



Hidalgo County

J.R. “Milo” Ponce Memorial Park Facility Improvements

RFB No. 2017-XXX-XX-XX-XXX

Edinburg, Texas

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HIDALGO COUNTY

**J.R. “MILO” PONCE MEMORIAL PARK FACILITY PARK
IMPROVEMENTS**

MECHANICAL/ELECTRICAL/PLUMBING ENGINEER:

HALFF ASSOCIATES, INC.
5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
P: (956) 664-0286
F: (956) 664-0282

MENTON J. ‘TREY’ MURRAY, III, P.E.

ELECTRICAL ENGINEER:

HALFF ASSOCIATES, INC.
5000 WEST MILITARY, STE. 100
MCALLEN, TEXAS 78503
P: (956) 664-0286
F: (956) 664-0282

THOMAS E. DEARMIN, P.E.

CIVIL ENGINEER:

HALFF ASSOCIATES, INC.
5000 WEST MILITARY, STE. 100
MCALLEN, TEXAS 78503
P: (956) 664-0286
F: (956) 664-0282

MILES BULLION, P.E.

STRUCTURAL ENGINEER:

CHANIN ENGINEERING
400 NOLANA, SUITE N2
MCALLEN, TEXAS 78504
P: (956) 687-9421
F: (956) 687-3211

MIGUEL CHANIN, P.E.

ARCHITECTURAL ENGINEER:

MEGAMORPHOSIS DESIGN
324 WEST VAN BUREN
HARLINGEN, TEXAS 78550
P: (956) 687-9421
F: (956) 687-3211

MEG F. JORN, AIA

LANDSCAPE ARCHITECT:

HALFF ASSOCIATES, INC.
14800 ST. MARY'S LANE, SUITE 160
HOUSTON, TX 77079-2943
P: (713) 588-2450
F: (281) 310-5259

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, 2016

Re: **HIDALGO COUNTY "J.R. "Milo" Ponce Memorial Park Facility Improvements"**

BID No: **2017-XXX-XX-XX-XXX**

Dear Gentleman/Ladies:

Enclosed please find a Request for Bid (RFB) packet for your review and consideration.

Hidalgo County Purchasing Department welcomes and appreciates your participation in the bid process.

If any further assistance is required, please do not hesitate to call the Purchasing Department 956/318-2626.

Sincerely,

Martha L. Salazar, CPPB
Hidalgo County Purchasing Agent

MLS/xxx

Enclosures

REQUEST FOR BIDS

TO SUPPLY HIDALGO COUNTY with sealed bids on: “J.R. “Milo” Ponce Memorial Park Facility Improvements”

A BIDDER’S BOND from a reliable surety company licensed to operate in the State of Texas or certified Cashier’s Check, payable without recourse to the County of Hidalgo, for the amount of not less than 5% of the total bid shall accompany the bid as guaranty that, if awarded the contract, the bidder will enter into a contract with the County of Hidalgo. Payment and Performance Bonds shall be executed except in the event into a single payment contract with the County of Hidalgo in lieu of a Performance Bond. In the event the total amount bid is \$25,000 or less, the successful contract has the option to enter into a single payment contract with the County of Hidalgo in lieu of a Payment and Performance Bond.

Bid Packets may be obtained by may be obtained from the office of Halff Associates, Inc. 5000 West Military Ste, 100 McAllen, Texas 78503 Phone No. **(956) 664-0286** for the amount of **\$150.00**. General and/or Prime Contractors submitting bids and/or proposals to the County of Hidalgo shall be **non-refundable**.

PRE-BID CONFERENCE is scheduled for **WEDNESDAY, XX, 2016 at 2:30P.M.** at **HIDALGO COUNTY NEW ADMINISTRATION BUILDING-PURCHASING DEPARTMENT 2812 S Business Hwy 281, EDINBURG, TEXAS 78539.**

UPON SUBMITTING SEALED BID, bidders are required to properly identify (handwritten, typed or printed) sealed envelope and/or packet as follows: Bidder's name and address on the upper left hand corner of the sealed envelope and/or package and Bid No.: **2016-XXX-XX-XX-XX-“ J.R. “Milo” Ponce Memorial Park Facility”** on the lower left hand corner of sealed envelope/and or packet. **OVERNIGHT MAIL MUST ALSO BE PROPERLY LABELED ON THE OUTSIDE OF EXPRESS ENVELOPE OR PACKAGE.**

The sealed bid must contain one (1) original and three (3) copies of bid and must be clearly identified and addressed for delivery to:

Martha L. Salazar, CPPB, Hidalgo County Purchasing Agent
Hidalgo County Purchasing Department

US Postal Mail/Courier Address
Hidalgo County New Administration Building
2812 S. Business Hwy281
Edinburg, Texas78539

Physical Location:
Hidalgo County New Administration Building
2802 S. Business Hwy. 281
(Southeast of Canton Rd& Business 281)
Edinburg, Texas78539

Sealed bids will be accepted until **3:30 p.m. on Wednesday, XX, 2016** at which time they will be opened in the Hidalgo County Purchasing Department Conference Room at **Physical Location: 2802 S. Business Hwy 281, Hidalgo County New Administration Building, Edinburg, Texas 78539.** NO FACSIMILES OR LATE ARRIVALS WILL BE ACCEPTED. ANY BID RECEIVED AFTER THAT TIME WILL NOT BE OPENED AND WILL BE RETURNED

Attention is called to the fact that not less than, the federally determined prevailing (**Davis-Bacon and Related Acts**) wage rate, as issued and contained in the contract documents, must be paid on this project. In addition, the successful bidder must ensure that employees and applicants for employment are not discriminated against because of race, color, religion, sex, age, disability or national origin (if applicable.)

BIDS MAY BE HELD by the County of Hidalgo for a period not to exceed ninety (90) days from the date of the opening of bids for the purpose of reviewing the bids and investigating the qualifications of bidders, prior to awarding of the contract.

THE COUNTY reserves the right to refuse and reject any/all bids and to waive any/all formalities or technicalities, or to accept the bids considered the best and most advantageous to the County.

Typed written bidding RFI’s shall be faxed to: Menton J. “Trey” Murray, III @ 956-664-0282 or e-mailed to tmurray@halff.com. Please call 956-664-0282 to confirm receipt of faxed RFI. RFI’s **will not be answered by phone**. NO HAND WRITTEN RFI’S will be processed/answered. All inquiries shall be forwarded by **5:00 PM XX, 2016**. Inquiries beyond this date will not be responded to. Contact project architect’s office for copies of Addenda. All bidders who paid a deposit will be required to return Addenda as part of the Construction Documents in order to receive full deposit or refund.

BY ORDER OF THE COMMISSIONERS COURT OF HIDALGO COUNTY, TEXAS on this the XX of 2016.

MARTHA L. SALAZAR, CPPB
HIDALGOCOUNTY PURCHASING AGENT
REPORT ROAD HAZARDS @ 1-866-HCR-SAFE OR 1-866-427-7233

Bid No:	Buyer :	Tel. No: (956) 318-2626 ext

REQUEST FOR BIDS

HIDALGO COUNTY

“J.R. “Milo” Ponce Memorial Park Facility Improvements”

BID OPENING

_____, 2017

Contact Person:

Martha L. Salazar, CPPB, Purchasing Agent
Hidalgo County Purchasing Department
Physical Address: 2802 S. Business Hwy. 281 -New Administration Building
Mailing/Postal Address: 2812 S. Business Hwy. 281
Edinburg, Texas 78539
956 318-2626



Form HCPD-03

1. Sealed bids will be received for **“HIDALGO COUNTY - “J. R. “Milo” Ponce Park Facility Improvements”** in accordance with the specifications attached as **Exhibit "A"** hereto. Bids should address all specifications set forth. Bidders may suggest substitutions of features which they feel would be in the best interest of Hidalgo County ("County"). Strong rationale must be presented for any deviation from the specifications. Hidalgo County reserves the right to reject the deviation and its effect on the overall bid.
2. **One (1) original and Three (3) copies** of all bids are required with the bidders name and return address clearly typed and or/printed on upper left hand corner and the proper notation clearly typed/printed on the lower left hand corner of the envelope and/or package: **BID NO.: 2017-XXX-XX-XX-XXX “J. R. “Milo” Ponce Park Facility Improvements”** and at County's Purchasing Department with a physical address: 2802 S. Business 281 and a mailing address: 2812 S. Business Hwy 281, New Administration Building, Edinburg, Texas, **on or before 3:30 P.M, WEDNESDAY, _____, 2017. NO FACSIMILES, EMAILS OR LATE ARRIVALS WILL BE ACCEPTED. ANY RFB RECEIVED AFTER THAT TIME WILL NOT BE OPENED AND WILL BE RETURNED. OVERNIGHT MAIL MUST ALSO BE PROPERLY LABELED ON THE OUTSIDE OF EXPRESS ENVELOPE OR PACKAGE WITH REFERENCE TO “HIDALGO COUNTY -“J. R. “Milo” Ponce Park Facility Improvements”** in **-RFB NO.: “2017-XXX-XX-XX-XXX”** Hidalgo County reserves the right to refuse and reject any/all bids and to waive any/all formalities or technicalities, or to accept the bids considered the best and most advantageous to Hidalgo County.

Additionally, all forms listed below must be properly executed and included with your bid:

1. Legal Notice (See page 8);
 2. Bid Page – Procurement Form – Areas of Specialization (See **Exhibit “B”**);
 3. Insurance pages with Acknowledgment Forms (See **Exhibit “C”**);
 4. Form CIQ-Conflict of Interest Questionnaire (See **Exhibit “D”**);
 5. Vendor Bidder Application & W-9 forms (See **Exhibit “E”**);
 6. Certification Regarding Debarment (See **Exhibit “F”**); and
 7. SAMS.gov Registration Acknowledgement (See Number 18 below).
3. Hidalgo County reserves the right to: A. separate and accept, or eliminate any item(s) listed under this bid that it deems necessary to accommodate budgetary and/or operational requirements; B. reject any or all bids submitted and further reserves the right to design the evaluation criteria to be used in selecting the lowest and best bid for approval; C. award the bid to one bidder or to multiple bidders if the County determines it is in its best interest to do so; **D. award the contract to the responsible bidder who submits the lowest and best bid. "Lowest and best" means a bid or offer providing the best value considering associated direct and indirect costs, including transport, maintenance, reliability, life cycle, warranties, and customer service after a sale.**
 4. The Bidder shall not substitute items named in the bid without the express written consent of Hidalgo County. Failure of the delivered item to perform as specified or failure to meet the stated delivery schedule shall release Hidalgo County from all obligations to the contracting party with regard to the item(s) in question. In such event, County may elect to award the contract to the next-lowest responsible bidder, or to reject all bids and re-advertise.
 5. For work to be performed at a County owned or operated location, each bidder shall, in its sole discretion, visit the job site before preparing the bid and thoroughly familiarize himself/herself with

existing conditions. Bidder should take field dimensions and note all circumstances which affect the dollar amount of the bid.

6. Descriptive specifications are referenced in this document to indicate the general kind and quality of equipment desired by Hidalgo County. Due to various styles and models of equipment, bidders are required to include illustrations, specifications, explanation of warranties, and service data with their bid including catalogue numbers and any necessary references.
7. No bid may be withdrawn within thirty (30) days from the scheduled time to open bids.
8. Proposed prices are to remain firm for a minimum of ninety (90) days after bid opening.
9. Any interpretations, amendments, corrections or changes to this bid document must be in a written addendum and signed by the County Judge or his designee. Addenda will be mailed to all who are known to have received a copy of the Request for Bids. Bidders shall acknowledge receipt of all addenda as a part of their bid.
10. County reserves the right to accept or reject any or all Bids.
11. Costs are to be net F.O.B., County Prepaid.
12. County is exempt from Federal Excise Tax, State Tax and Local Tax. Do Not include tax in cost figure. If it is determined that tax was included in the cost figures it will not be included in the tabulation of any awards. Tax exemption certificates will be furnished upon request.
13. Funds for this procurement have been provided through the County budget for this fiscal year only. County, on an annual basis, has the right to reconsider a contract during the budget process for ensuing years if financial resources of County are insufficient to meet the liabilities of said contract. The award of a bid or contract hereunder will not be construed to create a debt of the County which is payable out of funds beyond the current fiscal year.
14. Upon award and prior to execution of a contract, Sole Proprietorships are required to submit a copy of their social security cards to the Hidalgo County Auditor's Office in order to establish an account with the County. All awarded vendors must submit a completed W-9 and a copy of their Federal ID Number Certificate.
15. DELIVERY INSTRUCTIONS:
 - . No deliveries accepted after 3:00 P.M., Monday-Friday.
 - . At least seventy two (72) hours prior notice of delivery must be given to Martha L. Salazar, Purchasing Agent before delivery will be accepted.
 - . If you need additional information call the office listed below:

Hidalgo County Purchasing Department
Martha L. Salazar, Purchasing Agent
(956) 318-2626
16. BILLING AND PAYMENT INSTRUCTIONS:
 - . Invoices must include:
 - a) Name and address of successful bidder

- b) Name and address of receiving department or official
 - c) Purchase Order Number (if any)
 - d) Notation - "HIDALGO COUNTY -RFB NO.: 2017-XXX-XX-XX-XXX"
Descriptive information as to the items or services delivered, including product code, item number, quantity, etc.
 - e) Contract number must be indicated on all invoices
- . Discount payments will be considered when offered.
 - . Contact person for Billing and Payment questions:

Hidalgo County Auditor's Office
2808 S. Business Hwy 281
Edinburg, TX 78539
(956) 318-2511

17. SCHEDULE OF EVENTS

Bid Opening, 3:30 P.M.	_____, 2017
Award of Contract	_____, 2017
Commence Work or Deliver Products	_____, 2017

18. BID OR PERFORMANCE BOND AND DEBARMENT CERTIFICATION; PAYMENT UNDER CONTRACT:

. If the contract proposed is for the construction of public works or is for a contract for goods & services exceeding \$100,000, all bidders shall furnish a good and sufficient bid bond in the amount of five percent of the total contract price. A bid bond must be executed with a surety company authorized to do business in Texas. All bidders are also required to furnish a certification or acknowledgment stating that the contractor or vendor is free from suspension or debarment pursuant to federal regulation 45CFR Part 76. Register at SAMs System for Award Management @ www.sam.gov.

. Together with the signing of a contract or issuance of a purchase order following the acceptance of a bid, and prior to commencement of the actual work, the bidder shall furnish a performance bond to the County for the full amount of the contract, if that contract exceeds \$50,000.

. If the contract is for \$50,000 or less, no money will be paid to the contractor until completion and acceptance of the work or the fulfillment of the purchase obligation to the County, and, if applicable, the receipt by County of satisfactory evidence that all subcontractors and material men have been paid.

. If a contract is for the construction, alteration or repair of public buildings or public works, the contractor *shall* provide a payment bond for a contract in excess of Twenty Five Thousand Dollars (\$25,000.00), as required by Tex. Govt. Code Ch. 2253.

For requirements contracts, bond requirements are determined by applying the proposed unit price to the estimated quantities included in the specifications.

19. TITLE VI NOTICE/ NONDISCRIMINATION

a. "The County of Hidalgo, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat.252, 42 U.S.C. §§2000d to 2000d-4) and the Regulations, hereby notifies all

bidders that it will affirmatively ensure that any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.”

b. The appropriate clauses of Appendices “A” through “E” as delineated in the USDOT Standard Title VI/Nondiscrimination Assurances - Specific Assurances are hereby incorporated by reference as applicable. Title VI Appendices “A” through “E” are attached as **Exhibit “G.”**

c. Bidder will attach all applicable notices to which it is obligated to provide or submit as part of the bid, including Form FHWA 1273 to be submitted by all contractors and subcontractors in relation to construction contracts.

20. ETHICAL STANDARDS:

. It shall be a breach of ethics to offer, give or agree to give any elected official, department head or employee, or former elected official, department head or employee, of the County, or for any elected official, department head or employee or former elected official, department head or employee of the County, to solicit, demand, accept or agree to accept from another person, entity or organization, a gratuity or an offer of employment in connection with any decision, approval, disapproval, recommendation, preparation or any part of a program requirement or purchase request, influencing the content of any specification or procurement standard, rendering of advice, investigation, auditing, or in any other advisory capacity in any proceeding or application, request for ruling, determination, claim or controversy, or other particular matter pertaining to any program requirement or a contract or subcontract, or to any solicitation or proposal therefore pending before any department or agency of the County.

. It shall be a breach of ethics for any payment, gratuity or offer of employment to be made by or on behalf of a subcontractor under a contract to the prime contractor or higher tier subcontractor for any contract for the County, or any person associated therewith, as an inducement for the award of a subcontract or order.

. No public official shall have an interest in a contract awarded hereunder except in accordance with Tex. Loc. Govt. Code Chapter 171.

NOTICE:

ALL COMMUNICATIONS BY A VENDOR TO THE COUNTY, ITS OFFICIALS, AND DEPARTMENT HEADS REGARDING THIS PROCUREMENT SHALL BE DONE THROUGH THE HIDALGO COUNTY PURCHASING DEPARTMENT.

21. DISCLOSURE OF CONFLICT OF INTEREST

. Effective January 1, 2016, Chapter 176 of the Texas Local Government Code requires that any vendor, person, consultant or contractor considering doing business with Hidalgo County (“the County”) to disclose in the Conflict of Interest Questionnaire (the “CIQ”) attached as Exhibit E, the vendor, person, consultant or contractor’s affiliation or business relationship that might cause a conflict of interest with the County. By law, the CIQ must be filed with the Hidalgo County Clerk’s Office no later than the seventh business day after the date the person becomes aware of facts that require that statement to be filed. The disclosure requirement applies to a person or business who contracts or seeks to contract with Hidalgo County for the sale or purchase of property, goods or service. Any purchase order or contract resulting from this process shall be considered null and void if the successful bidder fails to comply with Texas Local Government Code Chapter 176. Vendors, consultants, contractors and others who desire to conduct business with Hidalgo County are encouraged to refer to Texas Local Government

Completed Form CIQ must be submitted to the Hidalgo County Clerk's Office located at 100 N. Closner, Edinburg, Texas 78539 - Hidalgo County Courthouse.

