum for all lighting branch circuits.
- C.** Provide homerun conductors of continuous length without joint or splice from overcurrent device to first outlet.
- D.** Install wiring in conduit, unless indicated otherwise.
- E.** Neatly train and lace wiring inside boxes, panelboards, wiring gutters, and other equipment using Thomas & Betts "Ty-Wraps."
- F.** Provide equal conductor lengths for all parallel circuits.
- G.** Provide individual neutral for branch circuits.
- H.** Drawings indicate proposed circuiting only, and do not indicate every conductor unless intent is unclear and further clarification is required.
- I.** Tag each circuit in an outlet box where two or more circuits run to a single outlet as a guide for the fixture hanger in making connections.

3.3 WIRING INSTALLATION IN RACEWAYS

- A.** Pull conductors into raceway at the same time. Use UL listed wire pulling lubricant. Do not exceed manufacturer's recommended tension.
- B.** Completely and thoroughly swab raceway system before installing conductors.
- C.** Remove and discard conductors cut too short or installed in wrong raceway. Do not install conductors, which have been removed from a raceway.
- D.** Do not install conductors in conduit, which contains wires already in place.

3.4 WIRING CONNECTIONS AND TERMINATIONS

- A. Make taps and splices in accessible junction or outlet boxes only.
- B. Thoroughly clean wires before installing lugs and connectors.
- C. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.
- D. Provide joints in branch circuits only where such circuits divide. Where circuits divide, provide one through circuit to which the branch is spliced from the circuit. Do not leave joints in branch circuits for fixture hanger to make. Make all taps and splices with approved type compression connector.
- E. Terminate spare conductors with electrical tape.
- F. Identify and label all conductor terminations as specified in electrical identification.
- G. Properly terminate indicated conductors in equipment furnished and provide properly sized lugs.

3.5 COLOR CODING

- A. Color code distribution systems as follows:

- 1. 120/240V System:

Phase	Color
A	Black
B	Red
N	White
G	Green

- 2. 277/480V System:

Phase	Color
A	Brown
B	Orange
C	Yellow
N	Gray/White
G	Green

- 3. For areas where local authority color coding differs from that specified, contact City of Port Arthur for instructions.

- B. Provide color coding throughout the full length of all wire No. 6 and smaller. Identification by permanent paint bands or tags at the outlets will be acceptable for wire sizes larger than No.6. Provide the same color and shade of color throughout the project.

3.6 FIELD QUALITY CONTROL

- A. Inspect wire and cable for physical damage and proper connection.

B. Torque test conductor connections and terminations to manufacturer's recommended values.

4. MEASUREMENT

4.1 Electrical Conductors installed in raceway, duct bank or conduit shall be measured by the number of linear feet of conductors, installed, and accepted. This item shall include labels, testing, and terminations. The measurement for this item shall include all conductors in the circuit run as well as additional quantities required for slack. Separate measurement shall be made for different circuit types and sizes.

5. PAYMENT

5.1 Payment for this item will be paid at the contract unit price for conductors installed in duct bank or conduit, in place by the Contractor and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all labor, equipment, tools, and incidentals, including ground connectors and trench marking tape, necessary to complete this item.



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ITEM 260526

GROUNDING AND BONDING SYSTEMS

1. DESCRIPTION

1.1 SECTION INCLUDES

A. Section includes grounding electrodes and conductors; equipment grounding conductors; bonding methods and materials; including:

1. Power system grounding.
2. Communication system grounding.
3. Electrical equipment and raceway grounding and bonding.
4. Structural steel grounding.
5. Miscellaneous system grounding.

1.2 RELATED SECTIONS

A. Section 260530 – Maintenance Testing of Electrical Systems.

B. Section 260519 - Wire and Cable.

1.3 REFERENCES

A. NECA - Standard of Installation.

B. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

C. NFPA 70 - National Electrical Code.

1.4 SYSTEM DESCRIPTION

A. Grounding systems use the following elements as grounding electrodes:

1. Metal frame of the building.
2. Rod electrode.

B. Grounding System Resistance: 3 ohms.

1.5 SUBMITTALS

A. Product Data: Submit grounding electrodes and connections; for fastening components; and nameplates, labels, and markers.

B. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

C. Manufacturer's Installation Instructions: Submit for active electrodes.

D. Project Record Documents: Record actual locations of components and grounding electrodes.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section with minimum three years documented experience, and with service facilities within 100 miles of project.

1.7 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

2. MATERIALS

2.1 ROD ELECTRODES:

A. Copper-encased steel, 3/4-inch diameter, minimum length 10 feet.

2.2 MECHANICAL CONNECTORS:

A. Manufacturers

1. Manufacturers include but are not limited to those listed. All proposed components and materials are subject to the approval of the engineer.

- a. Burndy
- b. O.Z. Gedney
- c. Equivalent product approved by the engineer.

B. Heavy-duty, bolt-type, copper alloy or bronze for grounding and bonding applications, in configurations required for particular installation.

2.3 EXOTHERMIC CONNECTIONS:

A. Type for underground and structural steel; Cadweld.

B. Exothermic materials, accessories, and tools for preparing and making permanent field connections between grounding system components.

2.4 WIRE:

A. Stranded, copper cable.

B. Foundation Electrodes: 2/0 AWG.

C. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

3. EXECUTION

3.1 GROUNDING AND BONDING INSTALLATION

A. Install rod electrodes as indicated. Install additional rod electrodes as required to achieve specified resistance to ground.

B. Provide bonding to meet Regulatory Requirements.

- C. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
- D. Locate and install anchors, fasteners, and supports in accordance with NECA "Standard of Installation".
- E. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
- F. Do not use spring steel clips and clamps.
- G. Do not use powder-actuated anchors.
- H. Do not drill or cut structural members.

3.2 ELECTRIC SERVICE GROUND

- A. Ground the electrical service system neutral at service entrance equipment to grounding electrodes.
- B. Bond together system neutrals, service equipment enclosures, and equipment grounding conductor at service entrance.
- C. Connect the electric service grounding electrode conductors to the incoming metal water pipe system (when available, using a suitable ground clamp) and to a supplemental electrode such as a ground rod or ground loop.
- D. Provide grounding and bonding at the power company's metering equipment.
- E. Provide test wells for access to the ground grid and removable connections for testing the system.

3.3 EQUIPMENT GROUND

- A. Provide a complete ground system for the building consisting of copper cable, ground rods and exothermic connections to serve the service entrance, building structural steel, metallic enclosures and conduit systems.
- B. Provide a separate, insulated equipment-grounding conductor from the main service ground to each main switchboard and in all feeders and branch circuits. Terminate each end on a grounding lug, bus, or bushing. Do not use conduit as grounding conductor.
- C. Provide OZ Type "BJ" bonding jumper at all expansion joints, points of electrical discontinuity or connections in conduit where firm mechanical bond is not possible, such as flexible connections, insulating couplings, etc.
- D. Ground each lighting and power panelboard by connecting the grounding conductor to the grounding stud.
- E. Ground each secondary dry-type transformer to the ground bus of the primary side panelboard. Provide a bonding jumper between the ground stud and the neutral. Ground transformer ground stud to ground loop if a ground loop is installed or the nearest structural steel member.

F. Bond every item of equipment served by the electrical system to the building equipment ground system. This includes switchboards, panelboards, disconnect switches, receptacles, controls, fans, air handling units, pumps, and flexible duct connections.

3.4 COMMUNICATIONS GROUND

A. Provide communications system grounding conductor at point of service entrance and connect to the ground point.

B. Use minimum No. 6 AWG copper conductor for communications service grounding conductor. Leave 10-foot slack conductor at terminal board.

3.5 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Grounding and Bonding: Perform inspections and tests listed in NETA ATS, Section 7.13.

4. METHOD OF MEASUREMENT AND PAYMENT

4.1 There will be no separate measurement for payment on the work discussed in this section. All work will be considered incidental for the completion of the component of work to which it is related.

**ITEM 260530 –
MAINTENANCE TESTING OF ELECTRICAL SYSTEMS**

1. GENERAL

1.1 SECTION INCLUDES

- A.** Test electrical systems and equipment.
- B.** These tests are required to determine that the equipment involved may be safely energized and operated.
- C.** Perform tests by and under the supervision of fully experienced and qualified personnel. Advise each respective manufacturer's representative of tests on their equipment.
- D.** Record all test data.
- E.** Each section of Division 26 that has products or systems listed herein incorporate this section by reference and is incomplete without the required tests stated herein.

1.2 REFERENCES

- A.** NFPA 70 - National Electrical Code.

1.3 SUBMITTALS

- A.** Submit test report forms for review a minimum of 90 days prior to requesting a final review by the construction manager.
- B.** Furnish six individually bound copies of test data. Neatly type and arrange data. Include with the data the date tested, personnel present, weather conditions, nameplate record of test instrument and list all measurements taken, both prior to and after any corrections are made to the system. Record all failures and corrective action taken to remedy incorrect situation.
- C.** The project manager will retain one copy. Remaining copies will be returned to Contractor for inclusion in the operation and maintenance manuals.

2. PRODUCTS

2.1 NOT USED

3. EXECUTION

3.1 PREPARATION

- A.** Furnish proposed test procedures, recording forms, list of personnel and test equipment for project manager review.
- B.** Follow recommended procedures for testing as published by test equipment manufacturer.

3.2 WIRE AND CABLE

- A.** Test insulation resistance of each main feeder and service after the installation is complete but before the connection is made to its source and point of termination.
- B.** Test insulation resistance using Biddle Megger or equivalent test instrument at a voltage not less than 1,000 volts DC. Measure resistance from phase-to-phase and phase-to-ground. In circuits where insulation test value is lower than 1 megohm, remove and replace conductor and retest.
- C.** Visually inspect connections of every branch circuit for tightness.
- D.** Ensure that grounding conductor is electrically continuous.
- E.** Test branch circuits against grounds, shorts or other faults.
- F.** Inspect grounding and bonding system conductors and connections for tightness and proper installation.
- G.** Measure ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment.
- H.** Test the system for stray currents, ground shorts, etc. If stray currents, shorts, etc., are detected, eliminate or correct as required.

3.3 WIRING DEVICES

- A.** Operate switches at least twice.
- B.** Test every convenience outlet with plug-in device for proper phasing and grounding.
- C.** Demonstrate operation of lighting circuits and lighting control systems.

3.4 ELECTRICAL EQUIPMENT

- A.** Before Energization:
 - 1. Visually inspect connections for tightness and correctness.
 - 2. Verify proper fusing.
- B.** After Energization
 - 1. Verify proper voltage with system operating at load conditions.
 - 2. Verify proper operation.
 - 3. Operate every circuit breaker, switch and contactor.
 - 4. Modify tap settings on transformers as required.
 - 5. Measure line amperes with system operating at load conditions.
 - 6. Modify circuit breaker and relay settings as required.
 - 7. Megger meter centers for opens, shorts and grounds.
 - 8. Thermographic Tests:
 - a. With system operating at load conditions, perform thermographic test on distribution panelboards, lighting panelboards and equipment feeders using an infrared temperature scanning unit. Provide thermograph tests performed by General Electric Instrumentation Division.

b. Tighten or correct connections with higher temperatures than acceptable. After corrections have been made, perform thermograph test to confirm that problems have been corrected.

C. Operate all equipment and control systems through intended sequence. Record all data pertaining to system operation.

1. Contactors.
2. Electrically operated circuit breakers.

3.5 SECONDARY GROUNDING

- A. Test service entrance ground resistance.
- B. Provide additional made-electrodes if resistance is more than 3 ohms.
- C. Test grounding system resistance within building at a minimum of four locations.
 1. Assure system functions.
 2. Assure system interfaces with other systems.
- D. Test the system to determine that it is free from grounds, open and short circuits.

4. METHOD OF MEASUREMENT AND PAYMENT

4.1 There will be no separate measurement for payment on the work discussed in this section. All work will be considered incidental for the completion of the component of work to which it is related.

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ITEM 260533 BOXES

1. GENERAL

1.1 SECTION INCLUDES

- A. Furnish and install wall and ceiling outlet boxes, floor boxes, and pull and junction boxes.

1.2 RELATED SECTIONS

- A. Section 260519 - Wire and Cable.
- B. Section 260553 - Electrical Identification.
- C. Section 260543 – Underground Electrical Duct Banks and Conduit

1.3 REFERENCES

- A. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- C. NFPA 70 - National Electrical Code.

2. PRODUCTS

2.1 MANHOLES, HANDHOLES AND PULLBOXES

- A. Pre-cast or cast-in-place manholes, handholes, and pullboxes shall be located as shown on the plans.
- B. Dimensions and reinforcement shall be as noted on plans. See Standard Detail Drawings for electrical pull boxes and CTMS Type 1 Ground Boxes.
- C. The Contractor shall prepare and submit detailed shop drawings for pre-cast and cast-in-place concrete pullboxes and manholes indicating reinforcement, dimensions and details of each miscellaneous item.
 - 1. All shop drawings shall be checked by the fabricator before being submitted for approval to the Construction Manager and Engineer-of-Record.
 - 2. The Contractor shall be responsible for the correctness and completeness of the drawings and fit and field connections even if the drawings have been approved by the Construction Manager.
- D. Concrete used for the construction of pre-cast or cast-in-place manholes and pullboxes shall conform to the requirements of Item 360.
- E. All reinforcing steel shall be of the size and in the location as shown on the plans. Reinforcing steel shall conform to the requirements of Item 360.

F. Duct terminators or end bells shall be provided in manhole, pull box, and handhole walls. They shall have a smooth, bull-nosed edge.

1. Terminators shall be formed of high impact, high strength, prime virgin acrylonitrile butadiene styrene (ABS) plastic, containing the proper number, size and arrangement of openings to receive ducts installed under this contract.
2. Terminators shall be hollow, 6 inches outside-to-outside of interior and exterior surfaces, to allow placement of reinforcing steel inside. Terminators shall be provided and installed for reception of future ducts. Only factory-fabricated plastic plugs of proper size shall be furnished and installed in the duct openings.

G. Frames and covers shall be East Jordan Iron Works, Inc.; Neenah Foundry Company, or as shown on the plans, or approved equivalent. Frames and covers shall be constructed in accordance with the details and shall be placed carefully to the lines or grades indicated on the plans. Frames and covers shall be hinged and vermin proof. Covers shall have built-in, flush lifting eyes or pockets with stainless steel rods for ease of cover lifting. Bolted-on or U-bolt type devices shall not be acceptable as cover lifting eyes. Cover bolts shall be corrosion resistant, all thread, 18-8, type 304 stainless steel. Threaded studs are not acceptable for bolting down covers. Covers are to include torsion assist stainless steel springs.

H. Castings, whether carbon-steel, gray steel iron or ductile iron, shall conform to the shape and dimensions shown on the plans and shall be clean, substantial castings, free from sand or blow holes or other defects. Surfaces of the casting shall be free from burnt-on sand and shall be reasonably smooth.

1. Bearing surfaces between manhole covers and frames shall be cast and machined with such precision that uniform bearing shall be provided throughout the perimeter area of contact.
2. Cast iron castings shall conform to the requirements of the Standard Specification for "Gray Iron Castings," ASTM Designation A48, Class No. 30.
3. Ductile iron castings shall conform to the requirements of the Standard Specifications for "Modular Iron Casting," ASTM Designation A536.

I. Pulling rings for cable installations shall be cast iron. Rings shall be Line Material Industries, Milwaukee, Wisconsin, Model No. DU2T2, or as otherwise shown on the plans, or approved equivalent. U-bolt or bolted-in type pulling rings shall not be acceptable.

J. Threaded inserts shall be Star Holzin, or approved equivalent, 1/2-inch diameter x 2 3/8-inch, unless otherwise noted on the drawings. Bolts shall be of the size indicated on drawings or as required.

K. Cable support racks shall be as detailed on the drawings.

L. Except for manhole and pullbox covers, frames and their related fittings and ground rods, all items specified under this section shall be galvanized after fabrication. Galvanizing of bolts, nuts, threaded inserts, and other connection devices shall conform to ASTM A 153, Class C or D, or to ASTM B633. Galvanizing of other steel items shall conform to ASTM A 123 or A 153.

M. Utility Company Handholes or Manholes must be coordinated with the utility company for exact size, rating, covers, drainage, bedding and exact locations. If no information is received from the utility company, then provide a manhole with the following characteristics: 5' x 5' x 5' minimum interior dimensions with 3" round sump drain with a 6" diameter x 18" deep gravel bed, spring-loaded steel bolt-down cover, rated for 20,000lb load rating minimum. Exact requirements

must be obtained by the local utility company and installation must follow the local utility company requirements.

2.2 EQUIPMENT ENCLOSURES

A. All outdoor equipment enclosures shall be stainless steel, NEMA 3R for wet locations. All doors shall be hinged and lockable.

2.3 COORDINATION OF BOX LOCATIONS

A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.

B. Electrical box locations shown on Drawings are approximate unless dimensioned.

C. Locate and install boxes to allow access. Provide access doors where installation is inaccessible. Coordinate locations and sizes of required access doors with those specified in Division 08 - Openings.

D. Locate and install to maintain headroom and to present a neat appearance.

3. EXECUTION

3.1 PULL AND JUNCTION BOX INSTALLATION

A. Support pull and junction boxes independent of conduit.

B. Provide pull boxes in feeder and branch circuits as required.

C. Identify all junction boxes by circuit number engraved on the cover.

D. Provide weatherproof pull boxes or junction boxes where installed outdoors with watertight gasketed covers fastened by means of corrosion resistant screws.

4. MEASUREMENT

4.1 Electrical or communication handholes, shall be measured by each unit, completed in place and accepted. This shall include the handhole structure, lid, cover and ID tag, saddle racks, ducts plugs, labels, encasement, ground rod with test report and connections, sump drain with gravel pit and all required excavation, foundation, dewatering, backfilling, sheeting and bracing, restoration of disturbed areas and connections. Separate measurement shall be made for the various types and sizes.

5. PAYMENT

5.1 The accepted quantity of electrical or communication handholes will be paid for at the contract unit price per each, complete and in place. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials, furnishing and installation of appurtenances and connections to conduit and other structures as may be required to complete the item as shown on the plans and for all labor, equipment, tools and incidentals necessary to complete

the structure.

ITEM 260543

UNDERGROUND ELECTRICAL DUCTBANKS AND CONDUIT

1. GENERAL

1.1 SECTION INCLUDES

A. This item shall consist of underground electrical ducts installed in accordance with this specification at the locations and in accordance with the dimensions, designs, and details shown in the plans. This item shall include the installation of all underground electrical ducts or underground conduits. It shall also include all trenching, backfilling, removal, and restoration of any paved areas; manholes, concrete encasement, mandreling installation of nylon pull string and duct markers, capping, and the testing of the installation as a completed duct system ready for installation of cables, to the satisfaction of the Engineer.

1.2 GENERAL

A. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when so requested by the Engineer.

B. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the Engineer.

C. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the Engineer and replaced with materials that comply with these specifications, at the Contractor's cost.

D. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in project that accrue directly or indirectly from late submissions or resubmissions of submittals.

E. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

2. PRODUCTS

2.1 CONCRETE

- A. Concrete shall conform to Item 360 and ductbanks shall be encased in Class D Concrete, 1500 psi.

2.2 STEEL CONDUIT

- A. Rigid galvanized steel (RGS) conduit and fittings shall be hot dipped galvanized inside and out and conform to the requirements of Underwriters Laboratories Standards 6, 514B, and 1242. All RGS conduits or RGS elbows installed below grade, in concrete, permanently wet locations or other similar environments shall be painted with a 10 mil thick coat of asphaltum sealer or shall have a factory bonded polyvinyl chloride (PVC) cover. Any exposed galvanizing or steel shall be coated with 10 mil of asphaltum sealer. When using PVC coated RGS conduit, care shall be exercised not to damage the factory PVC coating. Damaged PVC coating shall be repaired per the manufacturer's written instructions.

2.3 PLASTIC CONDUIT

- A. Plastic conduit and fittings shall conform to the following requirements:

1. UL 514B covers W-C-1094-Conduit fittings all types, classes 1 thru 3 and 6 thru 10.
2. UL 514C covers W-C-1094- all types, Class 5 junction box and cover in plastic (PVC).
3. UL 651 covers W-C-1094-Rigid PVC Conduit, types I and II, Class 4.
4. UL 651A covers W-C-1094-Rigid PVC Conduit and high-density polyethylene (HDPE) Conduit type III and Class 4.

- B. Underwriters Laboratories Standards UL-651 and Article 352 of the current National Electrical Code shall be one of the following, as shown on the plans:

1. Type I-Schedule 40 PVC suitable for underground use either direct-buried or encased in concrete.
2. Type II-Schedule 40 PVC suitable for either above ground or underground use.
3. Type III – Schedule 80 PVC suitable for either above ground or underground use either direct-buried or encased in concrete.
4. Type III –HDPE pipe, minimum standard dimensional ratio (SDR) 11, suitable for placement with directional boring under pavement.

- C. The type of solvent cement shall be as recommended by the conduit/fitting manufacturer.

2.4 SPLIT CONDUIT

- A. Split conduit shall be pre-manufactured for the intended purpose and shall be made of steel or plastic.

2.5 CONDUIT SPACERS

- A. Conduit spacers shall be prefabricated interlocking units manufactured for the intended purpose. They shall be of double wall construction made of high-grade, high-density polyethylene complete with interlocking cap and base pads, they shall be designed to accept No. 4 reinforcing bars installed vertically.

2.6 CONCRETE

A. Concrete shall conform to Item 360 using 1/8-inch maximum size coarse aggregate with a minimum 28-day compressive strength of 4000 psi. Where reinforced duct banks are specified, reinforcing steel shall conform to ASTM A615 Grade 60. Concrete and reinforcing steel are incidental to the respective pay item of which they are a component part.

2.7 FLOWABLE BACKFILL

A. Flowable material used to back fill conduit and duct bank trenches shall be designed utilizing a minimum of 5 lb cement (ASTM C150 – Type II) and 250 lb fly ash (ASTM C618, Class C or F) per cubic yard with remainder of volume consisting of sand, water and only approved admixtures to achieve a compressive strength of 100 to 200 psi when tested in accordance with ASTM D 4832 after 28 days.

2.8 TRENCH MARKING TAPE

A. The Contractor shall furnish and install trench marking tape (warning tape) over the top of concrete encased single and multi-way duct bank for the full length of the duct bank and below the ground surface in the non-encased conduit trench at no separate payment. Distances above duct bank and above non-encased conduit shall be as shown on the plans. The tape shall be 6 inches (150 mm) wide except where shown otherwise on the plans, 4 mils thick, bright red in color, marked "Electric Line Buried Below".

3. EXECUTION

3.1 GENERAL

A. The Contractor shall install underground duct banks and conduits at the approximate locations indicated on the plans. The Engineer shall indicate specific locations as the work progresses, if required to differ from the plans. Duct banks and conduits shall be of the size, material, and type indicated on the plans or specifications. Where no size is indicated on the plans or in the specifications, conduits shall be not less than 2 inches (50 mm) inside diameter or comply with the National Electrical Code based on cable to be installed, whichever is larger. All duct bank and conduit lines shall be laid so as to grade toward access points and duct or conduit ends for drainage. Unless shown otherwise on the plans, grades shall be at least 3 inches (75 mm) per 100 feet (30 m). On runs where it is not practicable to maintain the grade all one way, the duct bank and conduit lines shall be graded from the center in both directions toward access points or conduit ends, with a drain into the storm drainage system. Pockets or traps where moisture may accumulate shall be avoided. No duct bank or underground conduit shall be less than 18 inches (0.5 m) below finished grade. Where under pavement, the top of the duct bank shall not be less than 18 inches (0.5 m) below the subgrade.

B. The Contractor shall mandrel each individual conduit whether the conduit is direct-buried or part of a duct bank. An iron-shod mandrel, not more than 1/4 inch (6 mm) smaller than the bore of the conduit shall be pulled or pushed through each conduit. The mandrel shall have a leather or rubber gasket slightly larger than the conduit hole.

C. The Contractor shall swab out all conduits/ducts and clean base can, manhole, pull boxes, etc., interiors IMMEDIATELY prior to pulling cable. Once cleaned and swabbed the light bases, manholes, pull boxes, etc., and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, base cans, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial

cleaning, for any reason shall be recleaned at the Contractor's expense. All accessible points shall be kept closed when not installing cable. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the Engineer of any blockage in the existing ducts.

D. For pulling the permanent wiring, each individual conduit, whether the conduit is direct-buried or part of a duct bank, shall be provided with a 200 pound (90 kg) test polypropylene pull rope. The ends shall be secured and sufficient length shall be left in access points to prevent it from slipping back into the conduit. Where spare conduits are installed, as indicated on the plans, the open ends shall be plugged with removable tapered plugs, designed for this purpose.

E. All conduits shall be securely fastened in place during construction and shall be plugged to prevent contaminants from entering the conduits. Any conduit section having a defective joint shall not be installed. Ducts shall be supported and spaced apart using approved spacers at intervals not to exceed 5 feet (1.5 m).

F. Unless otherwise shown on the plans, concrete encased duct banks shall be used when crossing under pavements expected to carry aircraft loads, such as runways, taxiways, taxilanes, ramps and aprons. When under paved shoulders and other paved areas, conduit and duct banks shall be encased using flowable fill for protection.

G. Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored.

H. Trenches for conduits and duct banks may be excavated manually or with mechanical trenching equipment unless in pavement, in which case they shall be excavated with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of shoulder surface is disturbed. Blades of graders shall not be used to excavate the trench.

I. When rock is encountered, the rock shall be removed to a depth of at least 3 inches (75 mm) below the required conduit or duct bank depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4 inch (6 mm) sieve. Flowable backfill may alternatively be used. The Contractor shall ascertain the type of soil or rock to be excavated before bidding.

J. Underground electrical warning (Caution) tape shall be installed in the trench above all underground duct banks and conduits in unpaved areas. Contractor shall submit a sample of the proposed warning tape for approval by the Engineer. If not shown on the plans, the warning tape shall be located 6 inches above the duct/conduit or the counterpoise wire if present.