COMPLETION AND SUBMISSION OF FORM CIQ IS THE SOLE RESPONSIBILITY OF THE PROSPECTIVE RESPONDENT. QUESTIONS REGARDING COMPLIANCE SHOULD BE DIRECTED TO YOUR LEGAL COUNSEL.

22. CERTIFICATE OF INTERESTED PARTIES (FORM HB1295)

As of January 1, 2016, to comply with Texas Government Code Section §2252.908, and the rules issued by the Texas Ethics Commission found in Title 1, Section 46.1, 46.3 and 46.5 of the Texas Administrative Code, we have updated and revised our RFB packet. In accordance with these requirements, business must submit a completed Certificate of Interested Parties Form 1295 to the County before the County may enter into a contract with the business entity. In box 3 of Form 1295, you will provide the RFB Project No. (2016-000), as shown on the packet. Once completed and filed with the Texas Ethics Commission, Form 1295 must be printed and signed in the presence of a notary and submitted to our office either by facsimile transmission to (956) 292-7612 or via email to: tanya.delira@co.hidalgo.tx.us. Hidalgo County cannot enter into a contract until Form 1295 is submitted. Therefore, failure to timely submit Form 1295 signed and notarized may result in delay of award. Full instructions for completion and submittal of Form 1295 may be found on the Texas Ethics Commission website:

<https://www.ethics.state.tx.us/tec/1295-Info.htm>

THE AWARDED VENDOR WILL HAVE THIRTY (30) DAYS FROM THE DATE THE HIDALGO COUNTY COMMISSIONER'S COURT APPROVES THIS AGREEMENT TO SUBMIT THE SIGNED NOTARIZED FORM 1295. *HIDALGO COUNTY CANNOT ENTER INTO A CONTRACT UNTIL FORM 1295 IS SUBMITTED.*

23. If, during the life of any contract or bid awarded, the successful bidder's net prices generally available to other customers for items awarded herein are reduced below the contracted price, it is understood and agreed that the benefits of such reduction shall be extended to the County.
24. Bids, and all goods and services provided hereunder, shall comply with all federal, state and local laws concerning this type(s) of goods and/or services.
25. Minimum Standards for Responsible Prospective Bidders: A prospective bidder must affirmatively demonstrate bidder's responsibility. A prospective bidder, by submitting a bid, represents to County that it meets the following requirements:
- . Possess or is able to obtain adequate financial resources as required to perform under the bid;
 - . Be able to comply with the required or proposed delivery schedule;
 - . Have a satisfactory record of performance;
 - . Have a satisfactory record of integrity and ethics;
 - . Be otherwise qualified and eligible to receive an award.
26. Successful bidder will pay or cause to be paid, without cost or expenses to County, all FICA, FUTA/SUTA and Federal Income Withholding Taxes of all employees, and all wages and benefits as required by Federal or State law. Successful bidder's officers, agents and/or employees will not be entitled to any benefits of an employee or elected official of County, including, but not limited to, benefits associated with County's civil service system.

27. Any contract award to a successful bidder will be in effect until (a) the contract expires, (b) delivery and acceptance of products, and/or performance of services ordered, or (c) terminated by County with thirty day's written notice prior to cancellation.
28. County reserves the right to enforce performance of any contract awarded hereunder in any manner prescribed by law or deemed to be in the best interest of the County in the event of breach or default by successful bidder; County reserves the right to terminate any contract immediately in the event a successful bidder fails to:
- A. Meet schedules;
 - B. Pay any required fees or taxes; or
 - C. Otherwise perform in accordance with the specifications.
29. Successful bidder shall defend, indemnify and save harmless County and all its elected officials, officers, agents and employees from all suits, actions, or other claims of any character, name and description brought for or on account of any injuries or damages received or sustained by any person, persons, or property on account of any negligent act or fault of the successful bidder, or of any agent, employee, subcontractor or supplier of successful bidder in the execution of, or performance under, any contract which may result from bid award or which arises from any event or casualty happening on or within County premises themselves or happening upon or in any halls, elevators, entrances, stairways or approaches of or to such County facilities. Successful bidder shall pay any judgment with costs which may be obtained against County growing out of such injury or damages, and shall, upon request, provide a defense to County by counsel reasonably acceptable to County. Successful bidder's indemnity hereunder shall include, but is not limited to, claims relating to patent, copyright or trademark infringement, and the like, arising out of the goods and services provided by successful bidder.
30. Successful bidder shall warrant that all items/services shall conform with the specifications and/or all warranties provided under the Uniform Commercial Code and be free from all defects in material, workmanship and the like. Items supplied under a contract pursuant to this Request for Bids shall be subject to County's approval. Items found to be defective or not meeting specifications shall be replaced by successful bidder within two business days at no expense to County. Items not picked up within one (1) week after notification shall be deemed a donation to County and may be used or disposed of at County's discretion and without waiver of any other rights of County as to the item's nonconformity.
31. This document and any disputes arising hereunder shall be governed and construed according to the laws of the State of Texas, and will be performable exclusively in Hidalgo County, Texas.
32. The successful bidder shall not assign, sell, transfer or convey its rights under any awarded contract, in whole or in part, without the prior written consent of County.

LEGAL NOTICE

Bid
for
HIDALGO COUNTY
(Dept. Name)
“J. R. “Milo” Ponce Park Facility Improvements”
BID NO.: 2017-XXX-XX-XX-XXX

To: Martha L. Salazar, CPPB, Purchasing Agent
Physical Address: 2802 S. Business Hwy. 281 -New Administration Building
Mailing/Postal Address: 2812 S. Business Hwy. 281
Edinburg, Texas 78539

In accordance with the Specifications, and subject to all laws and regulations of the United States and state and local laws, the undersigned bidder proposes and commits to furnish all labor, equipment, material, software and services as set forth in the documents hereinbefore mentioned. The undersigned bidder further agrees, upon acceptance of its bid, to execute a contract and/or Purchase Order issued by Hidalgo County for performing and completing the work described in the Specifications within the time stated and for the prices proposed in the documents attached hereto and made a part hereof.

Bidder acknowledges receipt of all of the pages of the documents referenced in the Invitation to Bid Checklist presented in connection with this procurement. Bidder understands that Hidalgo County reserves the right to reject any or all bids and further reserves the right to design the evaluation criteria to be used in selecting the lowest and best bid.

Bidder agrees that this bid shall be good and may not be withdrawn for a period of ninety (90) calendar days after the scheduled closing time for receiving bids, as contained in the Specifications.

Respectfully submitted,

Bidder: _____
Address: _____
By: _____
Printed Name: _____
Title: _____



HIDALGO COUNTY PURCHASING OFFICE
2812 S. Business Highway 281
Administration Building
Edinburg, Texas 78539
(956) 318-2626/ Fax: (956) 292-7612

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HIDALGO COUNTY
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The above mentioned items shall be found in this Request for Bids-Goods/Products-RFB packet that is attached herewith. Should you find that any of the listed items are not attached in its entirety, please contact Purchasing by calling (956) 318-2626 or e-mail, to advise us of the missing documentation, and Purchasing will forward information either through facsimile, e-mail or by U.S. Mail.

Thank you.

Martha L. Salazar, CPPB, Purchasing Agent

Date

Revised 09/13/16

INFORMATION FOR BIDDERS

1. Receipt and Opening of Bids

The Hidalgo County (herein called the “Owner”), invites bids on the form attached hereto, all blanks of which must be appropriately filled in. Bids will be received by the Owner at the Hidalgo County Purchasing department until Wednesday, _____, 2017 at 3:30 p.m. and then at said office publicly open and read aloud. The envelopes containing the bids must be sealed, addressed to Martha L. Salazar, Hidalgo County Purchasing Agent at 2812 S Business 281, Edinburg, Texas 78539 and designated as Bid for Hidalgo County.

The owner may consider informal any bid not prepared and submitted in accordance with provisions hereof and may waive any informalities or reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. No bidder may withdraw a bid within 90 days after the actual date of the opening thereof.

2. Preparation of Bid

Each bid must be submitted on the prescribed forms and Certification by Bidder (contractor), concerning Labor Standards and Prevailing Wage Requirements. All blank spaces for bid prices must be filled in, in ink or typewritten, in both words and figures, and the foregoing Certificates must be fully completed and executed when submitted.

Each bid must be submitted in a sealed envelopes bearing on the outside the name of the bidder, his address, and the name of the project for which the bid is submitted. If forwarded by mail, the sealed envelope containing the bid must be enclosed in another enveloped addressed as specified in the bid form.

3. Subcontracts

The bidder is specifically advised that any person, firm, or other party to whom is proposed to ward a subcontract under this contract –

- a** Must be acceptable to the Owner after verification of the current eligibility status, and,
- b** Approval of the proposed subcontract award cannot be given by the Owner unless and until the proposed subcontractor has submitted the Certification and/or other evidence showing that it has fully complied with any reporting requirements to which it is or was subject. Although the bidder is not required to attach such Certification by proposed subcontractors to his bid, the bidder is here advised of this requirement so that appropriate action can be taken to prevent subsequent delay in subcontract awards.

4. Telegraphic Modification

Any bidder may modify his bid by telegraphic communication at any time prior to the scheduled closing time for receipt of bids, provided such telegraphic communication is received by the Owner prior to the

closing time, and provided further, the Owner is satisfied that a written confirmation of the telegraphic modification over the signature of the bidder was mailed prior to the closing time. The telegraphic communication should not reveal the bid price but should provide the addition or subtraction or other modification so that the final prices or terms will not be known by the Owner until the sealed bid is opened. If written confirmation is not received within two days from the closing time, no consideration will be given to the telegraphic modification.

5. Method of Bidding

The Owner invites the following bid(s): Project Name: _____

6. Qualifications of Bidder

The Owner may make such investigations as he deems necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request, the Owner reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the Owner that such bidder is properly qualified to carry out the obligations of the contract to complete the work contemplated therein. Conditional bids will not be accepted.

7. Bid Security

Each bid must be accompanied by certified check of the bidder, or a bid bond prepared on the form of bid bond attached hereto, duly executed by the bidder as principal and having as surety thereon a surety company approved by the Owner, in the amount of 5% of the bid. Such checks or bid bonds will be returned to all except the three lowest bidders within three days after the opening of bids, and the remaining checks, or bid bonds will be returned promptly after the Owner and the accepted bidder have executed the contract, or if no award has been made within 90 days after the date of the opening of bids, upon demand of the bidder at any time thereafter, so long as he has not been notified of the acceptance of his bid.

8. Liquidated Damages for Failure to enter into Contract

The successful bidder, upon his failure or refusal to execute and deliver the contract and bonds required within 10 days after he has received notice of the acceptance of his bid, shall forfeit to the Owner, as liquidated damages for such failure or refusal, the security deposited with his bid.

9. Time of Completion and Liquidated Damages

Bidder must agree to commence on or before a date to be specified in a Written "Notice to Proceed" of the Owner and to fully complete the project within **120 consecutive calendar days** thereafter. Bidder must agree also to pay as liquidated damages, the sum of **\$250.00** for each consecutive calendar day thereafter as hereinafter provided in the General Conditions.

10. Condition of Work

Each bidder must inform himself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful bidder of his obligation to furnish all material and labor necessary to carry out the provisions of his contract. Insofar as possible the contractor, in carrying out his work, must employ such methods or means as will not cause any interruption of or interference with work of any other contractor.

11. Addenda and Interpretations

No interpretation of the meaning of the plans, specifications or other pre-bid documents will be made to any bidder orally.

Every request for such interpretation should be in writing addressed to Halff Associates, Inc., 5000 West Military Ste. 100, McAllen, Texas 78503 attn: Menton J. "Trey" Murray, III and to be given consideration must be received at least five days prior to the date fixed for the opening of bids. Any all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, if issued, will be mailed by certified mail with return receipt requested to all prospective bidders (at the respective addresses furnished for such purposes), not later than three days prior to the date fixed for the opening of bids. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under his bid as submitted. All addenda so issued shall become part of the contract documents.

12. Security for Faithful Performance

Simultaneously with his delivery of the executed contract; the contractor shall furnish a surety bond or bonds as security for faithful performance of this contract and for the payment of all persons performing labor on the project under this contract and furnishing materials in connection with this contract, as specified in the General Conditions included herein. The surety on such bond or bonds shall be a duly authorized surety company satisfactory to the Owner.

13. Power of Attorney

Attorney-in-fact who sign bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

14. Notice of Special Conditions

Attention is particularly called to those parts of the contract documents and specification which deal with the following;

- a** Inspection and testing of materials
- b** Insurance requirements
- c** Wage rates
- d** States allowances

15. Laws and Regulations

The bidder's attention is directed to the fact that all applicable State laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction of the project shall apply to the contract throughout, and they will be deemed to be included in the contract the same as though herein written out in full.

16. Method of Award – Lowest Qualified Bidder

If at the time this contract is to be awarded, the lowest base bid submitted by a responsible bidder does not exceed the amount of funds then estimated by the Owner as available to finance the contract the contract will be awarded on the base bid only. If such bid exceeds such amount, the Owner may reject all bids or may award the contract on the base bid combined with such deductible alternates applied in numerical order in which they are listed in the form of Bid, as produces a net amount which is within the available funds.

17. Obligation of Bidder

At the time of the opening of bids each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the plans and contract documents (including all addenda). The failure or omission of any bidder to examine any form, instrument or document shall in no way relieve any bidder from any obligation in respect of his bid.

Supplement to Form HUD-4238-B®
INFORMATION FOR BIDDERS

18. SAFETY STANDARDS AND ACCIDENTS PREVENTION

With respect to all work performed under this contract, the contractor shall:

- 1 Comply with the safety standards provision of applicable laws, building and construction codes and the "Manual of Accident Prevention in Construction" published by the Associated General Contractors of America, the requirements of the Occupational Safety and Health Act of 1970 (Public Laws 91-596), and the requirements of Title 29 of the Code of Federal Regulations, Section 1518 as published in the "Federal Register", Volume 36, No 75, Saturday, April 17, 1971.
- 2 Exercise every precaution at all times for the prevention of accidents and the protection of persons (including employees) and property.
- 3 Maintain at his office or other well known place at the job site, all articles necessary for giving first aid to the injured, and shall make standing arrangements for the immediate removal to a hospital or a doctor's care of persons (including employee), whom may be injured on the job site. In no case shall employee be permitted to work at a job site before the employer has made a standing arrangement for removal of injured person to a hospital or a doctor's care.

SPECIAL PROVISIONS

- 1.** The County of Hidalgo reserves the right to partially award the contract in order to meet the budget.
- 2.** It shall be the Contractor's responsibility to locate underground utilities, whether shown or not shown on the drawings, sufficiently in advance of operations to preclude damage to same.
- 3.** Water, sewer, or other utility serves shall not be interrupted. Any damages to existing utilities will be Contractor's responsibility.
- 4.** In the event of damage to underground facilities, whether shown or not shown in the drawings, the Contractor shall make the necessary repairs to place the facilities back in service at no increase in the Contractors price and all such repairs shall conform to the requirements of the company or agency servicing the facility
- 5.** The Contractor shall exercise extra care to prevent damage to all other structures in the area including, fence, roads, pipelines, utilities, etc., whether publicly or privately owned.
- 6.** Until acceptance by the Engineer of any part or all of the construction, as provided for in the plans and these specifications, it shall be under the charge and care of the contractor, and he shall take every necessary precaution against injury or damage to any part of the work. The Contractor shall rebuild, repair, restore and make good, at his own expense, all injuries or damage to any portion of the work before its completion and acceptance.
- 7.** In case the Contractor deems extra compensation is due him for proposed work not covered in the contract, the Contractor shall notify the Engineer in writing of his claim for such extra compensation before he begins the work. Failure on the part of the Contractor to give such notification shall constitute a waiver of claim for such extra compensation. The Contractor shall not proceed until a written Change Order is approved by the Owner, Engineer, and Contractor.
- 8.** Prospective bidders should make a careful examination of the projects sites.
- 9.** Contractor shall review his overall method and schedule of construction with the County Prior to construction for proper coordination of inspection.
- 10.** No open trenches or excavation shall be left open overnight.

STATEMENT OF CREDENTIALS
for Facility Construction and Related Projects
(Non-road Improvements)

- 1. GENERAL:** In order to assist the Owner in determining the ability of each Bidder to properly fulfill the requirements of this proposed contract, the Bidder will complete the following items. **All questions must be answered** and the data given must be clear and comprehensive. **This statement must be notarized.** If necessary, questions may be answered on separate attached sheets. The Bidder may submit any additional information he/she desires.

Name of Bidder: _____

Address: _____

Date Organized: _____ Date Incorporated: _____

Office Number: _____ Fax Number: _____

Number of years in business under present name: _____

Type of work performed by your company: _____

Have you ever failed to complete any work awarded to you? _____

Have you ever defaulted on a contract? _____

- 2. EXPERIENCE:** The Bidder will give below a list of similar projects which he/she has completed within the last five (5) years.

1. Owner: _____

Address: _____

Ph/Fx Number: _____ Email: _____

Scope of Work Description: _____

Date Completed: _____ Total Cost: _____

2. Owner: _____

Address: _____

Ph/Fx Number: _____ Email: _____

Scope of Work Description: _____

Date Completed: _____ Total Cost: _____

3. Owner: _____

Address: _____

Ph/Fx Number: _____ Email: _____

Scope of Work Description: _____

Date Completed: _____ Total Cost: _____

4. Owner: _____

Address: _____

Ph/Fx Number: _____ Email: _____

Scope of Work Description: _____

Date Completed: _____ Total Cost: _____

5. Owner: _____

Address: _____

Ph/Fx Number: _____ Email: _____

Scope of Work Description: _____

Date Completed: _____ Total Cost: _____

-
-
-
-
-
-

- [illegible]

- 5. PERFORMANCE OF WORK BY BIDDER:** Except as otherwise provided, the **general contractor/bidder** shall perform no **more** than eighty percent **(80%)** of the work with his own organization, and **no less than** twenty percent **(20%)** of the work may be subcontracted.

The organization of the specifications into divisions, sections, articles, etc., and the arrangement and titles of project drawings shall not control the Bidder in dividing the work among subcontractors or in establishing the extent of work to be performed by any trade.