K. Joints in plastic conduit shall be prepared per the manufacturer's recommendations for the particular type of conduit. Plastic conduit shall be prepared by application of a plastic cleaner and brushing a plastic solvent on the outside of the conduit ends and on the inside of the couplings. The conduit fitting shall then be slipped together with a quick one-quarter turn twist to set the joint tightly. Where more than one conduit is placed in a single trench, or in duct banks, joints in the conduit shall be staggered a minimum of 2 feet (60 cm).

L. Changes in direction of runs exceeding 10 degrees, either vertical or horizontal, shall be accomplished using manufactured sweep bends.

M. Whether or not specifically indicated on the drawings, where the soil encountered at established duct bank grade is an unsuitable material, as determined by the Engineer, the

unsuitable material shall be removed and replaced with suitable material. Alternatively, additional duct bank supports that are adequate and stable shall be installed, as approved by the Engineer.

N. All excavation shall be unclassified and shall be considered incidental to the respective Spec 260543 pay item of which it is a component part. Dewatering necessary for duct installation, erosion and turbidity control, per Federal, state, and local requirements is incidental to its respective pay item as a part of Spec 260543. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the Spec 260543 Item.

O. Unless otherwise specified, excavated materials that are deemed by the Engineer to be unsuitable for use in backfill or embankments shall be removed and disposed of offsite.

P. Any excess excavation shall be filled with suitable material approved by the Engineer and compacted.

Q. It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables) cross proposed installations, the Contractor shall ensure that these cables are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

1. Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred
2. Trenching, etc., in cable areas shall then proceed with approval of the Engineer, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

R. In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair.

3.2 DUCT BANKS

A. Unless otherwise shown in the plans, duct banks shall be installed so that the top of the concrete envelope is not less than 18 inches (0.5 m) below the bottom of the base or stabilized base course layers where installed under runways, taxiways, aprons, or other paved areas, and not less than 18 inches (0.5 m) below finished grade where installed in unpaved areas.

B. Unless otherwise shown on the plans, duct banks under paved areas shall extend at least 3 feet (1 .m) beyond the edges of the pavement or 3 feet (1 m) beyond any under drains that may be installed alongside the paved area. Trenches for duct banks shall be opened the complete length before concrete is placed so that if any obstructions are encountered, proper provisions can be made to avoid them. Unless otherwise shown on the plans, all duct banks shall be placed on a layer of concrete not less than 3 inches (75 mm) thick prior to its initial set. Where two or more conduits in the duct bank are intended to carry conductors of equivalent voltage insulation rating, the Contractor shall space the conduits not less than 1.5 inch (37 mm) apart (measured from outside wall to outside wall). Where two or more conduits in the duct bank are intended to carry conductors of differing voltage insulation rating, the Contractor shall space the conduits not less than 3-inches apart (measured from outside wall to outside wall). All such multiple conduits shall be placed using conduit spacers applicable to the type of conduit. As the conduit laying progresses, concrete shall be placed around and on top of the conduits not less than 3 inches (75 mm) thick unless otherwise shown on the plans. All conduits shall terminate with female ends for ease of access in current and future use. End bells or couplings shall be installed flush with the concrete encasement at access points. Install factory

plugs in all unused ends. Do not cover the ends or plugs with concrete.

C. Conduits forming the duct bank shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth prior to placing the concrete encasement. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the Engineer for review prior to use.

D. When specified, the Contractor shall reinforce the bottom side and top of encasements with steel reinforcing mesh or fabric or other approved metal reinforcement. When directed, the Contractor shall supply additional supports where the ground is soft and boggy, where ducts cross under roadways, or where shown on the plans. Under such conditions, the complete duct structure shall be supported on reinforced concrete footings, piers, or piles located at approximately 5-foot (1.5-m) intervals.

E. All pavement surfaces that are to have ducts installed therein shall be neatly saw cut to form a vertical face. All excavation shall be included in the contract with price for the duct.

F. Install a plastic, detectable, color as noted, 3 to 6 inches (75 to 150 mm) wide tape, 8 inches (200 mm) minimum below grade above all underground conduit or duct lines not installed under pavement. Utilize the 3-inch (75-mm) wide tape only for single conduit runs. Utilize the 6-inch (150-mm) wide tape for multiple conduits and duct banks. For duct banks equal to or greater than 24 inches (600 mm) in width, utilize more than one tape for sufficient coverage and identification of the duct bank as required.

G. When existing cables are to be placed in split duct, encased in concrete, the cable shall be carefully located and exposed by hand tools. Prior to being placed in duct, the Engineer shall be notified so that he may inspect the cable and determine that it is in good condition. Where required, split duct shall be installed as shown on the drawings or as required by the Engineer.

3.3 CONDUITS WITHOUT CONCRETE ENCASEMENT

A. Trenches for single-conduit lines shall be not less than 6 inches (150 mm) nor more than 12 inches (300 mm) wide. The trench for 2 or more conduits installed at the same level shall be proportionately wider. Trench bottoms for conduits without concrete encasement shall be made to conform accurately to grade so as to provide uniform support for the conduit along its entire length.

B. Unless otherwise shown on the plans, a layer of fine earth material, at least 4 inches (100 mm) thick (loose measurement) shall be placed in the bottom of the trench as bedding for the conduit. The bedding material shall consist of soft dirt, sand or other fine fill, and it shall contain no particles that would be retained on a 1/4-inch (6 mm) sieve. The bedding material shall be tamped until firm. Flowable backfill may alternatively be used.

C. Unless otherwise shown on plans, conduits shall be installed so that the tops of all conduits within the secured area where trespassing is prohibited are at least 18 inches (0.5 m) below the finished grade. Conduits outside secured area shall be installed so that the tops of the conduits are at least 24 inches (60 cm) below the finished grade per National Electric Code (NEC), Table 300.5.

D. When two or more individual conduits intended to carry conductors of equivalent voltage

insulation rating are installed in the same trench without concrete encasement, they shall be spaced not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches (150 mm) apart in a vertical direction. Where two or more individual conduits intended to carry conductors of differing voltage insulation rating are installed in the same trench without concrete encasement, they shall be placed not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches (150 mm) apart in a vertical direction.

E. Trenches shall be opened the complete length between normal termination points before conduit is installed so that if any unforeseen obstructions are encountered, proper provisions can be made to avoid them.

F. Conduits shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth while backfilling. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the Engineer for review prior to use.

3.4 BACKFILLING FOR CONDUITS

A. For conduits, 8 inches (200 mm) of sand, soft earth, or other fine fill (loose measurement) shall be placed around the conduits ducts and carefully tamped around and over them with hand tampers. The remaining trench shall then be backfilled and compacted per Item P-152 "Excavation and Embankment" except that material used for back fill shall be select material not larger than 4 inches (100 mm) in diameter.

B. Flowable backfill may alternatively be used.

C. Trenches shall not contain pools of water during back filling operations.

D. The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

E. Any excess excavated material shall be removed and disposed of per instructions issued by the Engineer.

3.5 BACKFILLING FOR DUCT BANKS

A. After the concrete has cured, the remaining trench shall be backfilled and compacted except that the material used for backfill shall be select material not larger than 4 inches (100 mm) in diameter. In addition, where duct banks are installed under pavement, one moisture/density test per lift shall be made for each 250 linear feet (76 m) of duct bank or one work period's construction, whichever is less.

B. Flowable backfill may alternatively be used.

C. Trenches shall not contain pools of water during backfilling operations.

D. The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

- E. Any excess excavated material shall be removed and disposed of per instructions issued by the Engineer.

3.6 RESTORATION

A. Where sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the work shall be restored to its original condition. The restoration shall include a minimum of 4" seeding and topsoiling, as shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. All restoration shall be considered incidental to the respective Spec 260543 pay item. Following restoration of all trenching the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

3.7 BORE DRILL

A. The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pullback the pipe, a drilling fluid mixing and delivery system of sufficient capacity to successfully complete the crossing, a guidance system to accurately guide boring operations and trained and competent personnel to operate the system. All equipment shall be in good, safe operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of the project. Perform the work in general conformance with ASTM F1962, current revision, "Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit under Obstacles, Including River Crossings."

B. Locate all existing utilities in the area of the bore drill pathway prior to construction. Call all applicable municipalities and review existing landmarks. The contractor shall install a pilot bore prior to actual bore drilling operation to assure clear pathway. Keep detailed records of bore depth, pitch, fluids used and any special conditions. Monitor and adjust the drilling fluid mix as needed to match soil conditions. Once pilot bore has verified a clear pathway, then bore hole may be reamed and enlarged for installation of pipe.

C. Where pipe joints are required consult the PVC manufacturer on guidance for the proper connection methods approved for their products. Where butt fusion is approved, follow ASTM D3261. Test butt splice joint in accordance with ASTM D638. Use a data logging device to record the critical butt fusion parameters and procedures used in making each butt fusion joint. Compare the records to the pipe manufacturers butt fusion procedures to make sure the joints were made properly before pulling the pipe back into the bore hole.

D. The guidance system shall be of a proven type and shall be setup and operated by personnel trained and experienced with this system. The operator shall be aware of any magnetic anomalies and shall consider such influences in the operation of the guidance system if using a magnetic system.

E. The conduit duct shall be HDPE Schedule 80 PVC conduit. Conduit shall have an SDR ratio of 9 or 11. The Contractor is responsible for selection of Schedule 80 PVC raceway that is compatible with the proposed directional bore method and equipment."

F. The drilling fluid must be a mixture of Bentonite drilling clay, project specific cutting fluid additives and potable water is to be used at the cutting fluid and over ream hole filler. The drilling fluid mixture shall have the following viscosities as measured by a Marsh Funnel:

1. Rock Clay - 60 sec.
2. Hard Clay - 40 sec.
3. Soft Clay - 45 sec.
4. Sandy Clay - 90 sec
5. Stable Sand - 120 sec.
6. Loose Sand - 150 sec.
7. Wet Sand - 150 sec.

G. The Contractor will contain all drilling and pipe lubricating mud by taking special measures to prevent run-off onto adjacent properties and/or waterways. All surplus drilling and pipe lubricating mud will be removed from the site and properly disposed of by the Contractor at no cost to the Owner. The Contractor will also be responsible for all required erosion control measures at no cost to the Owner.

4. METHOD OF MEASUREMENT

4.1 Underground conduits and duct banks shall be measured by the linear feet (meter) of conduits and duct banks installed, including encasement, locator tape, couplings, end bells, conduit plugs, conduit transitions, conduit connections, trenching and backfill with designated material, and restoration, all measured in place, completed, and accepted. Also incidental to this item are the charging depot wireways shown on plans. Separate measurement shall be made for the various types and sizes.

5. BASIS OF PAYMENT

5.1 Payment will be made at the contract unit price per linear foot for each type and size of conduit and duct bank completed and accepted, including trench and backfill with the designated material. This price shall be full compensation for removal and disposal of existing duct banks and conduits as shown on the plans, furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item in accordance with the provisions and intent of the plans and specifications.

6. MATERIAL REQUIREMENTS

Fed. Spec.W-C-1094 Conduit and Conduit Fittings; Plastic, Rigid (cancelled; replaced by UL 514 Boxes, Nonmetallic Outlet, Flush Device Boxes, & Covers, and UL 651 Standard for Conduit & Rigid Conduit, Type EB & A Rigid PVC)

Underwriters Laboratories
Standard 514B

Fittings for Cable and Conduit

Underwriters Laboratories
Standard 1242

Intermediate Metal Conduit

Underwriters Laboratories
Standard 651

Schedule 40 and 80 Rigid PVC Conduit (for Direct Burial)



Underwriters Laboratories
Standard 651A

Type EB and A Rigid PVC Conduit and HDPE Conduit
(for concrete encasement)

SECTION 260553 ELECTRICAL IDENTIFICATION

1. GENERAL

1.1 SECTION INCLUDES

- A.** Furnish and install items for identification of electrical products installed under Division 26.

1.2 SUBMITTALS

- A.** Submit product data.

2. PRODUCTS AND MATERIALS

2.1 MANUFACTURERS

- A.** Manufacturers include but are not limited to those listed. All proposed components and materials are subject to the approval of the engineer.
- B.** W.H. Brady Co.
- C.** Carlton Industries, Inc.
- D.** Seton Nameplate Co.

2.2 MATERIALS

- A.** Nameplates: Provide engraved three-layer laminated plastic nameplates with white letters on a black background.
- B.** Wire and Cable Markers: Provide stainless steel, 2" round with 1/4" letters in all manholes and light bases and provide with stainless steel ties.
- C.** Underground Warning Tape
 - 1. Manufactured polyethylene material and unaffected by acids and alkalies.
 - 2. 3.5 mils thick and 6 inches wide.
 - 3. Tensile strength of 1,750 psi lengthwise.
 - 4. Printing on tape shall include an identification note BURIED ELECTRIC LINE, and a caution note CAUTION. Repeat identification and caution notes over full length of tape. Provide with black letters on a red background conforming to APWA recommendations.
- D.** Panelboard Directories: Provide a typed circuit directory for each panelboard. Mount circuit directory in a permanent, clear Lexan card holder located on inside of door on panelboard.
- E.** Conduit Markers: Flexible vinyl film with pressure sensitive adhesive backing and printed markings.
 - 1. Electrical conduit markers shall include three identifying titles on an orange background except as noted.

a. Typical.

- | | |
|------------|------------------------------|
| 1) Type | Example - AC 60 Hertz |
| 2) Load | Example - Lighting and Power |
| 3) Voltage | Example - 480 VAC/3 Phase |

2. Conduit that contains protective or communication systems shall have the exact content and title on blue background and installed and located as specified for conduit.

F. Conduit Markers and Letter Size

1. Dimensions:

Outside Diameter of Conduit in Inches	Width of Color Band in Inches	Height of Letter & Numerals in Inches
1/2 to 1-1/4	8	1/2
1-1/2 to 2	8	3/4
2-1/4 to 3-1/4	10	1
3-1/2 & Larger	12	1-1/4

G. Wiring Device Circuit Identification: Provide for each receptacle and light switch:

1. Flexible vinyl film with pressure sensitive adhesive backing and printed markings. Black 1/8" high letters.
2. Indicate panelboard and circuit number.

3. EXECUTION

3.1 INSTALLATION

- A. Degrease and clean surfaces to receive nameplates.
- B. Install nameplates parallel to equipment lines.
- C. Secure nameplates to equipment fronts using screws or rivets. Secure nameplate to inside face of recessed panelboard doors in finished locations.
- D. Embossed tape will not be accepted.
- E. Provide underground tape at all electrical installations.

3.2 WIRE AND CABLE LABELING

- A. Provide wire markers on each conductor in splice boxes, pull boxes, and at first load connection on homerun. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on equipment manufacturer's shop drawings for control wiring.
- B. Identify branch circuit or feeder number for power and lighting circuits on cover of pull and junction boxes with indelible marker.

3.3 EQUIPMENT LABELING

- A. Provide nameplates to identify all electrical distribution and control equipment.
- B. Engraved, Laminated Plastic Nameplates: 1/4-inch letters, equipment designation; 1/8-inch letters, source circuit number. Provide for:
 - 1. Meters.
 - 2. Panelboards, Switchboards, Switchgear including each individual device or piece of equipment within a switchboard.
 - 3. Cabinets.
 - 4. Enclosed switches, starters, circuit breakers and contactors. Provide neatly typed label inside each motor starter enclosure door identifying motor served, nameplate horsepower, full load amperes, design letter, service factor, and voltage/phase rating. Provide phenolic nameplate on cover exterior to indicate motor served.
 - 5. Transformers if identified on Drawings.
- C. Identify all junction boxes by circuit number with legible permanent ink marker.

3.4 BOX COLOR CODING

- A. Boxes and covers for fire alarm wiring shall be painted red.
- B. Boxes and covers for emergency system wiring shall be painted yellow.

3.5 CONDUIT MARKERS

- A. Location of Identifying Markers: At each end of conduit run and at intermediate points 50' on center maximum.

4. METHOD OF MEASUREMENT AND PAYMENT

4.1 There will be no separate measurement for payment on the work discussed in this section. All work will be considered incidental for the completion of the component of work to which it is related.

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ITEM 260580

SUPPORTING DEVICES

1. DESCRIPTION

1.1 SECTION INCLUDES

- A.** Supporting devices, including:
1. Conduit and equipment supports.
 2. Fastening hardware.

1.2 COORDINATION

- A.** Coordinate size, shape and location of concrete pads with section on cast-in-place concrete.
- B.** Coordinate size, shape and requirements for utility company equipment with local utility company.

1.3 QUALITY ASSURANCE

- A.** Provide support systems adequate for weight of equipment and conduit, including wiring which they carry.

2. PRODUCTS

2.1 MANUFACTURERS

- A.** Manufacturers include but are not limited to those listed. All proposed components and materials are subject to the approval of the engineer.
1. B-Line
 2. Kindorf.
 3. Unistrut.

2.2 MATERIAL

- A.** Support Channel: Galvanized or painted steel.
- B.** Hardware: Galvanized or painted steel.
- C.** Provide epoxy or PVC coated materials for corrosive environments.
- D.** Spring steel clips.

3. EXECUTION

3.1 INSTALLATION

- A.** Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion anchors, beam clamps or bolts.
- B.** Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; sheet metal screws in sheet metal studs and wood screws in wood construction.
- C.** Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.
- D.** Do not use powder-actuated anchors on new concrete structure.
- E.** Do not drill structural steel members.
- F.** Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.
- G.** Provide concrete pads and equipment bases for all outdoor equipment on grade, floor mounted equipment, areas with floors below grade, penthouse equipment rooms and where shown on drawings.
- H.** Install surface-mounted cabinets and panelboards with minimum of four anchors.
- I.** Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.
- J.** Do not support conduit from ceiling wire supports.
- K.** Do not use spring steel clips and clamps or support conduits by individual hanger wires.
- L.** Where multiple runs of conduit can be run grouped together, run conduit in racks supported from the building structure. Provide for future use of rack by properly planning routing of conduits in and through restricted areas such as through walls and around mechanical and electrical equipment.
- M.** Use spring steel clips with EMT for individual branch circuits and device boxes in drywall construction.

4. METHOD OF MEASUREMENT AND PAYMENT

- 4.1** There will be no separate measurement for payment on the work discussed in this section. All work will be considered incidental for the completion of the component of work to which it is related.

ITEM 260583
WIRE CONNECTIONS AND DEVICES

1. DESCRIPTION

1.1 SECTION INCLUDES

- A. Furnish and install splicing and terminating devices.

1.2 RELATED SECTIONS

- A. Section 260519 - Wire and Cable.

2. PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers include but are not limited to those listed. All proposed components and materials are subject to the approval of the engineer
- B. Burndy Corp.
- C. Dossert Manufacturing Corp.
- D. Ideal Industries, Inc.
- E. Ilsco Corp.
- F. Minnesota Mining and Manufacturing Co.
- G. Thomas & Betts Co., Inc.

2.2 MATERIALS

- A. Cable and wire connections for splicing or terminating shall be made with compression deforming type connectors. Connectors for cable sizes 250 kcmil and larger shall be the long barrel type for double indentation. Soldered connections will not be permitted. Twist-on insulated connectors may be used which are resistant to vibration and are used in the proper sizes.
- B. Provide terminal connectors with hole sizes and spacing in accordance with NEMA standards. Provide terminal connectors with two holes in tongue for use on conductor sizes 250 kcmil and larger. Terminal connectors will not be required for connections to the circuit breakers in the lighting and/or receptacle panels.
- C. Provide connections made with non-insulated connectors insulated with three layers of plastic tape, each layer being half lapped. Provide No. 33+ plastic tape.

3. EXECUTION

3.1 INSTALLATION

- A.** Provide electrical connections to equipment furnished under other contracts and furnish wiring, conduit, outlet boxes, and safety switches, as required. Verify locations, horsepower, and voltages of equipment prior to installation of feeders. If apparent conflict arises in power wiring, advise the project manager immediately for clarification.
- B.** Provide switches as required by national or local codes.
- C.** If the motor is integral to the equipment, isolate the entire piece of equipment with a short section of flexible metal conduit to prevent vibration and/or noise amplification to be transferred to the building structure.
- D.** If the motor is adjustable, install an additional length of flexible metal conduit at the motor.
- E.** Connect a ground wire from the conduit termination to the motor frame on the inside of flexible conduit. Use approved grounding lugs or clamps or the conduit connection.
- F.** Major equipment furnished under mechanical and other sections of specifications may require different rough-in requirements than those indicated on Drawings. Secure detailed drawings from source furnishing equipment to determine actual rough-in locations, conduit and conductor requirements to assure proper installation.
- G.** Before connecting any piece of equipment, verify the name plate data corresponds with information shown on Drawings. Discrepancies shall be called to attention of the project manager.
- H.** Change any feeders installed incorrectly as a result of not verifying equipment requirements, of equipment provided by others, prior to feeder installation.

4. METHOD OF MEASUREMENT AND PAYMENT

- 4.1** There will be no separate measurement or payment on the work discussed in this section. All work will be considered incidental for the completion of the component of work to which it is related.

SECTION 262116 SERVICE ENTRANCE

1. DESCRIPTION

1.1 SECTION INCLUDES

A. Furnish and install electrical service entrance, including:

1. Arrangement with the power company for new underground electrical service consisting of one (1) utility transformer and associated switch for automatic switchover.

1.2 RELATED SECTIONS

- A. Section 013000 – Allowances
- B. Section 260543 - Underground Duct Banks and Conduits

1.3 SYSTEM DESCRIPTION

- A. System Voltage: 120/240 volts, single-phase, three-wire, 60 hertz.
- B. Service Entrance: Underground.

1.4 QUALITY ASSURANCE

- A. Install service entrance in accordance with power company's rules and regulations.

2. PRODUCTS

2.1 METERING EQUIPMENT

- A. Coordinate with the power company and provide equipment, ductbank, conduits, manholes, grounding and equipment pads in accordance with power company directives.

3. EXECUTION

3.1 INSTALLATION

- A. Make arrangements with the power company to obtain permanent and temporary electric service to the project.
- B. Provide secondary service entrance conduits and wire from power company transformer to building service entrance equipment.
- C. Provide primary service entrance ductbank and manholes as required by the utility company to extend service to the property site.
- D. Coordinate with the utility company for easements, pads and clearances as required.

- E. Provide conduit and wiring as directed by power company to remote location for meter.

4. METHOD OF MEASUREMENT

4.1 Measurement for the Electrical Service Modifications shall include all work and materials installed complete but not limited to, coordination with the utility company, utility connection fees, meter boxes, CT box, ground connection with ground rod, modifications to existing transformer pad, support structure, foundations, anchor bolts, etc., furnished complete, installed and accepted by the engineer and utility company.

5. BASIS OF PAYMENT

5.1 Payment for the Electrical Service shall include all components, installed complete. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item in accordance with the provisions and intent of the plans and specifications.

ITEM 262416 PANELBOARDS

1. DESCRIPTION

1.1 SUMMARY

- A. Furnish and install distribution, lighting and appliance branch circuit panelboards.

1.2 RELATED SECTIONS

- A. Section 260553 - Electrical Identification.

1.3 REFERENCES

- A. UL 50 Cabinets and Boxes
- B. UL 67 Electric Panelboards
- C. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
- D. NEMA AB1 – Molded Case Circuit Breaker Case Switches
- E. NEMA AB3 – Molded Case Circuit Breakers and their Application

1.4 SUBMITTALS

- A. Include outline and support point dimensions, NEMA enclosure type, voltage, main bus ampacity and material, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

1.5 SPARE PARTS

- A. Keys: Furnish two keys to Owner for each panelboard, all keyed alike.

1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise onsite testing.
- C. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- D. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

E. 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.

F. Comply with NEMA PB 1.

1.7 DELIVERY, STORAGE AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.8 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03

2. PRODUCTS AND MATERIALS

2.1 MANUFACTURERS

A. Eaton Corporation

B. Schneider Electric; Square D Products

C. Siemens Industry, Inc.

2.2 GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.
2. Ambient Temperature:

C. Short Circuit Current Rating:

1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

- D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
1. Material: Hard-drawn copper, 98 percent conductivity.
 2. Provide 200 percent rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
 3. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- G. Conductor Terminations: Suitable for use with the conductors to be installed.
1. Material: Hard-drawn copper, 98 percent conductivity.
 2. Main and Neutral Lugs: Compression type.
 3. Ground Lugs and Bus-Configured Terminators: Compression type.
 4. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
 5. Subfeed (Double) Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
 6. Gutter-Tap Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
 7. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.
- H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.
 - c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
 - d. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 5.
 2. Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.
 - b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.
 3. Fronts:
 - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
 - b. Finishes:
 - 1) Panels and Trim: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - 2) Back Boxes: Galvanized steel.
 - 3) Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.
 4. Directory Card: Inside panelboard door, mounted in transparent card holder.
 5. Lockable Doors: All locks keyed alike unless otherwise indicated.
 6. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
 7. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.

- 8. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
- I. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices
- J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- K. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, listed and labeled for series-connected short-circuit rating by an NRTL.
- L. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.3 OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric

2.4 PANELBOARD SUPPRESSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Current Technology; a subsidiary of Danahar Corporation.
 - 2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 4. Liebert Corporation.
 - 5. Siemens Energy & Automation, Inc.
 - 6. Square D; a brand of Schneider Electric.
- B. Surge Protection Device: IEEE C62.41-compliant, integrally mounted, solid-state, parallel-connected, non-modular type, with sine-wave tracking suppression and filtering modules, UL 1449, second edition, short-circuit current rating matching or exceeding the panelboard short-circuit rating, and with the following features and accessories:
 - 1. Accessories:
 - a. LED indicator lights for power and protection status.
 - b. Audible alarm, with silencing switch, to indicate when protection has failed.
 - c. One set of dry contacts rated at 5 A and 250-V ac, for remote monitoring of protection status.
- C. Surge Protection Device: IEEE C62.41-compliant, integrally mounted, wired-in, solid-state, parallel-connected, modular (with field-replaceable modules) type, with sinewave tracking suppression and filtering modules, UL 1449, second edition, short-circuit current rating matching or exceeding the panelboard short-circuit rating, and with the following features and accessories:
 - 1. Accessories:
 - a. Fuses rated at 200-kA interrupting capacity.
 - b. Fabrication using bolted compression lugs for internal wiring.