Awarded bidder shall assign a project superintendent who is directly employed by the Bidder, that superintendent will be required to be on the job on a daily basis. No subcontractors will be allowed to act as project superintendents at any point during the construction of said project.

Bidder shall have a significant business presence with the Rio Grande Valley Area, the business must be headquartered in either Hidalgo, Cameron, or Starr County or a local office must be located in either of the three counties (Hidalgo, Cameron, Starr) with at least thirty percent (30%) of the total company workforce employed at the local office. County reserves the right to request payrolls and any necessary documentation to confirm that the local office meets these requirements.

Bidders shall carefully examine the plans, specifications and other documents, visit the site of the work, and fully inform themselves as to all conditions and matters which can affect the work or cost thereof. Should the bidder find discrepancies in, or omissions from the plans, specifications or other documents, or should he/she be in doubt as their meaning, he/she should at once notify the Engineer and obtain clarification by addendum prior to submitting any bid.

Bidder hereby certifies that said company carried liability coverage and workers compensation insurance coverage that meets the requirements set forth in this Request for Bids/Proposals when performing work on this project for Hidalgo County.

Furthermore, bidder certifies that any subcontractor on the project shall provide the said company with a certificate relating that all employees of the subcontractor also are provided with workers' compensation insurance coverage. Bidder will provide copies of all of these certificates to Hidalgo County during the course of the project for all subcontractors working on the project.

All subcontractors must comply with federally determined prevailing Davis-Bacon and Related Acts wage rate.

Hidalgo County encourages the hiring of minority women subcontractors and/or suppliers whenever and wherever feasible.

The undersigned hereby authorizes and requests any person, firm, or corporation to furnish any information requested by the owner in verification of the recitals comprising this Statement of Credentials.

Executed this _____ day of _____, 20____.

By _____

Title _____

Subscribed and sworn to me this _____ day of _____, 20____.

By: _____

Notary Public in and for _____ County, Texas

My commission expires _____

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SEALED BID FORM

PROJECT: J. R. " Milo" Ponce Memorial Park Facility Improvements
FM 2812 – 2 Miles East of U.S. 28
Edinburg, Texas

DATE: Wednesday, _____, 2017

TIME: 3:30 P.M.

TO: Martha L. Salazar, CPPB
Hidalgo County Purchasing Agent

1. Pursuant to and in compliance with the invitation to Bid and the proposed contract documents dated _____ 2017, and relating to the above referenced project, the undersigned hereby proposes and agrees to fully perform the work within the time stated and in strict accordance with the proposed Contract Documents, and addenda thereto, for the following sum of money:

- A. Base Bid - All labor, materials, services, and equipment necessary for the work shown on drawings and specification including contingencies the date set forth as the completion date of the project.

_____ Dollars (\$_____)

2. If Awarded this contract, the undersigned will execute a satisfactory Construction Contract, Performance Bond, Labor and Material Payment Bond and Proof of Insurance coverage, with the Owner for the entire work as per the Contract Documents within ten (10) days after the Notice of Award. It is agreed that his proposal is subjected to the owner's acceptance for a period of ninety (90) days from the above date.
3. Enclosed is a Certificate Check or Bidders Bond in the amount of \$_____ in compliance with the specifications requirements. (5% of highest amount bid) The above check or Bidders Bond is to become the property of the Owner in the event the Construction Contract (when offered by the Owner) and the bonds and proof of insurance are not within the time set forth above.
4. Extra Work:
The undersigned agrees that should any change in the work or extra work be ordered via contract change order, the allowance for overhead and profit contained shall be ten (10%) percent. It is further agreed that any extra work funded through all allowances shall have an O and overhead and profit of 0%.

The undersigned agrees to the following:

- A. To furnish all labor and materials as shown, specified, and reasonably inferred.
B. To complete the base proposal including anticipated delay days to inclement weather or muddy ground conditions in 120 calendar days from issuance of Notice to Proceed.
5. Receipt is acknowledged of the following addendums

No. _____ Date: _____ No. _____ Date: _____

No. _____ Date: _____ No. _____ Date: _____

6. The bidder attest and affirms that he and his subcontractors are skilled experienced in the use and interpretation of plans, specifications addenda, and related bid documents and has found them to be free of conflict and/or ambiguities and sufficient for bidding and construction purposes. Further, he has carefully examined the site of the work, and through his own personal observations has satisfied himself as to the nature, location and requirement of the work; the character, quality and quantity of materials required; the difficulties likely to be encountered; the other items and/or conditions which may affect the satisfactory performance of the work. He has based his bid solely on these documents and personal observation and has not relied in any way explanation or interpretation and or written from any source other than those written and issued by the Engineer.
7. The Bidder agrees that the owner has the right to accept or reject any or all bids and to waive all informalities.
8. The undersigned bidder, by signing and executing this bid, certifies and represents to Hidalgo County that bidder has nor offered, conferred or agreed to confer any pecuniary benefits, as defined by TEX. PENAL CODE ANN. S218, or any other thing or value, as consideration for the receipt of information or any special treatment or advantage relating to this bid; the Bidder also certifies, and presents, that the Bidder has not offered, conferred or agreed to confer any pecuniary benefit or other thing conferred of value as consideration not authorized by the law, the bidder also certifies and represents that bidder has not received any information not available to other bidders so as to give the undersigned a preferential advantage with respect to this bid; the bidder further certifies and represents that bidder has not violated any state, federal or local law, regulation or ordinance relating to bribery, improper influence, collusion or that the bidder will not, in the future, offer, confer, to agree to confer any pecuniary benefit or other thing of value to any officer, trustee, agent, or employee of the Hidalgo County, in return for the person having exercised the person's official discretion, power or duty with respect to this bid, the Bidder certifies and represents that is has now, and will not in the future, offer, confer, or agree to confer a pecuniary benefit or other thing of value of any officer, trustee, agent, or employee of the Hidalgo County in connection with information regarding this bid; the submission of this bid, the award of this bid or the performance, delivery or sale pursuant to this bid.

Respectfully submitted;

Proposal Prepared By:

Bidder: _____
Name of Firm

Signed by: _____

Address: _____

Name: _____

Title: _____

Phone No: _____

Date: _____

Email: _____

Website: _____

(Seal if bidder is a corporation)

END OF SECTION

HIDALGO COUNTY

BID BOND

KNOW ALL MEN BY THESE PRESENTS, That we, the undersigned _____
_____ as Principal, and _____
_____ as Surety, are hereby held and firmly bound
unto _____ as OWNER in the penal sum of _____

_____ for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, successors and assigns.

Signed, this _____ day of _____, 2_____.

The condition of the above obligation is such that whereas the Principal has submitted to _____
_____ a certain BID, attached hereto and
hereby made a part hereof to enter into a contract in writing for the

NOW, THEREFORE,

- (a) If said Bid shall be rejected, or
- (b) If said Bid shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said BID) and Shall furnish a BOND for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said BID, then, this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation is herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its BOND shall be in no way impaired or affected by any extension of the time within which the OWNER may accept such Bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

_____(L.S.)
Principal

Surety

By:_____

IMPORTANT – Surety companies executing BONDS must appear on the Treasury Department’s most current list (circular 570 as amended) and be authorized to transact business in the state where the project is located.

THE STATE OF TEXAS §
 §
COUNTY OF HIDALGO §

CONSTRUCTION CONTRACT
C-XX-XXX-XX-XX

This Agreement, entered into this _____ day of _____, 2____ by and between Hidalgo County (hereinafter called the "OWNER," and, _____ (a Texas corporation), of County of Hidalgo, and State of Texas, hereinafter called "CONTRACTOR".

WITNESSETH

That for and in consideration of the payments and agreement hereinafter mentioned, to be made and performed by the OWNER, the CONTRACTOR hereby agrees with the OWNER to commence and complete the construction described as follows:

NAME OF PROJECT

Hereinafter called the project, for the sum of _____ Dollars and _____ Cents and all extra work in connection therewith, under the terms and stated in the General and Special Conditions of the Contract; and at his (its or their) own proper cost and expense to furnish all the materials, supplies, machinery, equipment, tools, superintendence, labor, insurance, and other accessories and services necessary to complete the said project in accordance with the conditions and prices stated in the Proposal, the General Conditions and Special Conditions printed or written explanatory matter thereof, the specifications and contract documents therefore as prepared by _____ engineer, entitled the Architect/Engineer, and as enumerated in Paragraph 1.01.A.12 of the General Conditions, all of which are made a part hereof and collectively evidence and constitute the contract.

The CONTRACTOR hereby agrees to commence work under this contract on or after a date to be specified in written "Notice to Proceed" of the OWNER and to fully complete the project within _____ consecutive calendar days thereafter. The CONTRACTOR further agrees to pay, as liquidated damages, the sum of \$_____ for _____ each consecutive calendar day thereafter.

The OWNER agrees to pay the CONTRACTOR in current funds for the performance of the contract, subject to additions and deductions, as provided in the General Conditions of the contract, and to make payments on account thereof as provided in Paragraphs 14.02.C and 14.07.C of the General Conditions.

IN WITNESS WHEREOF, the parties to these present have executed this contract in six (6) counterparts, each of which shall be deemed an original, in year and day first above mentioned.

APPROVED BY COMMISSIONERS COURT ON, _____, 2_____.

CONTRACTOR: _____
Print Name & Title: _____
Name of Firm: _____
Address: _____
Fed I.D. #/SS #: _____

STATE OF TEXAS

COUNTY OF HIDALGO

This instrument was acknowledged before me on this the _____ day of _____,
2_____, by _____ Of and on behalf of _____
(Title) (A corporation)

Notary Public-Signature

APPROVED AS TO FORM:

BY: _____
Atlas, Hall & Rodriguez, LLP

DATE: _____

ATTEST:

COUNTY OF HIDALGO:

Arturo Guajardo, Jr., County Clerk

Ramon Garcia, County Judge

PROPOSER'S AFFIDAVIT
Exhibit "E"

PROPOSER'S AFFIDAVIT OF NON-COLLUSION NON-CONFLICT OF INTEREST, AND ANTI-LOBBYING

STATE OF TEXAS
COUNTY OF HIDALGO

Affiant, _____, being first duly sworn, deposes that:

(1) Affiant does hereby state neither the Proposer nor any of the Proposer's officers, partners, owners, agents, representatives, employees, or parties in interest, has in any way colluded, conspired, agreed, directly or indirectly with any person, firm, corporation, or other proposer, or potential proposer, to provide any money or other valuable consideration for assistance in procuring or attempting to procure a contract or fix the prices in the attached proposed or the proposal of any other proposer, and further states that no such money or other reward will be hereinafter paid.

(2) Affiant further states they have neither recommended or suggested to Hidalgo County or any of its officials or employees, any of the terms or provisions set forth in their Request for Proposal and subsequent agreement, except at a meeting open to all interested proposers, of which proper notice was given.

(3) Affiant, further states their officers, employees, or agents have not, and will not attempt to lobby, directly or indirectly, the Hidalgo County Commissioner's Court between proposal submission date and award by the Hidalgo County Commissioner's Court.

(4) Affiant further states no officer, or stockholder of the Proposer is a member of the staff, or related to any employee of the Hidalgo County except as noted herein below:

Signature/Title: _____

Subscribed and sworn to before me this _____ day of _____, 20____.

Notary Public

My commission expires: _____, 20____

NON-COLLUSION AFFIDAVIT OF PRIME BIDDER

State of)

County of.....)

_____, being first duly sworn,
deposes and says that:

(1) He is _____, of
_____, the Bidder that has submitted the attached Bid;

(2) He is fully informed respecting the preparation and contents of this attached bid and of all pertinent circumstances respecting such bid;

(3) Such bid is genuine and is not a collusive or sham Bid;

(4) Neither the said Bidder nor any of its officers, partners, owners, agents, representative;, employees or parties in interest, including this affiant, has in any way colluded, conspired a collusive or sham Bid in connection with the Contract for which the attaché Bid has been submitted or to refrain from bidding in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication of conference with any other Bidder, firm or person to fix the price or prices in the attached Bid or of any other Bidder, or to fix any overhead, profit or cost element of the Bid price or the Bid price of any other Bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the Owner or any person interested in the proposed Contract; and

(5) The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties in interest, including this affiant.

(Signed) _____

(Title)

Subscribed and sworn to before me on this _____

Day of _____

Title

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PAYMENT BOND

(To be used in Texas under V.A.T.S. 5160)

THE STATE OF _____

COUNTY OF _____

KNOW ALL MEN BY THESE PRESENTS: That we (1) _____,
a (2) _____, hereinafter called
Principal and (3) _____ of
_____, hereinafter called the
Surety, are held and firmly bound unto (4) _____ of
_____, hereinafter called Owner, and unto all persons,
firms, and corporations who may furnish materials for, or perform labor
upon the building or improvements hereinafter referred to the penal sum
of _____ (\$ _____) Dollars in lawful money of the
United States to be paid in (5) _____, for the
payment of which sum well and truly to be made, we bind ourselves, our
heirs, executors, administrators, and successors, jointly and severally,
firmly be these presents.

THE CONDITION OF THIS OBLIGATION is such that Whereas, the Principal
entered into a certain contract with (6) _____,
the Owner, dated
the _____ day of _____, A.D. 200__, a copy of which is
hereto attached and made a part hereof for the construction of:

HIDALGO COUNTY PRECINCT # _____

These footnotes refer to numbers in body of contract above:

Date of Bond must not be prior to date of contract

- (1) Correct name of Contractor
- (2) A Corporation, a Partnership or an Individual, as case may be
- (3) Correct name of Surety
- (4) Correct name of Owner
- (5) County and State
- (6) Owner

NOW, THEREFORE, the condition of this obligation is such that, if the
-1- Principal shall promptly make payment to all claimants as defined
in Article 5160 Revised Civil Statutes of Texas, 1925, as amended by
House Bill 344, Act 56th Legislature, Regular Session, 1925 effective
April 27, 1959, supplying labor and materials in the prosecution of
the work provided for in said Contract, then this obligation shall be
null and void, otherwise it shall remain in full force and effect.

This bond is made and entered into solely for the prosecution of all
claimants supplying labor and material in the prosecution of the work
provided for in said Contract, and all such claimants shall have a
direct right of action under the bond as provided in Article 5160,
Revised Civil Statutes 1925, as amended by House Bill 344, Acts 56th
Legislature, Regular Session, 1959

PROVIDED FURTHER, that if any legal action be filed upon this bond, venue
shall lie in Hidalgo County, State of Texas, and that the said surety,

for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specification accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

PROVIDED FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in six counterparts, each one of which shall be deemed an original, this the _____ day of _____ . A.D., 20_____.

ATTEST:

(Principal) Secretary

(Seal)

Witness as to Principal

(Address)

Principal _____
By _____

(Address) _____

Telephone Number: _____

Surety

ATTEST:

(Surety) Secretary

(Seal)

Witness as to Surety

(Address)

By _____

(Address) _____

NOTE: If Contractor is partnership all Partners should execute bond

Telephone Number: _____

PAYMENT BOND FORM

(Address)
Telephone Number: _____

(Individual Principal)

(Business Address)
Telephone Number: _____

(Corporate Principal)

(Business Address) (Affix Corporate SEAL)
Telephone Number: _____
BY _____

ATTEST:

(Business Address)(Affix Corporate SEAL)

BY _____
Telephone Number: _____

CERTIFICATES AS TO CORPORATE PRINCIPAL

I, _____, certify that I am the _____
Secretary of the corporation named as Principal in the within bond; that
_____, who signed the said bond on behalf of the
Principal was then _____ of said corporation; and I
know his signature, and his signature thereto is genuine; and that said
bond was duly signed, sealed, and attested for and in behalf of said
corporation by authority of its governing body.

(TITLE)
DATE _____

(AFFIX CORPORATE SEAL)

Telephone Number: _____

The rate of premium on this bond is _____ per thousand. Total
amount of premium charge \$ _____.
(The above must be filled in by corporate surety.) (Power-of-Attorney of
person signing for surety company must be attached.)

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PERFORMANCE BOND
(To be used in Texas under V.A.T.S. 5160)

THE STATE OF _____

COUNTY OF _____

KNOW ALL MEN BY THESE PRESENTS: That we (1) _____, a (2) _____ OF _____, hereinafter called Principal and (3) _____ of _____, State of _____, hereinafter called the Surety, are held and firmly bound unto (4) _____ of _____, hereinafter called Owner, in the penal sum of _____ (\$ _____) Dollars in lawful money of the United States to be paid in (5) _____, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly be these presents.

THE CONDITION OF THIS OBLIGATION is such that Whereas, the Principal entered into a certain contract with (6) _____, the Owner, dated the _____ day of _____, A.D. 200__, a copy of which is hereto attached and made a part hereof for the construction of:

HIDALGO COUNTY PRECINCT # _____

hereinafter called the "Work").

These footnotes refer to the numbers in body of contract above:

Date of Bond must not be prior to date of contract

- (1) Correct name of Contractor
 - (2) A Corporation, a Partnership or an Individual, as case may be
 - (3) Correct name of Surety
 - (4) Correct name of Owner
 - (5) County and State
 - (6) Owner
- (Texas Performance Bond) - Page 2.

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform the work in accordance with the plans, specifications, and contract documents during the original term thereof, and any extensions thereof which may be granted by the Owner, with or without notice to the Surety, and if he shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the Owner from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED FURTHER, that if any legal action be filed upon this bond, venue shall lie in Hidalgo County, State of Texas, and that the said surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the

work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alternation or addition to the terms of the contract or to the work or to the specifications.

IN WITNESS WHEREOF, this instrument is executed in six counterparts, each one of which shall be deemed an original, this the _____ day of _____ . A.D.

ATTEST:

(Principal) Secretary

(Seal)

Witness as to Principal

(Address)

Principal _____
By _____

(Address) _____

Telephone Number: _____

ATTEST:

(Surety) Secretary

(Seal)

Witness as to Surety

(Address)

By _____

(Address) _____

Telephone Number: _____

NOTE: If Contractor is a partnership, all partners should execute bond.