- c. Integral disconnect switch.
 - d. Redundant suppression circuits.
 - e. Redundant replaceable modules.
 - f. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
 - g. LED indicator lights for power and protection status.
 - h. Audible alarm, with silencing switch, to indicate when protection has failed.
 - i. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of system operation. Contacts shall reverse position on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
 - j. Six-digit, transient-event counter set to totalize transient surges.
- 2. Peak Single-Impulse Surge Current Rating: 160 kA per mode/320 kA per phase.
 - 3. Minimum single-impulse current ratings, using 8-by-20-mic.sec. waveform described in IEEE C62.41.2.
 - a. Line to Neutral: 70,000 A.
 - b. Line to Ground: 70,000 A.
 - c. Neutral to Ground: 50,000 A.
 - 4. Withstand Capabilities: 12,000 IEEE C62.41, Category C3 (10 kA), 8-by-20- mic.sec. surges with less than 5 percent change in clamping voltage.

2.5 ACCESSORY COMPONENTS AND FEATURES

- A.** Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.
- B.** Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

3. EXECUTION

3.1 EXAMINATION

- A.** Verify that field measurements are as indicated.
- B.** Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C.** Verify that mounting surfaces are ready to receive panelboards.
- D.** Verify that conditions are satisfactory for installation prior to starting work.
- E.** Receive, inspect, handle, and store panelboards according to NECA 407.
- F.** Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- G.** Examine elements and surfaces to receive panelboards for compliance with installation

tolerances and other conditions affecting performance of the Work.

H. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required support and attachment in accordance with Section 26 0529.
- F. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- G. Install panelboards plumb.
- H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.
- I. Mount floor-mounted power distribution panelboards on properly sized 3-inch high concrete pad constructed in accordance with Section 03 3000.
- J. Provide grounding and bonding in accordance with Section 26 0526.
- K. Install all field-installed branch devices, components, and accessories.
- L. Set field-adjustable circuit breaker tripping function settings as indicated.
- M. Provide filler plates to cover unused spaces in panelboards.
- N. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
- O. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- D. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- E. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- F. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 3. Perform the following infrared scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
 - c. Instruments and Equipment:
 - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- G. Panelboards will be considered defective if they do not pass tests and inspections.
- H. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

- B. Adjust alignment of panelboard fronts.
- C. Set field-adjustable circuit-breaker trip ranges as specified in Division 26 Section "Overcurrent Protective Device Coordination Study."
- D. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.
 - 1. Measure as directed during period of normal system loading.
 - 2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
 - 3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
 - 4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.6 PROTECTION

- A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

4. MEASUREMENT

4.1 Measurement for Electrical Distribution Equipment shall include all work and materials installed complete including, but not limited to, the distribution panelboards and switchboards, main and branch circuit breakers, cabinets, transformers, disconnect switches, fuses, shunt trip units, bussing, grounding, terminations, enclosures, instrumentation, meters, labels, supports, training, testing, as well as all interconnecting conduit and cable related to these systems.

5. PAYMENT

5.1 Payment for Electrical Distribution Equipment shall be on a Lump Sum basis and include all components, installed complete. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of the materials, and for all labor, equipment, tools, and incidentals necessary to complete this item in accordance with the provisions and intent of the plans and specifications.

ITEM 263630

DISCONNECT SWITCHES

1. DESCRIPTION

1.1 SECTION INCLUDES

A. Furnish and install disconnect switches, including:

1. Fuses.
2. Enclosures.

1.2 RELATED SECTIONS

- A. Section 260580 - Supporting Devices.
- B. Section 260553 - Electrical Identification.

1.3 REFERENCES

- A. NFPA 70 - National Electrical Code.
- B. UL 198E - Class J Fuses.

1.4 SUBMITTALS

- A. Furnish dimensions and ratings for voltage, ampacity, horsepower and short circuit.
- B. Indicate enclosure material finish and NEMA classification type.

2. PRODUCTS AND MATERIALS

2.1 MANUFACTURERS

- A. Manufacturers include but are not limited to those listed. All proposed components and materials are subject to the approval of the engineer
- B. Disconnect Switches
1. General Electric.
 2. Square D.
- C. Fuses
1. Bussman.
 2. Gould-Shawmut.
 3. Littelfuse.

2.2 DISCONNECT SWITCHES

- A. Fusible Switch Assemblies: Heavy duty; quick-make, quick-break, load interrupter enclosed switch with externally operable handle interlocked to prevent opening front cover

with switch in ON position. Handle lockable in OFF position. Fuse Clips: Designed to accommodate Class J.

B. Non-fusible Switch Assemblies: Heavy duty; quick-make, quick-break, load interrupter enclosed switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

C. Enclosures: Unless indicated otherwise, provide general purpose, NEMA 1 for indoor locations; and weatherproof, NEMA 3R for outdoor locations; except at cooling tower, provide NEMA 4, stainless steel.

D. General-Use Snap Switch: Motors of one HP or less as allowed by code.

E. Construct all current carrying parts of high conductivity copper with silver-plated switch contacts.

F. Provide solid copper neutral bar where a neutral is present in the circuit.

2.3 FUSES

A. Fuses 600 Amperes and Less: UL 198E, Class J; as indicated on drawings; time delay, dual element, current limiting, 600 volt.

B. Fuses Over 600 Amperes: Class L, bolt-on type with time delay and capability to hold 500 percent rated fuse current for a minimum of four seconds and clear 20 times rated fuse current in .01-second or less. Provide fuses with 'O' ring seals between end bells and glass melamine barrel similar to Bussman time delay KRP-C.

C. Interrupting Rating: 200,000 RMS symmetrical amperes.

D. Provide all fuses of the same manufacturer.

E. Install fuses in motor circuits in accordance with motor manufacturer's recommendations.

3. EXECUTION

3.1 INSTALLATION

A. Provide disconnect switches, where required by NFPA 70, where indicated on drawings, and where required by equipment manufacturer, in a location convenient for maintenance on each switch and adjacent equipment.

B. Provide fused disconnect switches when required to maintain equipment manufacturer's warranty. Coordinate with Division 15 for warranty requirements of equipment approved by submittal.

C. Install fuses in fusible disconnect switches. Provide permanent marking inside switch enclosure for fuse type.

D. Wall mount switches, where possible, or mount on Uni-Strut supports.

- E. Provide spare fuse cabinet in main electrical room complete with three spare fuses for each rating installed for fuse sizes over 600 amperes, and ten percent spare fuses (minimum of three) of each type and rating installed for 600 amperes or less.
- F. Provide fuse identification label showing type and size inside door of each switch.

4. METHOD OF MEASUREMENT AND PAYMENT

4.1 There will be no separate measurement or payment on the work discussed in this section. All work will be considered incidental for the completion of the component of work to which it is related.

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SECTION 263632 CONTACTORS

1. DESCRIPTION

1.1 RELATED SECTIONS

- A. Section 260553 - Electrical Identification
- B. Section 260530 - Electrical Testing.
- C. Section 262416 - Panelboards.
- D. Section 265630 - Lighting Fixtures – Site
- E. Section 265640 – Lighting Fixtures - Building

1.2 SUBMITTALS

- A. Furnish written verification that contactor type is compatible with all controlling devices.
- B. Indicate enclosure material finish and NEMA classification type.
- C. Provide operation and maintenance manual.

2. PRODUCTS AND MATERIALS

2.1 MANUFACTURERS

- A. Allen-Bradley.
- B. ASCO.
- C. General Electric.
- D. Square D.

2.2 MECHANICALLY HELD CONTACTORS

- A. Mechanically held for three-wire control.
- B. Encapsulate coils and internally wire to prevent continuous operation.

2.3 GENERAL

- A. Coil Operating Voltage: 120 volts, 60 hertz with cover mounted H.O.A. switch.
- B. Contacts: Provide the number of contacts for the control functions indicated plus two additional contacts, field convertible to normally open or normally closed contacts
- C. Provide solderless pressure wire terminals

3. EXECUTION

3.1 INSTALLATION

- A.** Install in accordance with manufacturer's instructions.
- B.** Coordinate controlling devices such as time clocks and photocells with contactor furnished for compatible system.
- C.** Identify with nameplate. Label each circuit controlled.

4. METHOD OF MEASUREMENT AND PAYMENT

4.1 There will be no separate measurement or payment on the work discussed in this section. All work will be considered incidental for the completion of the component of work to which it is related.

ITEM 265629 LED EXTERIOR LIGHTING

1. DESCRIPTION

1.1 SUMMARY

A. Section Includes:

1. Luminaire types.
2. Materials.
3. Finishes.
4. Luminaire support components.

1.2 DEFINITIONS

- A.** CCT: Correlated color temperature.
- B.** CRI: Color rendering index.
- C.** Fixture: See "Luminaire."
- D.** IP: International Protection or Ingress Protection Rating.
- E.** Lumen: Measured output of lamp and luminaire, or both.
- F.** Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 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.
 - a. Manufacturer's Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the 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 the attachment is suitable for components involved.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

- C. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing laboratory providing photometric data for luminaires.
- B. Product Certificates: For each type of the following:
1. Luminaire.
 2. Photoelectric relay.
- C. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Source quality-control reports.
- E. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and photoelectric relays to include in operation and maintenance manuals.
1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
 2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.6 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. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
 2. Glass, Acrylic, and Plastic Lenses, Covers, and Other Optical Parts: One for every 100 of each type and rating installed. Furnish at least one of each type.
 3. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.

1.7 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications:
1. Luminaire manufacturers' laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
- B. Provide luminaires from a single manufacturer for each luminaire type.
- C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.
- D. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

- A.** Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

1.9 FIELD CONDITIONS

- A.** Verify existing and proposed utility structures prior to the start of work associated with luminaire installation.
- B.** Mark locations of exterior luminaires for approval by Architect prior to the 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, the 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: 2 year(s) from date of Substantial Completion

2. PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

- 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.** NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.
- C.** FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- D.** UL Compliance: Comply with UL 1598 and listed for wet location.
- E.** Lamp base complying with ANSI C81.61.
- F.** Bulb shape complying with ANSI C79.1.
- G.** CRI of 80. CCT of 4000 K.
- H.** L70 lamp life of 50,000 hours.
- I.** Lamps dimmable from 100 percent to 0 percent of maximum light output.
- J.** Internal driver.
- K.** Nominal Operating Voltage: 277 V ac.

- L. Lamp Rating: Lamp marked for outdoor use.
- M. Source Limitations:
 - 1. Obtain luminaires from single source from a single manufacturer.

2.2 LUMINAIRE TYPES

- A. Area and Site:
 - 1. Luminaire Shape: Trapezoid.
 - 2. Mounting: Building with extruded-aluminum rectangular back box.
 - 3. Luminaire-Mounting Height: 17' unless noted otherwise on the contract documents.
 - 4. Distribution: Type IV unless noted otherwise on the contract documents.
 - 5. Diffusers and Globes: Clear, UV-stabilized acrylic.
 - 6. Lamps: LED with CRI 90 or greater. Use 4000K lamps unless noted otherwise on the contract documents.
 - 7. Housings:
 - a. Extruded-aluminum.

2.3 MATERIALS

- A. Metal Parts: Free of burrs and sharp corners and edges.
- B. Sheet Metal Components: Corrosion-resistant aluminum. 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 relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.
- D. Diffusers and Globes:
 - 1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - 2. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.
- E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- F. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
- G. 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.

H. 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 the following lamp characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. Lamp diameter, shape, size, wattage and coating.
 - c. CCT and CRI for all luminaires.

2.4 FINISHES

A. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
 - a. Color: Dark bronze.

2.5 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

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 the Work.
- B. Examine roughing-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.
- C. Examine walls for suitable conditions where luminaires will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the 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. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Support luminaires without causing deflection of finished surface.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

E. Wall-Mounted Luminaire Support:

1. Attached using through bolts and backing plates on either side of wall.

F. Wiring Method: Install cables in raceways. Conceal raceways and cables.

G. Install luminaires level, plumb, and square with finished grade unless otherwise indicated.

H. Coordinate layout and installation of luminaires with other construction.

I. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

J. Comply with requirements in Section 260519 "Wire and Cable" and Section 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.4 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.6 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. Perform the following tests and inspections:

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.
3. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

C. Luminaire will be considered defective if it does not pass tests and inspections.

D. Prepare a 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.

4. MEASUREMENT AND PAYMENT

4.1 METHOD OF MEASUREMENT

A. Measurement for the Exterior Lighting shall include all work and materials installed complete including, but not limited to, the light fixture, lamp, light engine, accessories noted in schedule, mounting hardware, control wiring, terminations, testing and labels. Separate measurement shall be made for various fixture types. Also included with this item are all associated controls such as switches, detectors, timers, relays, enclosures, etc for a complete functional system

4.2 BASIS OF PAYMENT

A. Payment for the exterior lighting shall be on a Per Each basis and include all components, installed complete. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item in accordance with the provisions and intent of the plans and specifications.