PERFORMANCE-PAYMENT BOND FORM

(Address)
Telephone Number: _____

(Individual Principal)

(Business Address)
Telephone Number: _____

(Corporate Principal)

(Business Address) (Affix Corporate SEAL)
Telephone Number: _____
BY _____

ATTEST:

(Business Address)(Affix Corporate SEAL)

BY _____
Telephone Number: _____

CERTIFICATES AS TO CORPORATE PRINCIPAL

I, _____, certify that I am the _____
Secretary of the corporation named as Principal in the within bond; that
_____, who signed the said bond on behalf of the
Principal was then _____ of said corporation; and I
know his signature, and his signature thereto is genuine; and that said
bond was duly signed, sealed, and attested for and in behalf of said
corporation by authority of its governing body.

(TITLE)
DATE _____

(AFFIX CORPORATE SEAL)

Telephone Number: _____

The rate of premium on this bond is _____ per thousand. Total
amount of premium charge \$ _____.
(The above must be filled in by corporate surety.) (Power-of-Attorney of
person signing for surety company must be attached.)

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EXHIBIT “C”

Insurance Requirements

The Bidder awarded the contract shall furnish proof of insurance, which will also include any subcontractor that is subcontracted by the bidder in at least the following limits, to be in place prior to providing any services under this Contract and to continue at all times in force in effect during the term of this Contract:

1. A Five Hundred Thousand Dollar (\$500,000.00) Comprehensive General Liability insurance policy providing additional coverage to all underlying liabilities of County.
2. Automobile liability insurance policy with limits of at least Three Hundred Thousand Dollars (\$300,000.00) per person and Five Hundred Thousand Dollars (\$500,000.00) per occurrence. Coverage should include injury to or death of persons and property damage claims with limits up to Five Hundred Thousand (\$500,000.00) arising out of the services provided to County hereunder.
3. Uninsured/Underinsured motorist coverage in an amount equal to the bodily injury limits set forth immediately above;
4. Workers compensation insurance in amounts established by Texas law, unless the Bidder is specifically exempted from the Texas Workers Compensation Act, Texas Labor Code Chapter 401, et. seq.

Certificates of insurance naming County as an additional insured shall be submitted to County for approval prior to any services being performed by Contractor. Each policy of insurance required hereunder shall extend for a period equivalent to, or longer than the term of the Contract, and any insurer hereunder shall be required to give at least thirty (30) days written notice to the County prior to the cancellation of any such coverage on the termination date, or otherwise. This Contract shall be automatically suspended upon the cancellation, or other termination, of any required policy of insurance hereunder, and such suspension shall continue until evidence adequate replacement coverage is provided to County. If replacement coverage is not provided within thirty (30) days following suspension of the Contract, this Contract shall automatically terminate.

Insurance Requirement Acknowledgment

I, _____, authorized representative for _____,
Company/Vendor

hereby acknowledge receipt of the County's required insurance limits. Said requirements:

- ☐ will be acquired within 10 working days after notification from Purchasing Department of bid awarded by the Hidalgo County Commissioners= Court;
- ☐ will acquire additional amounts required to meet the County's requirements within 10 working days after notification from Purchasing Department of bid award by the Hidalgo County Commissioners= Court; currently carry the following:

Automobile Liability: \$ _____ General Liability: \$ _____

- ☐ have already been met, see attached copy of insurance certificate.

Authorized Representative

Date

Notice to Bidder:

A certificate of insurance for the required insurance limits shall be provided to the Purchasing Department's Contract Managers in order to qualify for award of bid and to execute a contract between your Company and the County

Failure to provide Certificates of Insurance to the Purchasing Department's Contract Managers will cause the bid award to be rescinded and re-awarded to next lowest bidder. Certificates of Insurance will be monitored and verified on a **quarterly basis** to ensure coverage policy is in place. It is the Company=s obligation to maintain the appropriate insurance coverage throughout the term of the contract.

THIS FORM MUST ACCOMPANY BID PACKET

PROJECT REQUIREMENTS ACKNOWLEDGMENT

This is to certify that I, _____, possess all of the APPLICABLE:

1. Licenses: _____.
2. Bonds: _____.
3. Certificates: _____.
4. Permits: _____.
5. Other: _____.

necessary to carry out the required project. Furthermore, I am providing copies of the required documentation so that, if my company is awarded this bid, I may be eligible to enter into a contract with Hidalgo County and proceed to complete the project in a timely manner.

* Any licenses, bonds, certificates, permits, etc. which are required must be presented as part of the bid packet in order to expedite the bid evaluation process. Failure to provide said documentation will result in the disqualification of your bid.

Authorized Signature

Date

Company

Address

City, State, Zip

ACORD		CERTIFICATE OF INSURANCE		DATE (MM/DD/YY)	
PRODUCER		THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.			
		INSURERS AFFORDING COVERAGE			
INSURED		INSURER A:			
		INSURER B:			
		INSURER C:			
		INSURER D:			
		INSURER E:			

COVERAGES

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 THEIR TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
A	GENERAL LIABILITY				EACH OCCURRENCE	\$
	☐ COMMERCIAL GENERAL LIABILITY				FIRE DAMAGE (Any one fire)	\$
	☐ CLAIMS MADE OCCUR				MEDICAL (Any one person)	\$
	☐ OWNER'S & CONT. PROT				PERSONAL & ADV INJURY	\$
	☐ OWNER'S PROTECTIVE LIABILITY				GENERAL AGGREGATE	\$
	GEN'L AGGREGATE LIMIT APPLIES PER:				PRODUCTS - COMP/OP	\$
	☐ POLICY ☐ PROJECT ☐ LOC					
B	AUTOMOBILE LIABILITY				COMBINED SINGLE LIMIT (Ea accident)	\$
	☐ ANY AUTO				BODILY INJURY (Per person)	\$
	☐ ALL OWNED AUTOS				BODILY INJURY (Per accident)	\$
	☐ SCHEDULED AUTOS				PROPERTY DAMAGE (Per accident)	\$
	☐ HIRED AUTOS					
	GARAGE LIABILITY				AUTO ONLY-EA ACCIDENT	\$
	☐ ANY AUTO				OTHER THAN AUTO ONLY EA ACC AGG	\$
						\$
C	EXCESS LIABILITY				EACH OCCURRENCE	\$
	☐ OCCUR ☐ CLAIMS MADE				AGGREGATE	\$
	☐ DEDUCTIBLE					\$
	☐ RETENTION \$					\$
						\$
D	WORKERS COMPENSATION AND EMPLOYER'S LIABILITY				WC STATUS- ☐ OTHER TORY LIMITS	
					E.L. EACH ACCIDENT	\$
					E.L. DISEASE-EA EMPLOYEE	\$
					E.L. DISEASE-POLICY LIMIT	\$
	OTHER					

DESCRIPTION OF OPERATIONS / LOCATION / VEHICLES / EXCLUSIONS ADDED BY ENDORSEMENT / SPECIAL PROVISIONS

County of Hidalgo shall be named as additional insured on all Commercial General Liability policies.

CERTIFICATE HOLDER	ADDITIONAL INSURED; INSURER LETTER: _____	CANCELLATION
Hidalgo County Attn: Purchasing Department 2812 S Highway Bus. 281 Edinburg, Texas 78539		SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BY CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL <u>30</u> DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES. AUTHORIZED REPRESENTATIVE

Title 29 - LABOR

Subtitle A - Office of the Secretary of Labor

PART 3 - CONTRACTORS AND SUBCONTRACTORS ON PUBLIC BUILDING OR PUBLIC WORK FINANCED IN WHOLE OR IN PART BY LOANS OR GRANTS FROM THE UNITED STATES

- Sec.
- 3.1 Purpose and scope
 - 3.2 Definitions
 - 3.3 Weekly statement with respect to payment of wages
 - 3.4 Submission of weekly statements and the preservation and inspection of weekly payroll records.
 - 3.5 Payroll deductions permissible without application to or approval of the Secretary of Labor.
 - 3.6 Payroll deductions permissible with the approval of the Secretary of Labor.
 - 3.7 Applications for the approval of the Secretary of Labor
 - 3.8 Action by the Secretary of Labor upon applications.
 - 3.9 Prohibited payroll deductions.
 - 3.10 Methods of payment of wages.
 - 3.11 Regulations part of contract.

AUTHORITY: The provisions of this Part 3 issued under R.S. 16 1, sec. 2, 48 Stat. §48; Reorg. Plan No. 14 of 1950, 64 Stat. 1267, 5 U.S.C. Appendix; 5 U.S.C. 301; 40 U.S.C. 276c.

SOURCE: The provisions of this Part 3 appear at 29 F.R. 97, Jan. 4, 1964, unless otherwise noted.

Section 3.1 Purpose and Scope.

This part prescribes "anti-kickback" regulations under section 2 of the Act of June 13, 1934, as amended (40 U.S.C. 276c), popularly known as the Copeland Act. This part applies to any contract which is subject to Federal wage standards and which is for the construction, prosecution, completion, or repair of public buildings, public works or buildings or works financed in whole or in part by loans or grants from the United States. The part is intended to aid in the enforcement of the minimum wage provisions of the Davis-Bacon Act and the various statutes dealing with Federally assisted construction that contain similar minimum wage provisions, including those provisions

- (b) The terms construction," 4; prosecution,"

which are not subject to Reorganization Plan No. 14 (e.g., the College Housing Act of 1950, the Federal Water Pollution Control Act, and the Housing Act of 1959), and in the enforcement of the overtime provisions of the Contract Work Hours Standards Act whenever they are applicable to construction work. The part details the obligation of contractors and subcontractors relative to the weekly submission of statements regarding the wages paid on work covered thereby; sets forth the circumstances and procedures governing the making of payroll deductions from the wages of those employed on such work; and delineates the methods of payment permissible on such work.

Section 3.2 Definitions.

As used in the regulations in this part:

(a) The terms "building" or "work" generally include construction activity as distinguished from manufacturing, furnishing of materials, or servicing and maintenance work. The terms include, without limitation, buildings, structures, and improvements of all @s, such as bridges, dams, plants, highways, parkways, streets, subways, tunnels, sewers, mains, powerlines, pumping stations, railways, airports, terminals, docks, piers, wharves, ways, lighthouses, buoys, jetties, breakwaters, levees, and canals; dredging, shoring, scaffolding, drilling, blasting, excavating, clearing, and landscaping. Unless conducted in connection with and at the site of such a building or work as is described in the foregoing sentence, the manufacture or furnishing of materials, articles, supplies, or equipment (whether or not a Federal or State agency acquires title to such materials,

Copeland A ct Regulations

articles, supplies, or equipment during the course of the manufacture or furnishing, or owns the materials from which they are manufactured or furnished) is not a "building" or "work" within the meaning of the regulations in this part.

@'completion," or repair" mean all types of work done

on a particular building or work at the site thereof, including, without limitation, altering, remodeling, painting and decorating, the transporting of materials and supplies to or from the building or work by the employees of the construction contractor or construction subcontractor, and the manufacturing or furnishing of materials, articles, supplies, or equipment on the site of the building or work, by persons employed at the site by the contractor or subcontractor.

(c) The terms "public building" or "public work" include building or work for whose construction, prosecution, completion, or repair, as defined above, a Federal agency is a contracting party, regardless of whether title thereof is in a Federal agency.

(d) The term "building or work financed in whole or in part by loans or grants from the United States" includes building or work for whose construction, prosecution, completion, or repair, as defined above, payment or part payment is made directly or indirectly from funds provided by loans or grants by a Federal agency. The term includes building or work for which the Federal assistance granted is in the form of loan guarantees or insurance.

(e) Every person paid by a contractor or subcontractor in any manner for his labor in the construction, prosecution, completion, or repair of a public building or public work or building or work financed in whole or in part by loans or grants from the United States is "employed" and receiving 44 wages," regardless of any contractual relationship alleged to exist between him and the real employer.

(f) The term "any affiliated person" includes a spouse, child, parent, or other close relative of the contractor or subcontractor; a partner or officer of the contractor or subcontractor; a corporation closely connected with the contractor or subcontractor as parent, subsidiary or otherwise, and an officer or agent of such corporation.

(g) The term "Federal agency" means the United States, the District of Columbia, and all executive departments, independent establishments, administrative agencies, and instrumentalities of the United States and of the District of Columbia, including corporations, all or substantially all of the stock of which is beneficially owned by the United States, by the District of Columbia, or any of the foregoing departments, establishments, agencies, and instrumentalities.

(a) Each weekly statement required under §3.3 shall be delivered by the contractor or subcontractor, within seven days after the regular payment date of the payroll period, to a representative of a Federal or State agency in charge at the site of the building or work, or if there is no representative of a Federal or State agency at the site of the building or work, the statement shall

(29 FR 97, Jan. 4, 1964, as amended at 33 FR 32575, Nov. 27, 1973)

Section 3.3 Weekly statement with respect to payment of wages.

(a) As used in this section, the term "employee" shall not apply to persons in classifications higher than that of laborer or mechanic and those who are the immediate supervisors of such employees.

(b) Each contractor or subcontractor engaged in the construction, prosecution, completion, or repair of any public building or public work, or building or work financed in whole or in part by loans or grants from the United States, shall furnish each week a statement with respect to the wages paid each of its employees engaged on work covered by 29 CFR Parts 3 and 5 during the preceding weekly payroll period. This statement shall be executed by the contractor or subcontractor or by an authorized officer of employee of the contractor or subcontractor who supervises the payment of wages, and shall be on form @ 348, "Statement of Compliance," or on an identical form on the back of @ 347, "Payroll (For Contractors Optional Use)" or on any form with identical wording. Sample copies of @ 347 and @ 348 may be obtained from the Government contracting or sponsoring agency, and copies of these forms may be purchased at the Government Printing Office.

(c) The requirements of this section shall not apply to any contract of \$2,000 or less.

(d) Upon a written finding by the head of a Federal agency, the Secretary of Labor may provide reasonable limitations, variations, tolerances, and exemptions from the requirements of this section subject to such conditions as the Secretary of Labor may specify.

(29 F.R. 95, Jan. 4, 19(A, as amended at 33 F.R. 10186, July 17, 1968)

Copeland Act Regulations

Section 3.4 Submission of weekly statements and the preservation and inspection of weekly payroll records.

be mailed by the contractor or subcontractor, within such time, to a Federal or State agency contracting for or financing the building or work. After such examination and check as may be made, such statement, or a copy thereof, shall be kept available, or shall be transmitted together with a report of any violation, in accordance with applicable procedures

prescribed by the United States Department of Labor.

(b) Each contractor or subcontractor shall preserve his weekly payroll records for a period of three years from date of completion of the contract. The payroll records shall set out accurately and completely the name and address of each laborer and mechanic, his correct classification, rate of pay, daily and weekly number of hours worked, deductions made, and actual wages paid. Such payroll records shall be made available at all times for inspection by the contracting officer or his authorized representative, and by authorized representatives of the Department of Labor.

Section 3.5 Payroll deductions permissible without application to or approval of the Secretary of Labor.

Deductions made under the circumstances or in the situations described in the paragraphs of this section may be made without application to and approval of the Secretary of Labor:

(a) Any deduction made in compliance with the requirements of Federal, State, or local law, such as Federal or State withholding income taxes and Federal social security taxes.

(b) Any deduction of sums previously paid to the employee as a bona fide prepayment of wages when such prepayment is made without discount or interest. A "bona fide prepayment of wages" is considered to have been made only when cash or its equivalent has been advanced to the person employed in such manner as to give him complete freedom of disposition of the advanced funds.

(c) Any deduction of amounts required by court process to be paid to another, unless, the deduction is in favor of the contractor, subcontractor or any affiliated person, or when collusion or collaboration exists.

(d) Any deduction constituting a contribution on behalf of the person employed to funds established by the employer or representatives of employees, or both, for the purpose of providing either from principal or income, or both, medical or hospital care, pensions, or annuities on retirement, death benefits, compensation for injuries, illness, accidents, sickness, or disability, or for insurance to provide any of the foregoing, or unemployment benefits, vacation pay, savings accounts, or similar payments for the benefit of

(k) Any deduction for the cost of safety equipment of nominal value purchased by the employee as his own property for his personal protection in his work, such as safety shoes, safety glasses, safety gloves, and hard hats, if such equipment is not required by law to be furnished by the employer, if such deduction is not

employees, their families and dependents: Provided, however, That the following standards are met: (1) The deduction is not otherwise prohibited by law; (2) it is either: (i) Voluntarily consented to by the employee in writing and in advance of the period in which the work is to be done and such consent is not a condition either for the obtaining of or for the continuation of employment, or (ii) provided for in a bona fide collective bargaining agreement between the contractor or subcontractor and representatives of its employees; (3) no profit or other benefit is otherwise obtained, directly or indirectly, by the contractor or subcontractor or any affiliated person in the form of commission, dividend, or otherwise; and (4) the deductions shall serve the convenience and interest of the employee. (e) Any deduction contributing toward the purchase of United States Defense Stamps and Bonds when voluntarily authorized by the employee.

(f) Any deduction requested by the employee to enable him to repay loans to or to purchase shares in credit unions organized and operated in accordance with Federal and State credit union statutes.

(g) Any deduction voluntarily authorized by the employee for the making of contributions to

Copeland Act Regulations

governmental or quasi-governmental agencies, such as the American Red Cross.

(h) Any deduction voluntarily authorized by the employee for the making of contributions to Community Chests, United Givers Funds, and similar charitable organizations.

(i) Any deductions to pay regular union initiation fees and membership dues, not including fines or special assessments: Provided, however, That a collective bargaining agreement between the contractor or subcontractor and representatives of its employees provides for such deductions and the deductions are not otherwise prohibited by law.

(j) Any deduction not more than for the "reasonable cost" of board, lodging, or other facilities meeting the requirements of section 3(m) of the Fair Labor Standards Act of 1938, as amended, and Part 531 of this title. When such a deduction is made the additional records required under §516.27(a) of this title shall be kept.

violative of the Fair Labor Standards Act or prohibited by other law, if the cost on which the deduction is based does not exceed the actual cost to the employer where the equipment is purchased from him and does not include any direct or indirect monetary return to the employer where the equipment is purchased from a

third person, and if the deduction is either (1) voluntarily consented to be the employee in writing and in advance of the period in which the work is to be done and such consent is not a condition either for the obtaining of employment or its continuance; or (2) provided for in a bona fide collective bargaining agreement between the contractor or subcontractor and representatives of its employees.
(36 F.R. 9770, May 28, 1971.)

Section 3.6 Payroll deductions permissible with the approval of the Secretary of Labor.

Any contractor or subcontractor may apply to the Secretary of Labor for permission to make any

deduction not permitted under §3.5. The Secretary may grant permission whenever he finds that:

- (a) The contractor, subcontractor, or any affiliated person does not make a profit or benefit

directly or indirectly from the deduction either in the form of a commission, dividend, or otherwise;

- (b) The deduction is not otherwise prohibited by law;

- (c) The deduction is either (1) voluntarily consented to by the employee in writing and in advance of the period in which the work is to be done and such consent is not a condition either for the obtaining of employment or its continuance, or (2) provided for in a bona fide collective bargaining agreement between the contractor or subcontractor and representatives of its employees; and

- (d) The deduction serves the convenience and interest of the employee.

Section 3.7 Applications for the approval of the Secretary of Labor.

Any application for the making of payroll deductions under §3.6 shall comply with the requirements prescribed in the following paragraphs of this section:

- (a) The application shall be in writing and shall be addressed to the Secretary of Labor.

- (b) The application need not identify the contract or contracts under which the work in question is to be performed. Permission will be given for deductions on all current and future contracts of the applicant for a period of 1 year. A renewal of permission to make such payroll deduction will be granted upon the submission of an application which makes reference to the original application, recites the date of the Secretary of Labor's approval of such deductions, states affirmatively that there is continued compliance with the standards set

forth in the provisions of §3.6, and specifies any conditions which have changed in regard to the payroll deductions.

(36 F.R. 9770, May 29, 1971.)

- (c) The application shall state affirmatively that there is compliance with the standards set forth in the provisions of §3.6. The affirmation shall be accompanied by a full statement of the facts indicating such compliance.

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(d) The application shall include a description of the proposed deduction, the purpose to be served there by, and the classes of laborers or mechanics from whose wages the proposed deduction would be made.

(e) The application shall state the name and business of any third person to whom any funds obtained from the proposed deductions are to be transmitted and the affiliation of such person, if any, with the applicant. -

Section 3.8 Action by the Secretary of Labor upon applications.

The Secretary of Labor shall decide whether or not the requested deduction is permissible under provisions of §3.6; and shall notify the applicant in writing of his decision.

Section 3.9 Prohibited payroll deductions.

Deductions not elsewhere provided for by this part and which **are** not found to be permissible under §3.6 are prohibited.

Section 3.10 Methods of payment of wages.

The payment of wages shall be by cash, negotiable instruments payable on demand, or the additional forms of compensation for which deductions are permissible under this part. No other methods of payment shall be recognized on work subject to the Copeland Act.

Section 3.11 Regulations part of contract.

All contracts made with respect to the construction, prosecution, completion, or repair of any public building or public work or building or work financed in whole or in part by loans or grants from the United States covered by the regulations in this part shall expressly bind the contractor or subcontractor to comply with such of the regulations in this part as may be applicable. In this regard, see §5.5(a) of this subtitle.

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

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GENERAL CONDITIONS

ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Contract Documents and printed with initial or all capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof.

1. *Addenda*--Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the Contract Documents.

2. *Agreement*--The written instrument which is evidence of the agreement between OWNER and CONTRACTOR covering the Work.

3. *Application for Payment*--The form acceptable to ENGINEER which is to be used by CONTRACTOR during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Asbestos*--Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

5. *Bid*--The offer or proposal of a bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

6. *Bidding Documents*--The Bidding Requirements and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

7. *Bidding Requirements*--The Advertisement or Invitation to Bid, Instructions to Bidders, Bid security form, if any, and the Bid form with any supplements.

8. *Bonds*--Performance and payment bonds and other instruments of security.

9. *Change Order*--A document recommended by ENGINEER which is signed by CONTRACTOR and OWNER and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the

Contract Times, issued on or after the Effective Date of the Agreement.

10. *Claim*--A demand or assertion by OWNER or CONTRACTOR seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

11. *Contract*--The entire and integrated written agreement between the OWNER and CONTRACTOR concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*--The Contract Documents establish the rights and obligations of the parties and include the Agreement, Addenda (which pertain to the Contract Documents), CONTRACTOR's Bid (including documentation accompanying the Bid and any post Bid documentation submitted prior to the Notice of Award) when attached as an exhibit to the Agreement, the Notice to Proceed, the Bonds, these General Conditions, the Supplementary Conditions, the Specifications and the Drawings as the same are more specifically identified in the Agreement, together with all Written Amendments, Change Orders, Work Change Directives, Field Orders, and ENGINEER's written interpretations and clarifications issued on or after the Effective Date of the Agreement. Approved Shop Drawings and the reports and drawings of subsurface and physical conditions are not Contract Documents. Only printed or hard copies of the items listed in this paragraph are Contract Documents. Files in electronic media format of text, data, graphics, and the like that may be furnished by OWNER to CONTRACTOR are not Contract Documents.

13. *Contract Price*--The moneys payable by OWNER to CONTRACTOR for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of paragraph 11.03 in the case of Unit Price Work).

14. *Contract Times*--The number of days or the dates stated in the Agreement to: (i) achieve Substantial Completion; and (ii) complete the Work so that it is ready for final payment as evidenced by ENGINEER's written recommendation of final payment.

15. *CONTRACTOR*--The individual or entity with whom OWNER has entered into the Agreement.

16. *Cost of the Work*--See paragraph 11.01.A for definition.

17. *Drawings*--That part of the Contract Documents prepared or approved by ENGINEER which graphically shows the scope, extent, and character of the Work to be performed by CONTRACTOR. Shop Drawings and other CONTRACTOR submittals are not Drawings as so defined.

18. *Effective Date of the Agreement*--The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

19. *ENGINEER*--The individual or entity named as such in the Agreement.

20. *ENGINEER's Consultant*--An individual or entity having a contract with ENGINEER to furnish services as ENGINEER's independent professional associate or consultant with respect to the Project and who is identified as such in the Supplementary Conditions.

21. *Field Order*--A written order issued by ENGINEER which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

22. *General Requirements*--Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.

23. *Hazardous Environmental Condition*--The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the Work.

24. *Hazardous Waste*--The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

25. *Laws and Regulations; Laws or Regulations*--Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

26. *Liens*--Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

27. *Milestone*--A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

28. *Notice of Award*--The written notice by OWNER to the apparent successful bidder stating that upon timely compliance by the apparent successful bidder with the conditions precedent listed therein, OWNER will sign and deliver the Agreement.

29. *Notice to Proceed*--A written notice given by OWNER to CONTRACTOR fixing the date on which the Contract Times will commence to run and on which CONTRACTOR shall start to perform the Work under the Contract Documents.

30. *OWNER*--The individual, entity, public body, or authority with whom CONTRACTOR has entered into the Agreement and for whom the Work is to be performed.

31. *Partial Utilization*--Use by OWNER of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

32. *PCBs*--Polychlorinated biphenyls.

33. *Petroleum*--Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.

34. *Project*--The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part as may be indicated elsewhere in the Contract Documents.

35. *Project Manual*--The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

36. *Radioactive Material*--Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

37. *Resident Project Representative*--The authorized representative of ENGINEER who may be assigned to the Site or any part thereof.

38. *Samples*--Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

39. *Shop Drawings*--All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for CONTRACTOR and submitted by CONTRACTOR to illustrate some portion of the Work.

40. *Site*--Lands or areas indicated in the Contract Documents as being furnished by OWNER upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by OWNER which are designated for the use of CONTRACTOR.

41. *Specifications*--That part of the Contract Documents consisting of written technical descriptions of materials, equipment, systems, standards, and workmanship as applied to the Work and certain administrative details applicable thereto.

42. *Subcontractor*--An individual or entity having a direct contract with CONTRACTOR or with any other Subcontractor for the performance of a part of the Work at the Site.

43. *Substantial Completion*--The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of ENGINEER, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

44. *Supplementary Conditions*--That part of the Contract Documents which amends or supplements these General Conditions.

45. *Supplier*--A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with CONTRACTOR or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by CONTRACTOR or any Subcontractor.

46. *Underground Facilities*--All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

47. *Unit Price Work*--Work to be paid for on the basis of unit prices.

48. *Work*--The entire completed construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

49. *Work Change Directive*--A written statement to CONTRACTOR issued on or after the Effective Date of the Agreement and signed by OWNER and recommended by ENGINEER ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

50. *Written Amendment*--A written statement modifying the Contract Documents, signed by OWNER and CONTRACTOR on or after the Effective Date of the Agreement and normally dealing with the nonengineering or nontechnical rather than strictly construction-related aspects of the Contract Documents.

1.02 Terminology

A. Intent of Certain Terms or Adjectives

1. Whenever in the Contract Documents the terms "as allowed," "as approved," or terms of like effect or import are used, or the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of ENGINEER as to the Work, it is intended that such action or determination will be solely to evaluate, in general, the completed Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to ENGINEER any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraph 9.10 or any other provision of the Contract Documents.

B. Day

1. The word "day" shall constitute a calendar day of 24 hours measured from midnight to the next midnight.

C. Defective

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it does not conform to the Contract Documents or does not meet the requirements of any inspection, reference standard, test, or approval referred to in the Contract Documents, or has been damaged prior to ENGINEER's recommendation of final payment (unless responsibility for the protection thereof has been assumed by OWNER at Substantial Completion in accordance with paragraph 14.04 or 14.05).

D. Furnish, Install, Perform, Provide

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other

specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of CONTRACTOR, "provide" is implied.

E. Unless stated otherwise in the Contract Documents, words or phrases which have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 - PRELIMINARY MATTERS

2.01 Delivery of Bonds

A. When CONTRACTOR delivers the executed Agreements to OWNER, CONTRACTOR shall also deliver to OWNER such Bonds as CONTRACTOR may be required to furnish.

2.02 Copies of Documents

A. OWNER shall furnish to CONTRACTOR up to ten copies of the Contract Documents. Additional copies will be furnished upon request at the cost of reproduction.

2.03 Commencement of Contract Times; Notice to Proceed

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times com-

mence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

2.04 *Starting the Work*

A. CONTRACTOR shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 *Before Starting Construction*

A. *CONTRACTOR's Review of Contract Documents:* Before undertaking each part of the Work, CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. CONTRACTOR shall promptly report in writing to ENGINEER any conflict, error, ambiguity, or discrepancy which CONTRACTOR may discover and shall obtain a written interpretation or clarification from ENGINEER before proceeding with any Work affected thereby; however, CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless CONTRACTOR knew or reasonably should have known thereof.

B. *Preliminary Schedules:* Within ten days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), CONTRACTOR shall submit to ENGINEER for its timely review:

1. a preliminary progress schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;
2. a preliminary schedule of Shop Drawing and Sample submittals which will list each required submittal and the times for submitting, reviewing, and processing such submittal; and
3. a preliminary schedule of values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into

component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

C. *Evidence of Insurance:* Before any Work at the Site is started, CONTRACTOR and OWNER shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which CONTRACTOR and OWNER respectively are required to purchase and maintain in accordance with Article 5.

2.06 *Preconstruction Conference*

A. Within 20 days after the Contract Times start to run, but before any Work at the Site is started, a conference attended by CONTRACTOR, ENGINEER, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in paragraph 2.05.B, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

2.07 *Initial Acceptance of Schedules*

A. Unless otherwise provided in the Contract Documents, at least ten days before submission of the first Application for Payment a conference attended by CONTRACTOR, ENGINEER, and others as appropriate will be held to review for acceptability to ENGINEER as provided below the schedules submitted in accordance with paragraph 2.05.B. CONTRACTOR shall have an additional ten days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to CONTRACTOR until acceptable schedules are submitted to ENGINEER.

1. The progress schedule will be acceptable to ENGINEER if it provides an orderly progression of the Work to completion within any specified Milestones and the Contract Times. Such acceptance will not impose on ENGINEER responsibility for the progress schedule, for sequencing, scheduling, or progress of the Work nor interfere with or relieve CONTRACTOR from CONTRACTOR's full responsibility therefor.

2. CONTRACTOR's schedule of Shop Drawing and Sample submittals will be acceptable to ENGINEER if it provides a workable arrangement for reviewing and processing the required submittals.

3. CONTRACTOR's schedule of values will be acceptable to ENGINEER as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided whether or not specifically called for at no additional cost to OWNER.

C. Clarifications and interpretations of the Contract Documents shall be issued by ENGINEER as provided in Article 9.

3.02 *Reference Standards*

A. *Standards, Specifications, Codes, Laws, and Regulations*

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard, specification, manual or code, or any instruction of a Supplier shall be effective to change the duties or responsibilities of OWNER, CONTRACTOR, or ENGINEER, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents, nor shall any such provision or instruction be effective to assign to OWNER, ENGINEER, or any of ENGINEER's Consultants, agents, or employees any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

1. If, during the performance of the Work, CONTRACTOR discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier, CONTRACTOR shall report it to ENGINEER in writing at once. CONTRACTOR shall not proceed with the Work affected thereby (except in an emergency as required by paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in paragraph 3.04; provided, however, that CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any such conflict, error, ambiguity, or discrepancy unless CONTRACTOR knew or reasonably should have known thereof.

B. *Resolving Discrepancies*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

a. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof in one or

B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways: (i) a Field Order; (ii) ENGINEER's approval of a Shop Drawing or Sample; or (iii) ENGINEER's written interpretation or clarification.

3.05 *Reuse of Documents*

A. CONTRACTOR and any Subcontractor or Supplier or other individual or entity performing or furnishing any of the Work under a direct or indirect contract with OWNER: (i) shall not have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of ENGINEER or ENGINEER's Consultant, including electronic media editions; and (ii) shall not reuse any of such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of OWNER and ENGINEER and specific written verification or adaption by ENGINEER. This prohibition will survive final payment, completion, and acceptance of the Work, or termination or completion of the Contract. Nothing herein shall preclude CONTRACTOR from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 - AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS

4.01 *Availability of Lands*

A. OWNER shall furnish the Site. OWNER shall notify CONTRACTOR of any encumbrances or

restrictions not of general application but specifically related to use of the Site with which CONTRACTOR must comply in performing the Work. OWNER will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If CONTRACTOR and OWNER are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in OWNER's furnishing the Site, CONTRACTOR may make a Claim therefor as provided in paragraph 10.05.

B. Upon reasonable written request, OWNER shall furnish CONTRACTOR with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and OWNER's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

A. *Reports and Drawings:* The Supplementary Conditions identify:

1. those reports of explorations and tests of subsurface conditions at or contiguous to the Site that ENGINEER has used in preparing the Contract Documents; and

2. those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that ENGINEER has used in preparing the Contract Documents.

B. *Limited Reliance by CONTRACTOR on Technical Data Authorized:* CONTRACTOR may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," CONTRACTOR may not rely upon or make any Claim against OWNER, ENGINEER, or any of ENGINEER's Consultants with respect to:

1. the completeness of such reports and drawings for CONTRACTOR's purposes, includ-

ing, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by CONTRACTOR, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If CONTRACTOR believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which CONTRACTOR is entitled to rely as provided in paragraph 4.02 is materially inaccurate; or

2. is of such a nature as to require a change in the Contract Documents; or

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents; then CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by paragraph 6.16.A), notify OWNER and ENGINEER in writing about such condition. CONTRACTOR shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *ENGINEER's Review:* After receipt of written notice as required by paragraph 4.03.A, ENGINEER will promptly review the pertinent condition, determine the

necessity of OWNER's obtaining additional exploration or tests with respect thereto, and advise OWNER in writing (with a copy to CONTRACTOR) of ENGINEER's findings and conclusions.

C. *Possible Price and Times Adjustments*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in CONTRACTOR's cost of, or time required for, performance of the Work; subject, however, to the following:

a. such condition must meet any one or more of the categories described in paragraph 4.03.A; and

b. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of paragraphs 9.08 and 11.03.

2. CONTRACTOR shall not be entitled to any adjustment in the Contract Price or Contract Times if:

a. CONTRACTOR knew of the existence of such conditions at the time CONTRACTOR made a final commitment to OWNER in respect of Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or

b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for CONTRACTOR prior to CONTRACTOR's making such final commitment; or

c. CONTRACTOR failed to give the written notice within the time and as required by paragraph 4.03.A.

3. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be

made therefor as provided in paragraph 10.05. However, OWNER, ENGINEER, and ENGINEER's Consultants shall not be liable to CONTRACTOR for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by CONTRACTOR on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to OWNER or ENGINEER by the owners of such Underground Facilities, including OWNER, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. OWNER and ENGINEER shall not be responsible for the accuracy or completeness of any such information or data; and
2. the cost of all of the following will be included in the Contract Price, and CONTRACTOR shall have full responsibility for:
 - a. reviewing and checking all such information and data,
 - b. locating all Underground Facilities shown or indicated in the Contract Documents,
 - c. coordination of the Work with the owners of such Underground Facilities, including OWNER, during construction, and
 - d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or

performing any Work in connection therewith (except in an emergency as required by paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to OWNER and ENGINEER. ENGINEER will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, CONTRACTOR shall be responsible for the safety and protection of such Underground Facility.

2. If ENGINEER concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price of Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that CONTRACTOR did not know of and could not reasonably have been expected to be aware of or to have anticipated. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, OWNER or CONTRACTOR may make a Claim therefor as provided in paragraph 10.05.

4.05 *Reference Points*

A. OWNER shall provide engineering surveys to establish reference points for construction which in ENGINEER's judgment are necessary to enable CONTRACTOR to proceed with the Work. CONTRACTOR shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of OWNER. CONTRACTOR shall report to ENGINEER whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 *Hazardous Environmental Condition at Site*

A. *Reports and Drawings:* Reference is made to the Supplementary Conditions for the identification of those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that have been utilized by the ENGINEER in the preparation of the Contract Documents.

B. *Limited Reliance by CONTRACTOR on Technical Data Authorized:* CONTRACTOR may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," CONTRACTOR may not rely upon or make any Claim against OWNER, ENGINEER or any of ENGINEER's Consultants with respect to:

1. the completeness of such reports and drawings for CONTRACTOR's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by CONTRACTOR and safety precautions and programs incident thereto; or
2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
3. any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

C. CONTRACTOR shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. CONTRACTOR shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by CONTRACTOR, Subcontractors, Suppliers, or anyone else for whom CONTRACTOR is responsible.