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ITEM 265640

INTERIOR LIGHTING FIXTURES - BUILDING

1. GENERAL

1.1 SECTION INCLUDES

- A.** Furnish and install light fixtures associated with building, including:
 - 1. Interior luminaires and accessories.
 - 2. Emergency lighting units
 - 3. Exit signs
 - 4. Ballasts and drivers
 - 5. Fluorescent emergency power supply units

1.2 REFERENCE STANDARDS

- A.** IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules 2015, with Errata (2017).
- B.** NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems 2006.
- C.** NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems 2006.
- D.** NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E.** UL 1598 - Luminaires Current Edition, Including All Revisions.

1.3 SUBMITTALS

- A.** See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B.** Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
 - 1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.

1.4 QUALITY ASSURANCE

- A.** Comply with requirements of NFPA 70.

1.5 DELIVERY, STORAGE, AND PROTECTION

- A.** Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
- B.** Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.6 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

2. PRODUCTS AND MATERIALS

2.1 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.
- B. Products of other manufacturers will be considered upon submittal of product cutsheets.

2.2 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

2.3 LAMPS

- A. Provide lamps as noted on the fixture schedule.
- B. LED lamps must have a CRI of 90 or higher.

3. EXECUTION

3.1 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.
- B. Install products in accordance with manufacturer's instructions.
- C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
- D. Provide required support and attachment in accordance with Section 26 0529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Suspended Ceiling Mounted Luminaires:

1. Do not use ceiling tiles to bear weight of luminaires.
2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
3. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
4. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

G. Recessed Luminaires:

1. Install trims tight to mounting surface with no visible light leakage.

H. Suspended Luminaires:

1. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
2. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 4 feet between supports.

I. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

J. Install accessories furnished with each luminaire.

K. Furnish all LED fixtures with manufacturers recommended light engine.

L. Bond products and metal accessories to branch circuit equipment grounding conductor.

M. Install lamps in each luminaire.

3.2 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.3 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

3.4 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign

material and restore finishes to match original factory finish.

3.5 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

4. MEASUREMENT

4.1 Measurement for the Interior Lighting shall include all work and materials installed complete including, but not limited to, the light fixture, LED lamp, light engine, accessories noted in schedule, mounting hardware, control wiring, terminations, testing and labels. Separate measurement shall be made for various fixture types. Also included with this item are all associated controls such as switches, detectors, timers, relays, enclosures, etc. for a complete functional system.

5. PAYMENT

5.1 Payment for the Interior Lighting shall be on a Per Each basis and include all components, installed complete. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item in accordance with the provisions and intent of the plans and specifications.

SECTION E

CITY OF PORT ARTHUR, TEXAS
BID SHEET

BID FOR: CONSTRUCTION OF EV BUS PARKING, BUS CANOPIES AND ROADWAY

BID DUE DATE: MAY 6, 2026

DESCRIPTION	COST
CONSTRUCTION OF EV BUS PARKING, BUS CANOPIES AND ROADWAY	\$
CONTINGENCY	\$ 20,000
TOTAL COST	\$

WORK WILL BE COMPLETE IN _____ CALENDAR DAYS .

COMPANY NAME

STREET ADDRESS

SIGNATURE OF BIDDER

P.O. BOX

PRINT OR TYPE NAME

CITY STATE ZIP

TITLE

AREA CODE TELEPHONE NO

EMAIL

FAX NO

SECTION F



AIA[®] Document A310[™] – 2010

Bid Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

OWNER:

(Name, legal status and address)

BOND AMOUNT:

PROJECT:

(Name, location or address, and Project number, if any)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this _____ day of _____

(Witness)

(Contractor as Principal)

(Seal)

(Title)

(Surety)

(Seal)

(Witness)

(Title)

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

Init.

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 ACD43070810

SECTION G

CONFLICT OF INTEREST QUESTIONNAIRE

For vendor doing business with local governmental entity

FORM CIQ

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.

This questionnaire is being filed in accordance with Chapter 176, Local Government Code, by a vendor who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the vendor meets requirements under Section 176.006(a).

By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. See Section 176.006(a-1), Local Government Code.

A vendor commits an offense if the vendor knowingly violates Section 176.006, Local Government Code. An offense under this section is a misdemeanor.

OFFICE USE ONLY

Date Received

1 Name of vendor who has a business relationship with local governmental entity.

2 ☐ Check this box if you are filing an update to a previously filed questionnaire. (The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date on which you became aware that the originally filed questionnaire was incomplete or inaccurate.)

3 Name of local government officer about whom the information is being disclosed.

Name of Officer

4 Describe each employment or other business relationship with the local government officer, or a family member of the officer, as described by Section 176.003(a)(2)(A). Also describe any family relationship with the local government officer. Complete subparts A and B for each employment or business relationship described. Attach additional pages to this Form CIQ as necessary.

A. Is the local government officer or a family member of the officer receiving or likely to receive taxable income, other than investment income, from the vendor?

☐ Yes

☐ No

B. Is the vendor receiving or likely to receive taxable income, other than investment income, from or at the direction of the local government officer or a family member of the officer AND the taxable income is not received from the local governmental entity?

☐ Yes

☐ No

5 Describe each employment or business relationship that the vendor named in Section 1 maintains with a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership interest of one percent or more.

6 ☐ Check this box if the vendor has given the local government officer or a family member of the officer one or more gifts as described in Section 176.003(a)(2)(B), excluding gifts described in Section 176.003(a-1).

7

Signature of vendor doing business with the governmental entity

Date

CONFLICT OF INTEREST QUESTIONNAIRE
For vendor doing business with local governmental entity

A complete copy of Chapter 176 of the Local Government Code may be found at <http://www.statutes.legis.state.tx.us/Docs/LG/htm/LG.176.htm>. For easy reference, below are some of the sections cited on this form.

Local Government Code § 176.001(1-a): "Business relationship" means a connection between two or more parties based on commercial activity of one of the parties. The term does not include a connection based on:

- (A) a transaction that is subject to rate or fee regulation by a federal, state, or local governmental entity or an agency of a federal, state, or local governmental entity;
- (B) a transaction conducted at a price and subject to terms available to the public; or
- (C) a purchase or lease of goods or services from a person that is chartered by a state or federal agency and that is subject to regular examination by, and reporting to, that agency.

Local Government Code § 176.003(a)(2)(A) and (B):

- (a) A local government officer shall file a conflicts disclosure statement with respect to a vendor if:

- (2) the vendor:

(A) has an employment or other business relationship with the local government officer or a family member of the officer that results in the officer or family member receiving taxable income, other than investment income, that exceeds \$2,500 during the 12-month period preceding the date that the officer becomes aware that

- (i) a contract between the local governmental entity and vendor has been executed;

or

- (ii) the local governmental entity is considering entering into a contract with the vendor;

(B) has given to the local government officer or a family member of the officer one or more gifts that have an aggregate value of more than \$100 in the 12-month period preceding the date the officer becomes aware that:

- (i) a contract between the local governmental entity and vendor has been executed; or
- (ii) the local governmental entity is considering entering into a contract with the vendor.

Local Government Code § 176.006(a) and (a-1)

- (a) A vendor shall file a completed conflict of interest questionnaire if the vendor has a business relationship with a local governmental entity and:

(1) has an employment or other business relationship with a local government officer of that local governmental entity, or a family member of the officer, described by Section 176.003(a)(2)(A);

(2) has given a local government officer of that local governmental entity, or a family member of the officer, one or more gifts with the aggregate value specified by Section 176.003(a)(2)(B), excluding any gift described by Section 176.003(a-1); or

(3) has a family relationship with a local government officer of that local governmental entity.

- (a-1) The completed conflict of interest questionnaire must be filed with the appropriate records administrator not later than the seventh business day after the later of:

- (1) the date that the vendor:

(A) begins discussions or negotiations to enter into a contract with the local governmental entity; or

(B) submits to the local governmental entity an application, response to a request for proposals or bids, correspondence, or another writing related to a potential contract with the local governmental entity; or

- (2) the date the vendor becomes aware:

(A) of an employment or other business relationship with a local government officer, or a family member of the officer, described by Subsection (a);

(B) that the vendor has given one or more gifts described by Subsection (a); or

(C) of a family relationship with a local government officer.

SECTION H

AIA[®] Document A312[™] – 2010

Payment Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

OWNER:

(Name, legal status and address)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

CONSTRUCTION CONTRACT

Date:

Amount:

Description:

(Name and location)

BOND

Date:

(Not earlier than Construction Contract Date)

Amount:

Modifications to this Bond: ☐ None ☐ See Section 18

CONTRACTOR AS PRINCIPAL

Company: _____ (Corporate Seal)

SURETY

Company: _____ (Corporate Seal)

Signature: _____

Name

and Title:

(Any additional signatures appear on the last page of this Payment Bond.)

Signature: _____

Name

and Title:

(FOR INFORMATION ONLY – Name, address and telephone)

AGENT or BROKER:

OWNER'S REPRESENTATIVE:

(Architect, Engineer or other party:)

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

- .1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
- .2 have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- .1 the name of the Claimant;
- .2 the name of the person for whom the labor was done, or materials or equipment furnished;
- .3 a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- .4 a brief description of the labor, materials or equipment furnished;
- .5 the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- .6 the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- .7 the total amount of previous payments received by the Claimant; and
- .8 the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

§ 16.4 **Owner Default.** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 **Contract Documents.** All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL

Company:

(Corporate Seal)

SURETY

Company:

(Corporate Seal)

Signature: _____

Name and Title: _____

Address _____

Signature: _____

Name and Title: _____

Address _____

Init.

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SECTION I



CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

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	CONTACT NAME:	
	PHONE (A/C, No, Ext):	FAX (A/C, No):
	E-MAIL ADDRESS:	
	INSURER(S) AFFORDING COVERAGE	
	NAIC #	
INSURED	INSURER A:	
	INSURER B:	
	INSURER C:	
	INSURER D:	
	INSURER E:	
	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/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
	GENERAL LIABILITY <input type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS-MADE <input type="checkbox"/> OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: <input type="checkbox"/> POLICY <input type="checkbox"/> PRO-JECT <input type="checkbox"/> LOC						EACH OCCURRENCE \$ DAMAGE TO RENTED PREMISES (Ea occurrence) \$ MED EXP (Any one person) \$ PERSONAL & ADV INJURY \$ GENERAL AGGREGATE \$ PRODUCTS - COMP/OP AGG \$ \$
	AUTOMOBILE LIABILITY <input type="checkbox"/> ANY AUTO <input type="checkbox"/> ALL OWNED AUTOS <input type="checkbox"/> HIRED AUTOS <input type="checkbox"/> SCHEDULE D AUTOS <input type="checkbox"/> NON-OWNED AUTOS						COMBINED SINGLE LIMIT (Ea accident) \$ BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$ \$
	UMBRELLA LIAB <input type="checkbox"/> OCCUR EXCESS LIAB <input type="checkbox"/> CLAIMS-MADE DED <input type="checkbox"/> RETENTION \$						EACH OCCURRENCE \$ AGGREGATE \$ \$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y/N <input type="checkbox"/> ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below		N/A				WC STATUTORY LIMITS <input type="checkbox"/> OTH-ER <input type="checkbox"/> E.L. EACH ACCIDENT \$ E.L. DISEASE - EA EMPLOYEE \$ E.L. DISEASE - POLICY LIMIT \$

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

CERTIFICATE HOLDER**CANCELLATION**

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

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SECTION J

AIA[®] Document A312[™] – 2010

Performance Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

OWNER:

(Name, legal status and address)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

CONSTRUCTION CONTRACT

Date:

Amount:

Description:

(Name and location)

BOND

Date:

(Not earlier than Construction Contract Date)

Amount:

Modifications to this Bond: ☐ None ☐ See Section 16

CONTRACTOR AS PRINCIPAL

Company: *(Corporate Seal)*

SURETY

Company: *(Corporate Seal)*

Signature: _____

Name
and Title:

(Any additional signatures appear on the last page of this Performance Bond.)

Signature: _____

Name
and Title:

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:

OWNER'S REPRESENTATIVE:

(Architect, Engineer or other party:)

Init.

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

- .1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;
- .2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
- .3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

- .1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
- .2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

- .1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
- .2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and
- .3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 **Balance of the Contract Price.** The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 **Construction Contract.** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 **Contractor Default.** Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 **Owner Default.** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 **Contract Documents.** All the documents that comprise the agreement between the Owner and Contractor.

§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL

Company:

(Corporate Seal)

SURETY

Company:

(Corporate Seal)

Signature: _____

Name and Title: _____

Address _____

Signature: _____

Name and Title: _____

Address _____

Init.

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SECTION K

House Bill 89 Verification

I, _____ (Person name), the undersigned
representative (hereafter referred to as "Representative") of

_____ (company or business name, hereafter referred to
as "Business Entity"), being an adult over the age of eighteen (18) years of age, after
being duly sworn by the undersigned notary, do hereby depose and affirm the following:

1. That Representative is authorized to execute this verification on behalf of Business
Entity;
2. That Business Entity does not boycott Israel and will not boycott Israel during the
term of any contract that will be entered into between Business Entity and the City of Port
Arthur; and
3. That Representative understands that the term "boycott Israel" is defined by Texas
Government Code Section 2270.001 to mean 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.

SIGNATURE OF REPRESENTATIVE

SUBSCRIBED AND SWORN TO BEFORE ME, the undersigned authority, on this
_____ day of _____, 20____.

Notary Public

SECTION L

NON-COLLUSION AFFIDAVIT

CITY OF PORT ARTHUR §
 §
STATE OF TEXAS §

By the signature below, the signatory for the bidder certifies that neither he nor the firm, corporation, partnership or institution represented by the signatory or anyone acting for the firm bidding this project has violated the antitrust laws of this State, codified at Section 15.01, *et seq.*, Texas Business and Commerce Code, or the Federal antitrust laws, nor communicated directly or indirectly the bid made to any competitor or any other person engaged in the same line of business, nor has the signatory or anyone acting for the firm, corporation or institution submitting a bid committed any other act of collusion related to the development and submission of this bid proposal.

Signature: _____

Printed Name: _____

Title: _____

Company: _____

Date: _____

SUBSCRIBED and sworn to before me the undersigned authority by _____ the _____ of, _____ on behalf of said bidder.

Notary Public in and for the
State of Texas

My commission expires: _____

SECTION M

AFFIDAVIT

All pages in Offeror's Responses containing statements, letters, etc., shall be signed by a duly authorized officer of the company whose signature is binding.

The undersigned offers and agrees to one of the following:

_____ I hereby certify that **I do not have** outstanding debts with the City of Port Arthur. I further agree to pay succeeding debts as they become due.

_____ I hereby certify that **I do have** outstanding debts with the City of Port Arthur and agree to pay said debts prior to execution of this agreement. I further agree to pay succeeding debts as they become due.

_____ I hereby certify that **I do have** outstanding debts with the City of Port Arthur and agree to enter into an agreement for the payment of said debts. I further agree to pay succeeding debts as they become due.

Firm Name

Date

Authorized Signature

Title

Name (please print)

Telephone

Email

STATE: _____

COUNTY: _____

SUBSCRIBED AND SWORN to before me by the above named _____

on this the _____ day of _____, 20____.

Notary Public

RETURN THIS AFFIDAVIT AS PART OF THE BID PROPOSAL

SECTION N

SB 252

CHAPTER 2252 CERTIFICATION

I, _____, the undersigned and representative

of _____
(Company or Business Name)

being an adult over the age of eighteen (18) years of age, pursuant to Texas Government Code, Chapter 2252, Section 2252.152 and Section 2252.153, certify that the company named above is not listed on the website of the Comptroller of the State of Texas concerning the listing of companies that are identified under Section 806.051, Section 807.051 or Section 2253.153. I further certify that should the above-named company enter into a contract that is on said listing of companies on the website of the Comptroller of the State of Texas which do business with Iran, Sudan or any Foreign Terrorist Organization, I will immediately notify the City of Port Arthur Purchasing Department.

Name of Company Representative (Print)

Signature of Company Representative

Date

SECTION O

WAIVER AND INDEMNIFICATION

Each Proposer / Offeror must sign this waiver and indemnification clause to be considered for evaluation.

By submitting a proposal, each Proposer agrees to waive any claim it has, or may have, against the Owner, the Architect/Engineer, and their respective employees, arising out of or in any way connected with the administration, evaluation or recommendation of any proposal; requirements under the contract documents; acceptance or rejection of any proposals; and award of any contract. This waiver is to be construed as broadly as possible and includes any and all causes of action the Proposer may now have, or that may arise in the future, that relate to the proposal process or the award of a contract, against the Owner and or Architect/Engineer for their action(s), or inaction(s) including, but not limited to, causes of action for negligence, sole negligence, intentional tort, violation of a state or federal statute, violation of the state or federal constitution, injunctive relief, quo warranto proceeding, declaratory judgement and any other request for relief, whether at law or in equity. If a claim is brought against the Owner and/or Architect/Engineer by Proposer or anyone else as a result of Proposer's proposal, Proposer agrees to indemnify Owner and/or Architect/Engineer for any and all money damages, attorney's fees, cost of suit, or any claim for damages that are measured in dollars and cents. Further, Proposer agrees to indemnify and pay all expenses incurred in defending such litigation, including but not limited to, attorney's fees, cost of court, expert witness fees and expenses, hourly cost of Owner's and/or Architect's/Engineer's employee's time spent on the suit, whether directly or indirectly related to the litigation, and any cost or expense incurred by, directly or indirectly, Owner and/or the Architect/Engineer as long as such cost can be measured in dollars and cents. This paragraph is intended by the parties to meet the "Express Negligence Rule" as set out in the Texas Supreme Court opinion of Ethyl Corp. v. Daniel Construction Co., 725 SW2d 705 (Tex. 1987). The parties to this contract stipulate that the consideration for this paragraph is sufficient and confess its adequacy herein.

The undersigned represents that this Proposal is made in good faith, without fraud, collusion or connection of any kind with any other Offeror of the same work; that they are competing in their own interest and in their own behalf, without connection or obligation to any undisclosed person; that no other person has any interest in regard to all conditions pertaining to the proposal and in regard to the place where it is to be submitted; that they have made their own examination of the request for proposal and from it have made this proposal.

Firm Name: _____

Date: _____

Address: _____

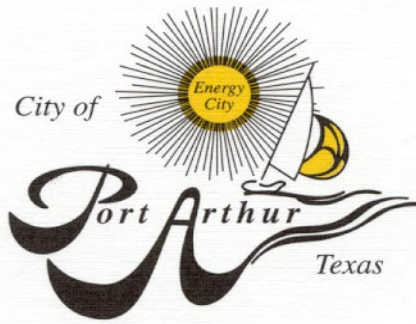
Legal Signature: _____

Type/Print Name and Position with Offeror: _____

SECTION P

CHARLOTTE M. MOSES, MAYOR
HAROLD L. DOUCET, SR.,
MAYOR PRO TEM

COUNCIL MEMBERS:
WILLIE BAE LEWIS, JR.
TIFFANY L. HAMILTON EVERFIELD
DONEANE BECKCOM
THOMAS KINLAW, III
DONALD FRANK, SR.



RONALD BURTON, CPM
CITY MANAGER

SHERRI BELLARD, TRMC
CITY SECRETARY

ROXANN PAIS COTRONEO
CITY ATTORNEY

DBE DOCUMENT

By signing this document the contractor is acknowledging that a participation will be provided in this contract.

If a subcontractor is required to meet that goal, the following will be done to make a good faith effort to hire a minority business (DBE).

1. **Solicitation Lists.** Must place small and minority businesses and women's business enterprises on solicitation lists. 2 C.F.R. § 200.321 (b)(1).
2. **Solicitations.** Must assure that it solicits small and minority businesses and women's business enterprises whenever they are potential sources. 2 C.F.R. § 200.321 (b)(2).
3. **Dividing Requirements.** Must divide total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses and women's business enterprises. 2 C.F.R. § 200.321(b)(3).
4. **Delivery Schedules.** Must establish delivery schedules, where the requirement permits, which encourage participation by small and minority businesses and women's business enterprises. 2 C.F.R. § 200.321 (b)(4).
5. **Obtaining Assistance.** Must use the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce. 2 C.F.R. § 200.321(b)(5).

Signature

Date

SECTION Q



AIA[®] Document G704[™] – 2000

Certificate of Substantial Completion

PROJECT: <i>(Name and address)</i>	PROJECT NUMBER:	OWNER <input type="checkbox"/>
	CONTRACT FOR:	ARCHITECT <input type="checkbox"/>
	CONTRACT DATE:	CONTRACTOR <input type="checkbox"/>
TO OWNER: <i>(Name and address)</i>	TO CONTRACTOR: <i>(Name and address)</i>	FIELD <input type="checkbox"/>
		OTHER <input type="checkbox"/>

PROJECT OR PORTION OF THE PROJECT DESIGNATED FOR PARTIAL OCCUPANCY OR USE SHALL INCLUDE:

The Work performed under this Contract has been reviewed and found, to the Architect's best knowledge, information and belief, to be substantially complete. Substantial Completion is the stage in the progress of the Work when the Work or designated portion is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. The date of Substantial Completion of the Project or portion designated above is the date of issuance established by this Certificate, which is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below:

ARCHITECT	BY	DATE OF ISSUANCE
-----------	----	------------------

A list of items to be completed or corrected is attached hereto. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Unless otherwise agreed to in writing, the date of commencement of warranties for items on the attached list will be the date of issuance of the final Certificate of Payment or the date of final payment.

Cost estimate of Work that is incomplete or defective: \$ _____

The Contractor will complete or correct the Work on the list of items attached hereto within
() days from the above date of Substantial Completion.

CONTRACTOR	BY	DATE
------------	----	------

The Owner accepts the Work or designated portion as substantially complete and will assume full possession at
(time) on (date).

OWNER	BY	DATE
-------	----	------

The responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance shall be as follows: *(Note: Owner's and Contractor's legal and insurance counsel should determine and review insurance requirements and coverage.)*

SECTION R

AIA[®] Document G705[™] – 2001

List of Subcontractors

PROJECT: *(Name and address)*

DATE:

TO ARCHITECT: *(Name and address)*

ARCHITECT'S PROJECT NUMBER:

FROM CONTRACTOR: *(Name and Address)*

CONTRACTOR'S PROJECT NUMBER :

(List Subcontractors and others proposed to be employed on the above Project as required by the bidding documents.)

Work/Firm Name

Address/Phone

Superintendent

SECTION S

STATUTORY LIEN WAIVER FORMS

1. SUMMARY

- A. Document Includes: Applicability and use of statutory Waiver and Release of Lien forms promulgated by the Legislature of the State of Texas for construction projects in Texas.

2. STATUTORY REGULATIONS

- A. Texas Property Code, Chapter 53, Subchapter L, Sections 53.281 thru 53.287 (includes the standard forms attached herewith immediately following this section):
 - 1. Form 1: Conditional Waiver for Progress Payments (*Page 2*)
 - 2. Form 2: Unconditional Waiver for Progress Payments (*Page 3*)
 - 3. Form 3: Conditional Waiver for Final Payments (*Page 4*)
 - 4. Form 4: Unconditional Waiver for Final Payments (*Page 5*)

3. SELECTION AND USE OF WAIVER AND RELEASE OF LIEN FORMS

- A. Based on answers to the following questions, use the applicable form for the occasion:
 - 1. Is the payment a *progress* payment (partial, not final), or a *final* payment?
 - 2. Is the release *unconditional* (for a payment already received), or *conditional* (given in anticipation of a payment not yet received)?
- B. Submit the applicable form, properly executed (filled out, signed and dated) and notarized, on each occasion required (see other portions of the Contract Documents, including but not necessarily limited to the related requirements documents cited above).
- C. The wording of these forms is prescribed by the State of Texas. Questions regarding their use, execution, etc. should be directed to user's own attorney experienced in construction or lien law. This document is not to be interpreted as rendering legal advice.
- D. Even if the Contract Documents do not explicitly require submittal of Waivers and Releases of Liens for every payment (for example, omitting them for monthly progress payments), the Owner reserves the right, at its sole discretion, to require applicable Waivers and Releases of Liens, executed and notarized, for any or all payments.

=====

CONDITIONAL WAIVER AND RELEASE ON PROGRESS PAYMENT

Project _____

Job No. _____

On receipt by the signer of this document of a check from _____ (maker of check) in the sum of \$_____ payable to _____ (payee or payees of check) and when the check has been properly endorsed and has been paid by the bank on which it is drawn, this document becomes effective to release any mechanic's lien right, any right arising from a payment bond that complies with a state or federal statute, any common law payment bond right, any claim for payment, and any rights under any similar ordinance, rule, or statute related to claim or payment rights for persons in the signer's position that the signer has on the property of _____ (owner) located at _____ (location) to the following extent: _____ (job description).

This release covers a progress payment for all labor, services, equipment, or materials furnished to the property or to _____ (person with whom signer contracted) as indicated in the attached statement(s) or progress payment request(s), except for unpaid retention, pending modifications and changes, or other items furnished.

Before any recipient of this document relies on this document, the recipient should verify evidence of payment to the signer.

The signer warrants that the signer has already paid or will use the funds received from this progress payment to promptly pay in full all of the signer's laborers, subcontractors, materialmen, and suppliers for all work, materials, equipment, or services provided for or to the above referenced project in regard to the attached statement(s) or progress payment request(s).

Date _____

_____ (Company name)

By _____ (Signature)

_____ (Title)

=====

NOTE: Section 53.281(b)(2), Texas Property Code, requires that the above form be notarized. See Chapter 121, Texas Civil Practice & Remedies Code, regarding Acknowledgments & Proofs of Written Instruments, or consult an attorney. For short acknowledgement forms that might be suitable, see Section 121.008 in Chapter 121. Click [here](#) to go there.

=====

NOTICE:

This document waives rights unconditionally and states that you have been paid for giving up those rights. It is prohibited for a person to require you to sign this document if you have not been paid the payment amount set forth below. If you have not been paid, use a conditional release form.