D. If CONTRACTOR encounters a Hazardous Environmental Condition or if CONTRACTOR or anyone for whom CONTRACTOR is responsible creates a Hazardous Environmental Condition, CONTRACTOR shall immediately: (i) secure or otherwise isolate such condition;

(ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by paragraph 6.16); and (iii) notify OWNER and ENGINEER (and promptly thereafter confirm such notice in writing). OWNER shall promptly consult with ENGINEER concerning the necessity for OWNER to retain a qualified expert to evaluate such condition or take corrective action, if any.

E. CONTRACTOR shall not be required to resume Work in connection with such condition or in any affected area until after OWNER has obtained any required permits related thereto and delivered to CONTRACTOR written notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If OWNER and CONTRACTOR cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by CONTRACTOR, either party may make a Claim therefor as provided in paragraph 10.05.

F. If after receipt of such written notice CONTRACTOR does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then OWNER may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If OWNER and CONTRACTOR cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in paragraph 10.05.

OWNER may have such deleted portion of the Work performed by OWNER's own forces or others in accordance with Article 7.

G. To the fullest extent permitted by Laws and Regulations, OWNER shall indemnify and hold harmless CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and the officers, directors, partners, employees, agents, other consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or

Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by CONTRACTOR or by anyone for whom CONTRACTOR is responsible. Nothing in this paragraph 4.06.E shall obligate OWNER to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

H. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees, agents, other consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by CONTRACTOR or by anyone for whom CONTRACTOR is responsible. Nothing in this paragraph 4.06.F shall obligate CONTRACTOR to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

I. The provisions of paragraphs 4.02, 4.03, and 4.04 are not intended to apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 - BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

A. CONTRACTOR shall furnish performance and payment Bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all CONTRACTOR's obligations under the Contract Documents. These Bonds shall remain in effect at least until one year after the date when final payment becomes due, except as provided otherwise by Laws or Regulations or by the Contract Documents. CONTRACTOR shall also furnish such other Bonds as are required by the Contract Documents.

B. All Bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Compa-

nies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All Bonds signed by an agent must be accompanied by a certified copy of such agent's authority to act.

C. If the surety on any Bond furnished by CONTRACTOR is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of paragraph 5.01.B, CONTRACTOR shall within 20 days thereafter substitute another Bond and surety, both of which shall comply with the requirements of paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

A. All Bonds and insurance required by the Contract Documents to be purchased and maintained by OWNER or CONTRACTOR shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue Bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

A. CONTRACTOR shall deliver to OWNER, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by OWNER or any other additional insured) which CONTRACTOR is required to purchase and maintain. OWNER shall deliver to CONTRACTOR, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by CONTRACTOR or any other additional insured) which OWNER is required to purchase and maintain.

5.04 *CONTRACTOR's Liability Insurance*

A. CONTRACTOR shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from CONTRACTOR's performance of the Work and CONTRACTOR's other obligations under the Contract Documents, whether it is to be performed by CONTRACTOR, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to

perform any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;

2. claims for damages because of bodily injury, occupational sickness or disease, or death of CONTRACTOR's employees;

3. claims for damages because of bodily injury, sickness or disease, or death of any person other than CONTRACTOR's employees;

4. claims for damages insured by reasonably available personal injury liability coverage which are sustained: (i) by any person as a result of an offense directly or indirectly related to the employment of such person by CONTRACTOR, or (ii) by any other person for any other reason;

5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and

6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

B. The policies of insurance so required by this paragraph 5.04 to be purchased and maintained shall:

1. with respect to insurance required by paragraphs 5.04.A.3 through 5.04.A.6 inclusive, include as additional insureds (subject to any customary exclusion in respect of professional liability) OWNER, ENGINEER, ENGINEER's Consultants, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;

3. include completed operations insurance;

4. include contractual liability insurance covering CONTRACTOR's indemnity obligations under paragraphs 6.07, 6.11, and 6.20;

5. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least thirty days prior written notice has been given to OWNER and CONTRACTOR and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the CONTRACTOR pursuant to paragraph 5.03 will so provide);

6. remain in effect at least until final payment and at all times thereafter when CONTRACTOR may be correcting, removing, or replacing defective Work in accordance with paragraph 13.07; and

7. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment (and CONTRACTOR shall furnish OWNER and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to OWNER and any such additional insured of continuation of such insurance at final payment and one year thereafter).

5.05 *OWNER's Liability Insurance*

A. In addition to the insurance required to be provided by CONTRACTOR under paragraph 5.04, OWNER, at OWNER's option, may purchase and maintain at OWNER's expense OWNER's own liability insurance as will protect OWNER against claims which may arise from operations under the Contract Documents.

5.06 *Property Insurance*

A. Unless otherwise provided in the Supplementary Conditions, OWNER shall purchase and maintain property

insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an additional insured;

2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, false work, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, and such other perils or causes of loss as may be specifically required by the Supplementary Conditions;

3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by OWNER prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by ENGINEER;

5. allow for partial utilization of the Work by OWNER;

6. include testing and startup; and

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by OWNER, CONTRACTOR, and ENGINEER with

30 days written notice to each other additional insured to whom a certificate of insurance has been issued.

B. OWNER shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and any other individuals or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to OWNER and CONTRACTOR and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with paragraph 5.07.

D. OWNER shall not be responsible for purchasing and maintaining any property insurance specified in this paragraph 5.06 to protect the interests of CONTRACTOR, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by CONTRACTOR, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

E. If CONTRACTOR requests in writing that other special insurance be included in the property insurance policies provided under paragraph 5.06, OWNER shall, if possible, include such insurance, and the cost thereof will be charged to CONTRACTOR by appropriate Change Order or Written Amendment. Prior to commencement of the Work at the Site, OWNER shall in writing advise CONTRACTOR whether or not such other insurance has been procured by OWNER.

5.07 *Waiver of Rights*

A. OWNER and CONTRACTOR intend that all policies purchased in accordance with paragraph 5.06 will protect OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and all other

individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. OWNER and CONTRACTOR waive all rights against each other and their respective officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors, ENGINEER, ENGINEER's Consultants, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them) under such policies for losses and damages so caused.

None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by OWNER as trustee or otherwise payable under any policy so issued.

B. OWNER waives all rights against CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to OWNER's property or the Work caused by, arising out of, or resulting from fire or other peril whether or not insured by OWNER; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by OWNER during partial utilization pursuant to

paragraph 14.05, after Substantial Completion pursuant to paragraph 14.04, or after final payment pursuant to paragraph 14.07.

C. Any insurance policy maintained by OWNER covering any loss, damage or consequential loss referred to in paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against CONTRACTOR, Subcontractors, ENGINEER, or ENGINEER's Consultants and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

A. Any insured loss under the policies of insurance required by paragraph 5.06 will be adjusted with OWNER and made payable to OWNER as fiduciary for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause and of paragraph 5.08.B. OWNER shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order or Written Amendment.

B. OWNER as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to OWNER's exercise of this power. If such objection be made, OWNER as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, OWNER as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, OWNER as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

A. If either OWNER or CONTRACTOR has any objection to the coverage afforded by or other provisions of the Bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the

certificates (or other evidence requested) required by paragraph 2.05.C. OWNER and CONTRACTOR shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the Bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent Bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

A. If OWNER finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

A. CONTRACTOR shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with

the Contract Documents. CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction, but CONTRACTOR shall not be responsible for the negligence of OWNER or ENGINEER in the design or specification of a specific means, method, technique, sequence, or procedure of

construction which is shown or indicated in and expressly required by the Contract Documents. CONTRACTOR shall be responsible to see that the completed Work complies accurately with the Contract Documents.

B. At all times during the progress of the Work, CONTRACTOR shall assign a competent resident superintendent thereto who shall not be replaced without written notice to OWNER and ENGINEER except under extraordinary circumstances. The superintendent will be CONTRACTOR's representative at the Site and shall have authority to act on behalf of CONTRACTOR. All communications given to or received from the superintendent shall be binding on CONTRACTOR.

6.02 *Labor; Working Hours*

A. CONTRACTOR shall provide competent, suitably qualified personnel to survey, lay out, and construct the

Work as required by the Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, and CONTRACTOR will not permit overtime work or the performance of Work on Saturday, Sunday, or any legal holiday without OWNER's written consent (which will not be unreasonably withheld) given after prior written notice to ENGINEER.

6.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the General Requirements, CONTRACTOR shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All warranties and guarantees specifically called for by the Specifications shall expressly

run to the benefit of OWNER. If required by ENGINEER, CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

A. CONTRACTOR shall adhere to the progress schedule established in accordance with paragraph 2.07 as it may be adjusted from time to time as provided below.

1. CONTRACTOR shall submit to ENGINEER for acceptance (to the extent indicated in paragraph 2.07) proposed adjustments in the progress schedule that will not result in changing the Contract Times (or Milestones). Such adjustments will conform generally to the progress schedule then in effect and additionally will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the progress schedule that will change the Contract Times (or Milestones) shall be submitted in accordance with the requirements of Article 12. Such adjustments may only be made by a Change Order or Written Amendment in accordance with Article 12.

6.05 *Substitutes and "Or-Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to ENGINEER for review under the circumstances described below.

1. *"Or-Equal" Items:* If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be

considered by ENGINEER as an "or-equal" item, in which case review and approval of the proposed item may, in ENGINEER's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment ENGINEER determines that: (i) it is at least equal in quality, durability, appearance, strength, and design characteristics; (ii) it will reliably perform at least equally well the function imposed by the design concept of the completed Project as a functioning whole, and;

b. CONTRACTOR certifies that: (i) there is no increase in cost to the OWNER; and (ii) it will conform substantially, even with deviations, to the detailed requirements of the item named in the Contract Documents.

2. *Substitute Items*

a. If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR does not qualify as an "or-equal" item under paragraph 6.05.A.1, it will be considered a proposed substitute item.

b. CONTRACTOR shall submit sufficient information as provided below to allow ENGINEER to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by ENGINEER from anyone other than CONTRACTOR.

c. The procedure for review by ENGINEER will be as set forth in paragraph 6.05.A.2.d, as supplemented in the General Requirements and as ENGINEER may decide is appropriate under the circumstances.

d. CONTRACTOR shall first make written application to ENGINEER for review of a proposed substitute item of material or equipment that CONTRACTOR seeks to furnish or use. The application shall certify

that the proposed substitute item will perform adequately the functions and achieve the results called for by the general design, be similar in substance to that specified, and be suited to the same use as that specified. The application will state the extent, if any, to which the use of the proposed substitute item will prejudice CONTRACTOR's achievement of Substantial Completion on time, whether or not use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) to adapt the design to the proposed substitute item and whether or not incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty. All variations of the proposed substitute item from that specified will be identified in the application, and available engineering, sales, maintenance, repair, and replacement services will be indicated. The application will also contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change, all of which will be considered by ENGINEER in evaluating the proposed substitute item. ENGINEER may require CONTRACTOR to furnish additional data about the proposed substitute item.

B. *Substitute Construction Methods or Procedures:*

If a specific means, method, technique, sequence, or procedure of construction is shown or indicated in and expressly required by the Contract Documents, CONTRACTOR may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by ENGINEER. CONTRACTOR shall submit sufficient information to allow ENGINEER, in ENGINEER's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The procedure for review by ENGINEER will be similar to that provided in subparagraph 6.05.A.2.

C. *Engineer's Evaluation:* ENGINEER will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to paragraphs 6.05.A and 6.05.B. ENGINEER will be the sole judge of acceptability. No "or-equal" or substitute will be ordered, installed or utilized until ENGINEER's review is complete, which will be evidenced by either a Change Order for a

substitute or an approved Shop Drawing for an "or equal." ENGINEER will advise CONTRACTOR in writing of any negative determination.

D. *Special Guarantee:* OWNER may require CONTRACTOR to furnish at CONTRACTOR's expense a special performance guarantee or other surety with respect to any substitute.

E. *ENGINEER's Cost Reimbursement:* ENGINEER will record time required by ENGINEER and ENGINEER's Consultants in evaluating substitute proposed or submitted by CONTRACTOR pursuant to paragraphs 6.05.A.2 and 6.05.B and in making changes in the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) occasioned thereby. Whether or not ENGINEER approves a substitute item so proposed or submitted by CONTRACTOR, CONTRACTOR shall reimburse OWNER for the charges of ENGINEER and ENGINEER's Consultants for evaluating each such proposed substitute.

F. *CONTRACTOR's Expense:* CONTRACTOR shall provide all data in support of any proposed substitute or "or-equal" at CONTRACTOR's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

A. CONTRACTOR shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to OWNER as indicated in paragraph 6.06.B), whether initially or as a replacement, against whom OWNER may have reasonable objection. CONTRACTOR shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom CONTRACTOR has reasonable objection.

B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to OWNER in advance for acceptance by OWNER by a specified date prior to the Effective Date of the Agreement, and if CONTRACTOR has submitted a list thereof in accordance with the Supplementary Conditions, OWNER's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. CONTRACTOR shall submit an acceptable replacement

for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued or Written Amendment signed. No acceptance by OWNER of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of OWNER or ENGINEER to reject defective Work.

C. CONTRACTOR shall be fully responsible to OWNER and ENGINEER for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as CONTRACTOR is responsible for CONTRACTOR's own acts and omissions. Nothing in the Contract Documents shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between OWNER or ENGINEER and any such Subcontractor, Supplier or other individual or entity, nor shall it create any obligation on the part of OWNER or ENGINEER to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

D. CONTRACTOR shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR.

E. CONTRACTOR shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with ENGINEER through CONTRACTOR.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control CONTRACTOR in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for CONTRACTOR by a Subcontractor or Supplier will be pursuant to an appropriate agreement between CONTRACTOR and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of OWNER and ENGINEER. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in paragraph 5.06, the agreement between the CONTRAC-

TOR and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against OWNER, CONTRACTOR, ENGINEER, ENGINEER's Consultants, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, CONTRACTOR will obtain the same.

6.07 *Patent Fees and Royalties*

A. CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of OWNER or ENGINEER its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by OWNER in the Contract Documents. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees or agents, and other consultants of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Permits*

A. Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall obtain and pay for all construction permits and licenses. OWNER shall assist CONTRACTOR, when necessary, in obtaining such permits and licenses. CONTRACTOR shall pay all governmental charges and inspection fees necessary for

the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. CONTRACTOR shall pay all charges of utility owners for connections to the Work, and OWNER shall pay all charges of such utility owners for capital costs related thereto, such as plant investment fees.

6.09 *Laws and Regulations*

A. CONTRACTOR shall give all notices and comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither OWNER nor ENGINEER shall be responsible for monitoring CONTRACTOR's compliance with any Laws or Regulations.

B. If CONTRACTOR performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, CONTRACTOR shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work; however, it shall not be CONTRACTOR's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve CONTRACTOR of CONTRACTOR's obligations under paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work may be the subject of an adjustment in Contract Price or Contract Times. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in paragraph 10.05.

6.10 *Taxes*

A. CONTRACTOR shall pay all sales, consumer, use, and other similar taxes required to be paid by CONTRACTOR in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.11 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*

1. CONTRACTOR shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations,

and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. CONTRACTOR shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, CONTRACTOR shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultant, and the officers, directors, partners, employees, agents, and other consultants of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against OWNER, ENGINEER, or any other party indemnified hereunder to the extent caused by or based upon CONTRACTOR's performance of the Work.

B. *Removal of Debris During Performance of the Work:* During the progress of the Work CONTRACTOR shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning*: Prior to Substantial Completion of the Work CONTRACTOR shall clean the Site and make it ready for utilization by OWNER. At the completion of the Work CONTRACTOR shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading Structures*: CONTRACTOR shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall CONTRACTOR subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 *Record Documents*

A. CONTRACTOR shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Written Amendments, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to ENGINEER for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to ENGINEER for OWNER.

6.13 *Safety and Protection*

A. CONTRACTOR shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;
2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. CONTRACTOR shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. CONTRACTOR shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property. All damage, injury, or loss to any property referred to in paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by CONTRACTOR, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by CONTRACTOR (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of OWNER or ENGINEER or ENGINEER's Consultant, or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of CONTRACTOR or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them). CONTRACTOR's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and ENGINEER has issued a notice to OWNER and CONTRACTOR in accordance with paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

A. CONTRACTOR shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

A. CONTRACTOR shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

6.16 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, CONTRACTOR is obligated to act to prevent threatened damage, injury, or loss. CONTRACTOR shall give ENGINEER prompt written notice if CONTRACTOR believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If ENGINEER determines that a change in the Contract Documents is required because of the action taken by CONTRACTOR in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 *Shop Drawings and Samples*

A. CONTRACTOR shall submit Shop Drawings to ENGINEER for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals. All submittals will be identified as ENGINEER may require and in the number of copies specified in the General Requirements. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show ENGINEER the services, materials, and equipment CONTRACTOR proposes to provide and to enable ENGINEER to review the information for the limited purposes required by paragraph 6.17.E.

B. CONTRACTOR shall also submit six (6) Samples to ENGINEER for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals. Each Sample will be identified clearly as to material, Supplier, pertinent data such as catalog numbers, and the use for which intended and otherwise as ENGINEER may require to enable ENGINEER to review the submittal for the limited purposes required by paragraph 6.17.E. The numbers of each Sample to be submitted will be as specified in the Specifications.

C. Where a Shop Drawing or Sample is required by the Contract Documents or the schedule of Shop Drawings and Sample submittals acceptable to ENGINEER as required by paragraph 2.07, any related Work performed prior to ENGINEER's review and approval of the pertinent submittal will be at the sole expense and responsibility of CONTRACTOR.

D. *Submittal Procedures*

1. Before submitting each Shop Drawing or Sample, CONTRACTOR shall have determined and verified:

a. all field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

b. all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work;

c. all information relative to means, methods, techniques, sequences, and procedures of construction and safety precautions and programs incident thereto; and

d. CONTRACTOR shall also have reviewed and coordinated each Shop Drawing or

Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

2. Each submittal shall bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR's obligations under the Contract Documents with respect to CONTRACTOR's review and approval of that submittal.

3. At the time of each submittal, CONTRACTOR shall give ENGINEER specific written notice of such variations, if any, that the Shop Drawing or Sample submitted may have from the requirements of the Contract Documents, such notice to be in a written communication separate from the submittal; and, in addition, shall cause a specific notation to be made on each Shop Drawing and Sample submitted to ENGINEER for review and approval of each such variation.

E. *ENGINEER's Review*

1. ENGINEER will timely review and approve Shop Drawings and Samples in accordance with the schedule of Shop Drawings and Sample submittals acceptable to ENGINEER. ENGINEER's review and approval will be only to determine if the items covered by the submittals

will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. ENGINEER's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. ENGINEER's review and approval of Shop Drawings or Samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless CONTRACTOR has in writing called ENGINEER's attention to each such variation at the time of each submittal as required by paragraph 6.17.D.3 and ENGINEER has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample approval; nor will any approval by ENGINEER relieve CONTRACTOR from responsibility for complying with the requirements of paragraph 6.17.D.1.

F. *Resubmittal Procedures*

1. CONTRACTOR shall make corrections required by ENGINEER and shall return the required number of corrected copies of Shop Drawings and submit as required new Samples for review and approval. CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by ENGINEER on previous submittals.

6.18 *Continuing the Work*

A. CONTRACTOR shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with OWNER. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by paragraph 15.04 or as OWNER and CONTRACTOR may otherwise agree in writing.

6.19 *CONTRACTOR's General Warranty and Guarantee*

A. CONTRACTOR warrants and guarantees to OWNER, ENGINEER, and ENGINEER's Consultants that all Work will be in accordance with the Contract Documents and will not be defective. CONTRACTOR's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than CONTRACTOR, Subcontractors, Suppliers, or any other individual or entity for whom CONTRACTOR is responsible; or
2. normal wear and tear under normal usage.

B. CONTRACTOR's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents:

1. observations by ENGINEER;
2. recommendation by ENGINEER or payment by OWNER of any progress or final payment;
3. the issuance of a certificate of Substantial Completion by ENGINEER or any payment related thereto by OWNER;
4. use or occupancy of the Work or any part thereof by OWNER;
5. any acceptance by OWNER or any failure to do so;
6. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by ENGINEER;
7. any inspection, test, or approval by others; or
8. any correction of defective Work by OWNER.

6.20 Indemnification

A. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage:

1. is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom; and
2. is caused in whole or in part by any negligent act or omission of CONTRACTOR, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by any negligence or omission of an individual or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such individual or entity.

B. In any and all claims against OWNER or ENGINEER or any of their respective consultants, agents, officers, directors, partners, or employees by any employee (or the survivor or personal representative of such employee) of CONTRACTOR, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for CONTRACTOR or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of CONTRACTOR under paragraph 6.20.A shall not extend to the liability of ENGINEER and ENGINEER's Consultants or to the officers, directors, partners, employees, agents, and

other consultants and subcontractors of each and any of them arising out of:

1. the preparation or approval of, or the failure to prepare or approve, maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

ARTICLE 7 - OTHER WORK

7.01 Related Work at Site

A. OWNER may perform other work related to the Project at the Site by OWNER's employees, or let other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:

1. written notice thereof will be given to CONTRACTOR prior to starting any such other work; and
2. if OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in paragraph 10.05.

B. CONTRACTOR shall afford each other contractor who is a party to such a direct contract and each utility owner (and OWNER, if OWNER is performing the other work with OWNER's employees) proper and safe access to the Site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work and shall properly coordinate the Work with theirs. Unless otherwise provided in the Contract Documents, CONTRACTOR shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. CONTRACTOR shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of ENGINEER and the others whose work will be affected. The duties and responsibilities of CONTRACTOR under this paragraph are for the benefit of

such utility owners and other contractors to the extent that there are comparable provisions for the benefit of CONTRACTOR in said direct contracts between OWNER and such utility owners and other contractors.

C. If the proper execution or results of any part of CONTRACTOR's Work depends upon work performed by others under this Article 7, CONTRACTOR shall inspect such other work and promptly report to ENGINEER in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of CONTRACTOR's Work. CONTRACTOR's failure to so report will constitute an acceptance of such other work as fit and proper for integration with CONTRACTOR's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

A. If OWNER intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
2. the specific matters to be covered by such authority and responsibility will be itemized; and
3. the extent of such authority and responsibilities will be provided.

B. Unless otherwise provided in the Supplementary Conditions, OWNER shall have sole authority and responsibility for such coordination.

ARTICLE 8 - OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, OWNER shall issue all communications to CONTRACTOR through ENGINEER.

8.02 *Replacement of ENGINEER*

A. In case of termination of the employment of ENGINEER, OWNER shall appoint an engineer to whom CONTRACTOR makes no reasonable objection, whose status under the Contract Documents shall be that of the former ENGINEER.

8.03 *Furnish Data*

A. OWNER shall promptly furnish the data required of OWNER under the Contract Documents.

8.04 *Pay Promptly When Due*

A. OWNER shall make payments to CONTRACTOR promptly when they are due as provided in paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

A. OWNER's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in paragraphs 4.01 and 4.05. Paragraph 4.02 refers to OWNER's identifying and making available to CONTRACTOR copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site that have been utilized by ENGINEER in preparing the Contract Documents.

8.06 *Insurance*

A. OWNER's responsibilities, if any, in respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

A. OWNER is obligated to execute Change Orders as indicated in paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

A. OWNER's responsibility in respect to certain inspections, tests, and approvals is set forth in paragraph 13.03.B.

8.09 *Limitations on OWNER's Responsibilities*

A. The OWNER shall not supervise, direct, or have control or authority over, nor be responsible for, CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the performance of the Work. OWNER will not be responsible for CONTRACTOR's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

A. OWNER's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

A. If and to the extent OWNER has agreed to furnish CONTRACTOR reasonable evidence that financial arrangements have been made to satisfy OWNER's obligations under the Contract Documents, OWNER's responsibility in respect thereof will be as set forth in the Supplementary Conditions.

ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *OWNER'S Representative*

A. ENGINEER will be OWNER's representative during the construction period. The duties and responsibilities and the limitations of authority of ENGINEER as OWNER's representative during construction are set forth in the Contract Documents and will not be changed without written consent of OWNER and ENGINEER.

9.02 *Visits to Site*

A. ENGINEER will make visits to the Site at intervals appropriate to the various stages of construction as ENGINEER deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of CONTRACTOR's executed Work. Based on information obtained during such visits and

observations, ENGINEER, for the benefit of OWNER, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. ENGINEER will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. ENGINEER's efforts will be directed toward providing for OWNER a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, ENGINEER will keep OWNER informed of the progress of the Work and will endeavor to guard OWNER against defective Work.

B. ENGINEER's visits and observations are subject to all the limitations on ENGINEER's authority and responsibility set forth in paragraph 9.10, and particularly, but without limitation, during or as a result of ENGINEER's visits or observations of CONTRACTOR's Work ENGINEER will not supervise, direct, control, or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

A. If OWNER and ENGINEER agree, ENGINEER will furnish a Resident Project Representative to assist ENGINEER in providing more extensive observation of the Work. The responsibilities and authority and limitations thereon of any such Resident Project Representative and assistants will be as provided in paragraph 9.10 and in the Supplementary Conditions. If OWNER designates another representative or agent to represent OWNER at the Site who is not ENGINEER's Consultant, agent or employee,

the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Clarifications and Interpretations*

A. ENGINEER will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents as ENGINEER may determine necessary, which shall be consistent with the intent of and reasonably inferable from the Contract Documents.

ments. Such written clarifications and interpretations will be binding on OWNER and CONTRACTOR. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a written clarification or interpretation, a Claim may be made therefor as provided in paragraph 10.05.

9.05 *Authorized Variations in Work*

A. ENGINEER may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on OWNER and also on CONTRACTOR, who shall perform the Work involved promptly. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of a Field Order, a Claim may be made therefor as provided in paragraph 10.05.

9.06 *Rejecting Defective Work*

A. ENGINEER will have authority to disapprove or reject Work which ENGINEER believes to be defective, or that ENGINEER believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. ENGINEER will also have authority to require special inspection or testing of the Work as provided in paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.07 *Shop Drawings, Change Orders and Payments*

A. In connection with ENGINEER's authority as to Shop Drawings and Samples, see paragraph 6.17.

B. In connection with ENGINEER's authority as to Change Orders, see Articles 10, 11, and 12.

C. In connection with ENGINEER's authority as to Applications for Payment, see Article 14.

9.08 *Determinations for Unit Price Work*

A. ENGINEER will determine the actual quantities and classifications of Unit Price Work performed by CONTRACTOR. ENGINEER will review with CONTRACTOR the ENGINEER's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). ENGINEER's written decision thereon will be final and binding (except as modified by ENGINEER to reflect changed factual conditions or more accurate data) upon OWNER and CONTRACTOR, subject to the provisions of paragraph 10.05.

9.09 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. ENGINEER will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. Claims, disputes and other matters relating to the acceptability of the Work, the quantities and classifications of Unit Price Work, the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, and Claims seeking changes in the Contract Price or Contract Times will be referred initially to ENGINEER in writing, in accordance with the provisions of paragraph 10.05, with a request for a formal decision.

B. When functioning as interpreter and judge under this paragraph 9.09, ENGINEER will not show partiality to OWNER or CONTRACTOR and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity. The rendering of a decision by ENGINEER pursuant to this paragraph 9.09 with respect to any such Claim, dispute, or other matter (except any which have been waived by the making or acceptance of final payment as provided in paragraph 14.07) will be a condition precedent to any exercise by OWNER or CONTRACTOR of such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any such Claim, dispute, or other matter.

9.10 *Limitations on ENGINEER's Authority and Responsibilities*

A. Neither ENGINEER's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by ENGINEER in good faith either to exercise or not exercise such

authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by ENGINEER shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by ENGINEER to CONTRACTOR, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. ENGINEER will not supervise, direct, control, or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the performance of the Work. ENGINEER will not be responsible for CONTRACTOR's failure to perform the Work in accordance with the Contract Documents.

C. ENGINEER will not be responsible for the acts or omissions of CONTRACTOR or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. ENGINEER's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.

E. The limitations upon authority and responsibility set forth in this paragraph 9.10 shall also apply to ENGINEER's Consultants, Resident Project Representative, and assistants. See Article 18.

ARTICLE 10 - CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

A. Without invalidating the Agreement and without notice to any surety, OWNER may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Written Amendment, a Change Order, or a Work Change Directive. Upon receipt of any such document, CONTRACTOR shall promptly proceed with the Work involved which will be performed under the

applicable conditions of the Contract Documents (except as otherwise specifically provided).

B. If OWNER and CONTRACTOR are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

A. CONTRACTOR shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in paragraph 3.04, except in the case of an emergency as provided in paragraph 6.16 or in the case of uncovering Work as provided in paragraph 13.04.B.

10.03 *Execution of Change Orders*

A. OWNER and CONTRACTOR shall execute appropriate Change Orders recommended by ENGINEER (or Written Amendments) covering:

1. changes in the Work which are: (i) ordered by OWNER pursuant to paragraph 10.01.A, (ii) required because of acceptance of defective Work under paragraph 13.08.A or OWNER's correction of defective Work under paragraph 13.09, or (iii) agreed to by the parties;

2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by ENGINEER pursuant to paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, CONTRACTOR shall carry on the Work and adhere to the progress schedule as provided in paragraph 6.18.A.

10.04 *Notification to Surety*

A. If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times) is required by the provisions of any Bond to be given to a surety, the giving of any such notice will be CONTRACTOR's responsibility. The amount of each applicable Bond will be adjusted to reflect the effect of any such change.

10.05 *Claims and Disputes*

A. *Notice:* Written notice stating the general nature of each Claim, dispute, or other matter shall be delivered by the claimant to ENGINEER and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. Notice of the amount or extent of the Claim, dispute, or other matter with supporting data shall be delivered to the ENGINEER and the other party to the Contract within 60 days after the start of such event (unless ENGINEER allows additional time for claimant to submit additional or more accurate data in support of such Claim, dispute, or other matter). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of paragraph 12.01.B. A Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to ENGINEER and the claimant within 30 days after receipt of the claimant's last submittal (unless ENGINEER allows additional time).

B. *ENGINEER's Decision:* ENGINEER will render a formal decision in writing within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any. ENGINEER's written decision on such Claim, dispute, or other matter will be final and binding upon OWNER and CONTRACTOR unless:

1. an appeal from ENGINEER's decision is taken within the time limits and in accordance with the dispute resolution procedures set forth in Article 16; or

2. if no such dispute resolution procedures have been set forth in Article 16, a written notice of intention to appeal from ENGINEER's written decision is delivered by OWNER or CONTRACTOR to the other and to ENGINEER within 30 days

after the date of such decision, and a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction within 60 days after the date of such decision or within 60 days after Substantial Completion, whichever is later (unless otherwise agreed in writing by OWNER and CONTRACTOR), to exercise such rights or remedies as the appealing party may have with respect to such Claim, dispute, or other matter in accordance with applicable Laws and Regulations.

C. If ENGINEER does not render a formal decision in writing within the time stated in paragraph 10.05.B, a decision denying the Claim in its entirety shall be deemed to have been issued 31 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any.

D. No Claim for an adjustment in Contract Price or Contract Times (or Milestones) will be valid if not submitted in accordance with this paragraph 10.05.

ARTICLE 11 - COST OF THE WORK; CASH ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

A. *Costs Included:* The term Cost of the Work means the sum of all costs necessarily incurred and paid by CONTRACTOR in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to CONTRACTOR will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by OWNER, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items, and shall not include any of the costs itemized in paragraph 11.01.B.

1. Payroll costs for employees in the direct employ of CONTRACTOR in the performance of the Work under schedules of job classifications agreed upon by OWNER and CONTRACTOR. Such employees shall include without limitation superintendents, foremen, and other personnel employed full time at the Site. Payroll costs for employees not employed full time on the Work

shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by OWNER.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to CONTRACTOR unless OWNER deposits funds with CONTRACTOR with which to make payments, in which case the cash discounts shall accrue to OWNER. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to OWNER, and CONTRACTOR shall make provisions so that they may be obtained.

3. Payments made by CONTRACTOR to Subcontractors for Work performed by Subcontractors. If required by OWNER, CONTRACTOR shall obtain competitive bids from subcontractors acceptable to OWNER and CONTRACTOR and shall deliver such bids to OWNER, who will then determine, with the advice of ENGINEER, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as CONTRACTOR's Cost of the Work and fee as provided in this paragraph 11.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

a. The proportion of necessary transportation, travel, and subsistence expenses of

CONTRACTOR's employees incurred in discharge of duties connected with the Work.

b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of CONTRACTOR.

c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from CONTRACTOR or others in accordance with rental agreements approved by OWNER with the advice of ENGINEER, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

d. Sales, consumer, use, and other similar taxes related to the Work, and for which CONTRACTOR is liable, imposed by Laws and Regulations.

e. Deposits lost for causes other than negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by CONTRACTOR in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of OWNER. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining CONTRACTOR's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, expressage, and similar petty cash items in connection with the Work.

i. When the Cost of the Work is used to determine the value of a Change Order or of a Claim, the cost of premiums for additional Bonds and insurance required because of the changes in the Work or caused by the event giving rise to the Claim.

j. When all the Work is performed on the basis of cost-plus, the costs of premiums for all Bonds and insurance CONTRACTOR is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnerships and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by CONTRACTOR, whether at the Site or in CONTRACTOR's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in paragraph 11.01.A.1 or specifically covered by paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the CONTRACTOR's fee.

2. Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the Site.

3. Any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the Work and charges against CONTRACTOR for delinquent payments.

4. Costs due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not

limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraphs 11.01.A and 11.01.B.

C. *CONTRACTOR's Fee:* When all the Work is performed on the basis of cost-plus, CONTRACTOR's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, CONTRACTOR's fee shall be determined as set forth in paragraph 12.01.C.

D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to paragraphs 11.01.A and 11.01.B, CONTRACTOR will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to ENGINEER an itemized cost breakdown together with supporting data.

11.02 *Cash Allowances*

A. It is understood that CONTRACTOR has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums as may be acceptable to OWNER and ENGINEER. CONTRACTOR agrees that:

1. the allowances include the cost to CONTRACTOR (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. CONTRACTOR's costs for unloading and handling on the Site, labor, installation costs, overhead, profit, and other expenses contemplated for the allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

B. Prior to final payment, an appropriate Change Order will be issued as recommended by ENGINEER to reflect actual amounts due CONTRACTOR on account of

Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by CONTRACTOR will be made by ENGINEER subject to the provisions of paragraph 9.08.

B. Each unit price will be deemed to include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR's overhead and profit for each separately identified item.

C. OWNER or CONTRACTOR may make a Claim for an adjustment in the Contract Price in accordance with paragraph 10.05 if:

1. the quantity of any item of Unit Price Work performed by CONTRACTOR differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
2. there is no corresponding adjustment with respect any other item of Work; and
3. if CONTRACTOR believes that CONTRACTOR is entitled to an increase in Contract Price as a result of having incurred additional expense or OWNER believes that OWNER is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 - CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order or by a Written Amendment. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the ENGINEER and the other party to the Contract in accordance with the provisions of paragraph 10.05.

B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of paragraph 11.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with paragraph 12.01.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in paragraph 11.01) plus a CONTRACTOR's fee for overhead and profit (determined as provided in paragraph 12.01.C).

C. *CONTRACTOR's Fee*: The CONTRACTOR's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or
2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under paragraphs 11.01.A.1 and 11.01.A.2, the CONTRACTOR's fee shall be 15 percent;

b. for costs incurred under paragraph 11.01.A.3, the CONTRACTOR's fee shall be five percent;

c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of paragraph 12.01.C.2.a is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and CONTRACTOR will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

d. no fee shall be payable on the basis of costs itemized under paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;

e. the amount of credit to be allowed by CONTRACTOR to OWNER for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in CONTRACTOR's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in CONTRACTOR's fee shall be computed on the basis of the net change in accordance with paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

A. The Contract Times (or Milestones) may only be changed by a Change Order or by a Written Amendment. Any Claim for an adjustment in the Contract Times (or Milestones) shall be based on written notice submitted by the party making the claim to the ENGINEER and the other party to the Contract in accordance with the provisions of paragraph 10.05.

B. Any adjustment of the Contract Times (or Milestones) covered by a Change Order or of any Claim for an adjustment in the Contract Times (or Milestones)

will be determined in accordance with the provisions of this Article 12.

12.03 *Delays Beyond CONTRACTOR's Control*

A. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of CONTRACTOR, the Contract Times (or Milestones) will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in paragraph 12.02.A. Delays beyond the control of CONTRACTOR shall include, but not be limited to, acts or neglect by OWNER, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

12.04 *Delays Within CONTRACTOR's Control*

A. The Contract Times (or Milestones) will not be extended due to delays within the control of CONTRACTOR. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of CONTRACTOR.

12.05 *Delays Beyond OWNER's and CONTRACTOR's Control*

A. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of both OWNER and CONTRACTOR, an extension of the Contract Times (or Milestones) in an amount equal to the time lost due to such delay shall be CONTRACTOR's sole and exclusive remedy for such delay.

12.06 *Delay Damages*

A. In no event shall OWNER or ENGINEER be liable to CONTRACTOR, any Subcontractor, any Supplier, or any other person or organization, or to any surety for or employee or agent of any of them, for damages arising out of or resulting from:

1. delays caused by or within the control of CONTRACTOR; or

2. delays beyond the control of both OWNER and CONTRACTOR including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God, or acts or neglect by utility

owners or other contractors performing other work as contemplated by Article 7.

B. Nothing in this paragraph 12.06 bars a change in Contract Price pursuant to this Article 12 to compensate CONTRACTOR due to delay, interference, or disruption directly attributable to actions or inactions of OWNER or anyone for whom OWNER is responsible.

ARTICLE 13 - TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 *Notice of Defects*

A. Prompt notice of all defective Work of which OWNER or ENGINEER has actual knowledge will be given to CONTRACTOR. All defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 *Access to Work*

A. OWNER, ENGINEER, ENGINEER's Consultants, other representatives and personnel of OWNER, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspecting, and testing. CONTRACTOR shall provide them proper and safe conditions for such access and advise them of CONTRACTOR's Site safety procedures and programs so that they may comply therewith as applicable.

13.03 *Tests and Inspections*

A. CONTRACTOR shall give ENGINEER timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. OWNER shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests, or approvals covered by paragraphs 13.03.C and 13.03.D below;

2. that costs incurred in connection with tests or inspections conducted pursuant to paragraph 13.04.B shall be paid as provided in said paragraph 13.04.B; and

3. as otherwise specifically provided in the Contract Documents.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, CONTRACTOR shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish ENGINEER the required certificates of inspection or approval.

D. CONTRACTOR shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for OWNER's and ENGINEER's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to CONTRACTOR's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to OWNER and ENGINEER.

E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by CONTRACTOR without written concurrence of ENGINEER, it must, if requested by ENGINEER, be uncovered for observation.

F. Uncovering Work as provided in paragraph 13.03.E shall be at CONTRACTOR's expense unless CONTRACTOR has given ENGINEER timely notice of CONTRACTOR's intention to cover the same and ENGINEER has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

A. If any Work is covered contrary to the written request of ENGINEER, it must, if requested by ENGINEER, be uncovered for ENGINEER's observation and replaced at CONTRACTOR's expense.

B. If ENGINEER considers it necessary or advisable that covered Work be observed by ENGINEER or inspected or tested by others, CONTRACTOR, at ENGINEER's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as ENGINEER may require, that portion of the Work in

question, furnishing all necessary labor, material, and equipment. If it is found that such Work is defective, CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and OWNER shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, OWNER may make a Claim therefor as provided in paragraph 10.05. If, however, such Work is not found to be defective, CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Times (or Milestones), or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, CONTRACTOR may make a Claim therefor as provided in paragraph 10.05.

13.05 *OWNER May Stop the Work*

A. If the Work is defective, or CONTRACTOR fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, OWNER may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of OWNER to stop the Work shall not give rise to any duty on the part of OWNER to exercise this right for the benefit of CONTRACTOR, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

A. CONTRACTOR shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by ENGINEER, remove it from the Project and replace it with Work that is not defective. CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

13.07 *Correction Period*

A. If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for CONTRACTOR's use by OWNER or permitted by Laws and Regulations as contemplated in paragraph 6.11.A is found to be defective, CONTRACTOR shall promptly, without cost to OWNER and in accordance with OWNER's written instructions: (i) repair such defective land or areas, or (ii) correct such defective Work or, if the defective Work has been rejected by OWNER, remove it from the Project and replace it with Work that is not defective, and (iii) satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom. If CONTRACTOR does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, OWNER may have the defective Work corrected or repaired or may have the rejected Work removed and replaced, and all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by CONTRACTOR.

B. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications or by Written Amendment.

C. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

D. CONTRACTOR's obligations under this paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this paragraph 13.07 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, OWNER (and, prior to ENGINEER's recommendation of final payment, ENGINEER) prefers to accept it, OWNER may do so. CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to OWNER's evaluation of and determination to accept such defective Work (such costs to be approved by ENGINEER as to reasonableness) and the diminished value of the Work to the extent not otherwise paid by CONTRACTOR pursuant to this sentence. If any such acceptance occurs prior to ENGINEER's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and OWNER shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, OWNER may make a Claim therefor as provided in paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by CONTRACTOR to OWNER.

13.09 *OWNER May Correct Defective Work*

A. If CONTRACTOR fails within a reasonable time after written notice from ENGINEER to correct defective Work or to remove and replace rejected Work as required by ENGINEER in accordance with paragraph 13.06.A, or if CONTRACTOR fails to perform the Work in accordance with the Contract Documents, or if CONTRACTOR fails to comply with any other provision of the Contract Documents, OWNER may, after seven days written notice

to CONTRACTOR, correct and remedy any such deficiency.

B. In exercising the rights and remedies under this paragraph, OWNER shall proceed expeditiously. In connection with such corrective and remedial action, OWNER may exclude CONTRACTOR from all or part of the Site, take possession of all or part of the Work and suspend CONTRACTOR's services related thereto, take possession of CONTRACTOR's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which OWNER has paid CONTRACTOR but which are stored elsewhere. CONTRACTOR shall allow OWNER, OWNER's representatives, agents and employees, OWNER's other contractors, and ENGINEER and ENGINEER's Consultants access to the Site to enable OWNER to exercise the rights and remedies under this paragraph.

C. All Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by OWNER in exercising the rights and remedies under this paragraph 13.09 will be charged against CONTRACTOR, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and OWNER shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, OWNER may make a Claim therefor as provided in paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of CONTRACTOR's defective Work.

D. CONTRACTOR shall not be allowed an extension of the Contract Times (or Milestones) because of any delay in the performance of the Work attributable to the exercise by OWNER of OWNER's rights and remedies under this paragraph 13.09.

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND
COMPLETION

14.01 *Schedule of Values*

A. The schedule of values established as provided in paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to ENGINEER. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments*

A. *Applications for Payments*

1. At least 20 days before the date established for each progress payment (but not more often than once a month), CONTRACTOR shall submit to ENGINEER for review an Application for Payment filled out and signed by CONTRACTOR covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that OWNER has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect OWNER's interest therein, all of which must be satisfactory to OWNER.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of CONTRACTOR stating that all previous progress payments received on account of the Work have been applied on account to discharge CONTRACTOR's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. *Review of Applications*

1. ENGINEER will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to OWNER or return the Application to CONTRACTOR indicating in writing ENGINEER's reasons for refusing to recommend payment. In the latter case, CONTRACTOR may make the necessary corrections and resubmit the Application.

2. ENGINEER's recommendation of any payment requested in an Application for Payment will constitute a representation by ENGINEER to OWNER, based on ENGINEER's observations on the Site of the executed Work as an experienced and qualified design professional and on ENGINEER's review of the Application for Payment and the accompanying data and schedules, that to the best of ENGINEER's knowledge, information and belief:

a. the Work has progressed to the point indicated;

b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under paragraph 9.08, and to any other qualifications stated in the recommendation); and

c. the conditions precedent to CONTRACTOR's being entitled to such payment appear to have been fulfilled in so far as it is ENGINEER's responsibility to observe the Work.

3. By recommending any such payment ENGINEER will not thereby be deemed to have represented that: (i) inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to ENGINEER in the Contract Documents; or (ii) that there may not be other matters or issues between the parties

that might entitle CONTRACTOR to be paid additionally by OWNER or entitle OWNER to withhold payment to CONTRACTOR.

4. Neither ENGINEER's review of CONTRACTOR's Work for the purposes of recommending payments nor ENGINEER's recommendation of any payment, including final payment, will impose responsibility on ENGINEER to supervise, direct, or control the Work or for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for CONTRACTOR's failure to comply with Laws and Regulations applicable to CONTRACTOR's performance of the Work. Additionally, said review or recommendation will not impose responsibility on ENGINEER to make any examination to ascertain how or for what purposes CONTRACTOR has used the moneys paid on account of the Contract Price, or to determine that title to any of the Work, materials, or equipment has passed to OWNER free and clear of any Liens.

5. ENGINEER may refuse to recommend the whole or any part of any payment if, in ENGINEER's opinion, it would be incorrect to make the representations to OWNER referred to in paragraph 14.02.B.2. ENGINEER may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in ENGINEER's opinion to protect OWNER from loss because:

a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;

b. the Contract Price has been reduced by Written Amendment or Change Orders;

c. OWNER has been required to correct defective Work or complete Work in accordance with paragraph 13.09; or

d. ENGINEER has actual knowledge of the occurrence of any of the events enumerated in paragraph 15.02.A.

C. Payment Becomes Due

1. Ten days after presentation of the Application for Payment to OWNER with ENGINEER's recommendation, the amount recommended will (subject to the provisions of paragraph 14.02.D) become due, and when due will be paid by OWNER to CONTRACTOR.

D. Reduction in Payment

1. OWNER may refuse to make payment of the full amount recommended by ENGINEER because:

a. claims have been made against OWNER on account of CONTRACTOR's performance or furnishing of the Work;

b. Liens have been filed in connection with the Work, except where CONTRACTOR has delivered a specific Bond satisfactory to OWNER to secure the satisfaction and discharge of such Liens;

c. there are other items entitling OWNER to a set-off against the amount recommended; or

d. OWNER has actual knowledge of the occurrence of any of the events enumerated in paragraphs 14.02.B.5.a through 14.02.B.5.c or paragraph 15.02.A.

2. If OWNER refuses to make payment of the full amount recommended by ENGINEER, OWNER must give CONTRACTOR immediate written notice (with a copy to ENGINEER) stating the reasons for such action and promptly pay CONTRACTOR any amount remaining after deduction of the amount so withheld. OWNER shall promptly pay CONTRACTOR the amount so withheld, or any adjustment thereto agreed to by OWNER and CONTRACTOR, when CONTRACTOR corrects to OWNER's satisfaction the reasons for such action.

3. If it is subsequently determined that OWNER's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by paragraph 14.02.C.1.

14.03 *CONTRACTOR's Warranty of Title*

A. CONTRACTOR warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to OWNER no later than the time of payment free and clear of all Liens.

14.04 *Substantial Completion*

A. When CONTRACTOR considers the entire Work ready for its intended use CONTRACTOR shall notify OWNER and ENGINEER in writing that the entire Work is substantially complete (except for items specifically listed by CONTRACTOR as incomplete) and request that ENGINEER issue a certificate of Substantial Completion. Promptly thereafter, OWNER, CONTRACTOR, and ENGINEER shall make an inspection of the Work to determine the status of completion. If ENGINEER does not consider the Work substantially complete, ENGINEER will notify CONTRACTOR in writing giving the reasons therefor. If ENGINEER considers the Work substantially complete, ENGINEER will prepare and deliver to OWNER a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. OWNER shall have seven days after receipt of the tentative certificate during which to make written objection to ENGINEER as to any provisions of the certificate or attached list. If, after considering such objections, ENGINEER concludes that the Work is not substantially complete, ENGINEER will within 14 days after submission of the tentative certificate to OWNER notify CONTRACTOR in writing, stating the reasons therefor. If, after consideration of OWNER's objections, ENGINEER considers the Work substantially complete, ENGINEER will within said 14 days execute and deliver to OWNER and CONTRACTOR a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as ENGINEER believes justified after consideration of any objections from OWNER. At the time of delivery of the tentative certificate of Substantial Completion ENGINEER will deliver to OWNER and CONTRACTOR a written recommendation as to division of responsibilities pending final payment between OWNER and CONTRACTOR with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless OWNER and CONTRACTOR agree otherwise in writing and so inform ENGINEER in writing prior to ENGINEER's issuing the definitive certificate of Substantial Completion,

ENGINEER's aforesaid recommendation will be binding on OWNER and CONTRACTOR until final payment.

B. OWNER shall have the right to exclude CONTRACTOR from the Site after the date of Substantial Completion, but OWNER shall allow CONTRACTOR reasonable access to complete or correct items on the tentative list.

14.05 *Partial Utilization*

A. Use by OWNER at OWNER's option of any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which OWNER, ENGINEER, and CONTRACTOR agree constitutes a separately functioning and usable part of the Work that can be used by OWNER for its intended purpose without significant interference with CONTRACTOR's performance of the remainder of the Work, may be accomplished prior to Substantial Completion of all the Work subject to the following conditions.

1. OWNER at any time may request CONTRACTOR in writing to permit OWNER to use any such part of the Work which OWNER believes to be ready for its intended use and substantially complete. If CONTRACTOR agrees that such part of the Work is substantially complete, CONTRACTOR will certify to OWNER and ENGINEER that such part of the Work is substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. CONTRACTOR at any time may notify OWNER and ENGINEER in writing that CONTRACTOR considers any such part of the Work ready for its intended use and substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. Within a reasonable time after either such request, OWNER, CONTRACTOR, and ENGINEER shall make an inspection of that part of the Work to determine its status of completion. If ENGINEER does not consider that part of the Work to be substantially complete, ENGINEER will notify OWNER and CONTRACTOR in writing giving the reasons therefor. If ENGINEER considers that part of the Work to be substantially complete, the provisions of paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

2. No occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

A. Upon written notice from CONTRACTOR that the entire Work or an agreed portion thereof is complete, ENGINEER will promptly make a final inspection with OWNER and CONTRACTOR and will notify CONTRACTOR in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. CONTRACTOR shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 *Final Payment*

A. *Application for Payment*

1. After CONTRACTOR has, in the opinion of ENGINEER, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, Bonds, certificates or other evidence of insurance certificates of inspection, marked-up record documents (as provided in paragraph 6.12), and other documents, CONTRACTOR may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by: (i) all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by subparagraph 5.04.B.7; (ii) consent of the surety, if any, to final payment; and (iii) complete and legally effective releases or waivers (satisfactory to OWNER) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in paragraph 14.07.A.2 and as approved by OWNER, CONTRACTOR may furnish receipts or releases in full and an affidavit of CONTRACTOR that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other

indebtedness connected with the Work for which OWNER or OWNER's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, CONTRACTOR may furnish a Bond or other collateral satisfactory to OWNER to indemnify OWNER against any Lien.

B. *Review of Application and Acceptance*

1. If, on the basis of ENGINEER's observation of the Work during construction and final inspection, and ENGINEER's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, ENGINEER is satisfied that the Work has been completed and CONTRACTOR's other obligations under the Contract Documents have been fulfilled, ENGINEER will, within ten days after receipt of the final Application for Payment, indicate in writing ENGINEER's recommendation of payment and present the Application for Payment to OWNER for payment. At the same time ENGINEER will also give written notice to OWNER and CONTRACTOR that the Work is acceptable subject to the provisions of paragraph 14.09. Otherwise, ENGINEER will return the Application for Payment to CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment, in which case CONTRACTOR shall make the necessary corrections and resubmit the Application for Payment.

C. *Payment Becomes Due*

1. Thirty days after the presentation to OWNER of the Application for Payment and accompanying documentation, the amount recommended by ENGINEER will become due and, when due, will be paid by OWNER to CONTRACTOR.

14.08 *Final Completion Delayed*

A. If, through no fault of CONTRACTOR, final completion of the Work is significantly delayed, and if ENGINEER so confirms, OWNER shall, upon receipt of CONTRACTOR's final Application for Payment and recommendation of ENGINEER, and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by OWNER for Work not

fully completed or corrected is less than the retainage stipulated in the Agreement, and if Bonds have been furnished as required in paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by CONTRACTOR to ENGINEER with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 *Waiver of Claims*

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by OWNER against CONTRACTOR, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from CONTRACTOR's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by CONTRACTOR against OWNER other than those previously made in writing which are still unsettled.

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

15.01 *OWNER May Suspend Work*

A. At any time and without cause, OWNER may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to CONTRACTOR and ENGINEER which will fix the date on which Work will be resumed. CONTRACTOR shall resume the Work on the date so fixed. CONTRACTOR shall be allowed an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if CONTRACTOR makes a Claim therefor as provided in paragraph 10.05.

15.02 *OWNER May Terminate for Cause*

A. The occurrence of any one or more of the following events will justify termination for cause:

1. CONTRACTOR's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the progress schedule established under paragraph 2.07 as adjusted from time to time pursuant to paragraph 6.04);

2. CONTRACTOR's disregard of Laws or Regulations of any public body having jurisdiction;

3. CONTRACTOR's disregard of the authority of ENGINEER; or

4. CONTRACTOR's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in paragraph 15.02.A occur, OWNER may, after giving CONTRACTOR (and the surety, if any) seven days written notice, terminate the services of CONTRACTOR, exclude CONTRACTOR from the Site, and take possession of the Work and of all CONTRACTOR's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by CONTRACTOR (without liability to CONTRACTOR for trespass or conversion), incorporate in the Work all materials and equipment stored at the Site or for which OWNER has paid CONTRACTOR but which are stored elsewhere, and finish the Work as OWNER may deem expedient. In such case, CONTRACTOR shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by OWNER arising out of or relating to completing the Work, such excess will be paid to CONTRACTOR. If such claims, costs, losses, and damages exceed such unpaid balance, CONTRACTOR shall pay the difference to OWNER. Such claims, costs, losses, and damages incurred by OWNER will be reviewed by ENGINEER as to their reasonableness and, when so approved by ENGINEER, incorporated in a Change Order