UNCONDITIONAL WAIVER AND RELEASE ON PROGRESS PAYMENT

Project _____

Job No. _____

The signer of this document has been paid and has received a progress payment in the sum of \$_____ for all labor, services, equipment, or materials furnished to the property or to _____ (person with whom signer contracted) on the property of _____ (owner) located at _____ (location) to the following extent: _____ (job description). The signer therefore waives and releases any mechanic's lien right, any right arising from a payment bond that complies with a state or federal statute, any common law payment bond right, any claim for payment, and any rights under any similar ordinance, rule, or statute related to claim or payment rights for persons in the signer's position that the signer has on the above referenced project to the following extent:

This release covers a progress payment for all labor, services, equipment, or materials furnished to the property or to _____ (person with whom signer contracted) as indicated in the attached statement(s) or progress payment request(s), except for unpaid retention, pending modifications and changes, or other items furnished.

The signer warrants that the signer has already paid or will use the funds received from this progress payment to promptly pay in full all of the signer's laborers, subcontractors, materialmen, and suppliers for all work, materials, equipment, or services provided for or to the above referenced project in regard to the attached statement(s) or progress payment request(s).

Date _____

_____ (Company name)

By _____ (Signature)

_____ (Title)

=====

NOTE: Section 53.281(b)(2), Texas Property Code, requires that the above form be notarized. See Chapter 121, Texas Civil Practice & Remedies Code, regarding Acknowledgments & Proofs of Written Instruments, or consult an attorney. For short acknowledgement forms that might be suitable, see Section 121.008 in Chapter 121. Click [here](#) to go there.

=====

CONDITIONAL WAIVER AND RELEASE ON FINAL PAYMENT

Project _____

Job No. _____

On receipt by the signer of this document of a check from _____ (maker of check) in the sum of \$_____ payable to _____ (payee or payees of check) and when the check has been properly endorsed and has been paid by the bank on which it is drawn, this document becomes effective to release any mechanic's lien right, any right arising from a payment bond that complies with a state or federal statute, any common law payment bond right, any claim for payment, and any rights under any similar ordinance, rule, or statute related to claim or payment rights for persons in the signer's position that the signer has on the property of _____ (owner) located at _____ (location) to the following extent: _____ (job description).

This release covers the final payment to the signer for all labor, services, equipment, or materials furnished to the property or to _____ (person with whom signer contracted).

Before any recipient of this document relies on this document, the recipient should verify evidence of payment to the signer.

The signer warrants that the signer has already paid or will use the funds received from this final payment to promptly pay in full all of the signer's laborers, subcontractors, materialmen, and suppliers for all work, materials, equipment, or services provided for or to the above referenced project up to the date of this waiver and release.

Date _____

_____ (Company name)

By _____ (Signature)

_____ (Title)

=====

NOTE: Section 53.281(b)(2), Texas Property Code, requires that the above form be notarized. See Chapter 121, Texas Civil Practice & Remedies Code, regarding Acknowledgments & Proofs of Written Instruments, or consult an attorney. For short acknowledgement forms that might be suitable, see Section 121.008 in Chapter 121. Click [here](#) to go there.

=====

NOTICE:

This document waives rights unconditionally and states that you have been paid for giving up those rights. It is prohibited for a person to require you to sign this document if you have not been paid the payment amount set forth below. If you have not been paid, use a conditional release form.

UNCONDITIONAL WAIVER AND RELEASE ON FINAL PAYMENT

Project _____

Job No. _____

The signer of this document has been paid in full for all labor, services, equipment, or materials furnished to the property or to _____ (person with whom signer contracted) on the _____ property of _____ (owner) located at _____ (location) to the following extent: _____ (job description). The signer therefore waives and releases any mechanic's lien right, any right arising from a payment bond that complies with a state or federal statute, any common law payment bond right, any claim for payment, and any rights under any similar ordinance, rule, or statute related to claim or payment rights for persons in the signer's position.

The signer warrants that the signer has already paid or will use the funds received from this final payment to promptly pay in full all of the signer's laborers, subcontractors, materialmen, and suppliers for all work, materials, equipment, or services provided for or to the above referenced project up to the date of this waiver and release.

Date _____

_____(Company name)

By _____(Signature)

_____(Title)

=====

NOTE: Section 53.281(b)(2), Texas Property Code, requires that the above form be notarized. See Chapter 121, Texas Civil Practice & Remedies Code, regarding Acknowledgments & Proofs of Written Instruments, or consult an attorney. For short acknowledgement forms that might be suitable, see Section 121.008 in Chapter 121. Click [here](#) to go there.

SECTION T

AIA[®] Document G702[™] – 1992

Application and Certificate for Payment

TO OWNER:	PROJECT:	APPLICATION NO:	Distribution to:
		PERIOD TO:	OWNER <input type="checkbox"/>
		CONTRACT FOR:	ARCHITECT <input type="checkbox"/>
FROM CONTRACTOR:	VIA ARCHITECT:	CONTRACT DATE:	CONTRACTOR <input type="checkbox"/>
		PROJECT NOS:	FIELD <input type="checkbox"/>
			OTHER <input type="checkbox"/>

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract. AIA Document G703[™], Continuation Sheet, is attached.

1. ORIGINAL CONTRACT SUM	\$
2. NET CHANGE BY CHANGE ORDERS	\$
3. CONTRACT SUM TO DATE (Line 1 ± 2)	\$
4. TOTAL COMPLETED & STORED TO DATE (Column G on G703)	\$
5. RETAINAGE:	
a. % of Completed Work	
(Columns D + E on G703)	\$
b. % of Stored Material	
(Column F on G703)	\$
Total Retainage (Lines 5a + 5b, or Total in Column I of G703)	\$
6. TOTAL EARNED LESS RETAINAGE	\$
(Line 4 minus Line 5 Total)	
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT	\$
(Line 6 from prior Certificate)	
8. CURRENT PAYMENT DUE	\$
9. BALANCE TO FINISH, INCLUDING RETAINAGE	
(Line 3 minus Line 6)	\$

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	\$	\$
Total approved this month	\$	\$
TOTAL	\$	\$
NET CHANGES by Change Order	\$	

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

State of: _____

County of: _____

Subscribed and sworn to before
me this _____ day of _____

Notary Public:

My commission expires: _____

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED \$

(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

ARCHITECT:

By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

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Continuation Sheet

AIA Document G702™-1992, Application and Certificate for Payment, or G732™-2009, Application and Certificate for Payment, Construction Manager as Adviser Edition, containing Contractor's signed certification is attached.
In tabulations below, amounts are in US dollars.
Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO:

APPLICATION DATE:

PERIOD TO:

ARCHITECT'S PROJECT NO:

[illegible]

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

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SECTION U

CHILD SUPPORT CERTIFICATION

TEXAS FAMILY CODE, SECTION 231.006 INELIGIBILITY TO RECEIVE STATE GRANTS, LOANS OR RECEIVE PAYMENT ON STATE CONTRACTS

A child support obligor who is more than 30 days delinquent in paying child support and a business entity in which the obligor is a sole proprietor, partner, shareholder, or owner with an interest of at least 25 percent is not eligible to receive payments from state funds under a contract to provide property, materials or services, or receive a state-funded grant or loan until:

1. All arrearages have been paid;
2. The obligor is in compliance with a written repayment agreement or court order as to any existing delinquency; or
3. A court-ordered exemption has been granted.

CERTIFICATION STATEMENT

Under Section 231.006, Family Code, the vendor or applicant certifies that the individual or business entity named in this contract, bid, or application is not ineligible to receive the specified grant, loan, or payment and acknowledge that this contract may be terminated and payment may be withheld if this certification is inaccurate.

I, the undersigned, hereby certify that I am in compliance with the Texas Family Code, Section 231.006.

AGREED TO BY:

CONTRACTOR

By: _____

Name: _____

Title: _____

Date: _____

SECTION V

Bid Protests.

- (1) *Notice of Protest.* A vendor wishing to protest any aspect of the procurement process must do so in writing and submit to the Purchasing Manager. The written protest should include, at a minimum:

- Both the name and address of the protestor, as well as the vendor they represent, if different.
- The name of the bid being protested.
- A statement of the grounds for protest and any supporting documentation.

A protest may be submitted to the Purchasing Manager no later than five (5) working days after award.

- (2) *Staff Review.* A protest must be in writing and supported by sufficient information in order to be considered. A decision and response to the protest will be prepared by the Purchasing Manager or his designee, in consultation with the department and the City Attorney, within fifteen (15) days of receipt of the protest. Within the fifteen (15) day time period, the City will:

- Allow for informal conference on the merits of the protest with all interested parties.
- Allow for reconsideration if data becomes available that was not previously known, or if there has been an error of law or regulation.
- Render a decision supporting or canceling the award, such decision shall be in the form of a staff recommendation.

- (3) *Appeals.* If the protesting vendor does not agree with staff recommendation, they may appeal to the City Council by contacting the City Secretary. Staff recommendations will be made available for public review prior to consideration by the City Council.

Reporting of Anticompetitive Practices.

When for any reason collusion or other anticompetitive practices are suspected among any bidders or offerors, a notice of the relevant facts shall be transmitted to the Attorney General.

Retention of Procurement Records.

All procurement records shall be retained and disposed of in accordance with records retention guidelines and schedules approved by the City Council. All procurement records must be made available to the City Secretary in order to remain in compliance with the City's Records Retention Schedule.

SECTION W

Superseded General Decision Number: TX20230038

State: Texas

Construction Type: Highway

Counties: Austin, Brazoria, Chambers, Fort Bend, Galveston, Hardin, Harris, Jefferson, Liberty, Montgomery, Orange, San Jacinto and Waller Counties in Texas.

HIGHWAY CONSTRUCTION PROJECTS (excluding tunnels, building structures in rest area projects & railroad construction; bascule, suspension & spandrel arch bridges designed for commercial navigation, bridges involving marine construction; and other major bridges).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	<ul style="list-style-type: none">. Executive Order 14026 generally applies to the contract.. The contractor must pay all covered workers at least \$17.20 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 2024.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	<ul style="list-style-type: none">. Executive Order 13658 generally applies to the contract.. The contractor must pay all covered workers at least \$12.90 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2024.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at

<http://www.dol.gov/whd/govcontracts>.

Modification Number	Publication Date
0	01/05/2024

SUTX2011-013 08/10/2011

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER (Paving and Structures).....	\$ 12.98	**
ELECTRICIAN.....	\$ 27.11	
FORM BUILDER/FORM SETTER Paving & Curb.....	\$ 12.34	**
Structures.....	\$ 12.23	**
LABORER Asphalt Raker.....	\$ 12.36	**
Flagger.....	\$ 10.33	**
Laborer, Common.....	\$ 11.02	**
Laborer, Utility.....	\$ 11.73	**
Pipelayer.....	\$ 12.12	**
Work Zone Barricade Servicer.....	\$ 11.67	**
PAINTER (Structures).....	\$ 18.62	
POWER EQUIPMENT OPERATOR: Asphalt Distributor.....	\$ 14.06	**
Asphalt Paving Machine.....	\$ 14.32	**
Broom or Sweeper.....	\$ 12.68	**
Concrete Pavement Finishing Machine.....	\$ 13.07	**
Concrete Paving, Curing, Float, Texturing Machine....	\$ 11.71	**
Concrete Saw.....	\$ 13.99	**
Crane, Hydraulic 80 Tons or less.....	\$ 13.86	**
Crane, Lattice boom 80 tons or less.....	\$ 14.97	**
Crane, Lattice boom over 80 Tons.....	\$ 15.80	**
Crawler Tractor.....	\$ 13.68	**
Excavator, 50,000 pounds or less.....	\$ 12.71	**
Excavator, Over 50,000 pounds.....	\$ 14.53	**
Foundation Drill, Crawler Mounted.....	\$ 17.43	
Foundation Drill, Truck Mounted.....	\$ 15.89	**
Front End Loader 3 CY or Less.....	\$ 13.32	**
Front End Loader, Over 3 CY.	\$ 13.17	**
Loader/Backhoe.....	\$ 14.29	**
Mechanic.....	\$ 16.96	**
Milling Machine.....	\$ 13.53	**
Motor Grader, Fine Grade....	\$ 15.69	**
Motor Grader, Rough.....	\$ 14.23	**
Off Road Hauler.....	\$ 14.60	**
Pavement Marking Machine....	\$ 11.18	**

Piledriver.....\$ 14.95 **
Roller, Asphalt.....\$ 11.95 **
Roller, Other.....\$ 11.57 **
Scraper.....\$ 13.47 **
Spreader Box.....\$ 13.58 **

Servicer.....\$ 13.97 **

Steel Worker

Reinforcing Steel.....\$ 15.15 **
Structural Steel Welder.....\$ 12.85 **
Structural Steel.....\$ 14.39 **

TRUCK DRIVER

Low Boy Float.....\$ 16.03 **
Single Axle.....\$ 11.46 **
Single or Tandem Axle Dump..\$ 11.48 **
Tandem Axle Tractor w/Semi
Trailer.....\$ 12.27 **

WELDERS - Receive rate prescribed for craft performing
operation to which welding is incidental.

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** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$17.20) or 13658 (\$12.90). Please see the Note at the top of the wage determination for more information. Please also note that the minimum wage requirements of Executive Order 14026 are not currently being enforced as to any contract or subcontract to which the states of Texas, Louisiana, or Mississippi, including their agencies, are a party.

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>.

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 classification and wage rates that have been found to be prevailing for the

cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which 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. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of 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. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write 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 the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write 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 by 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

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION"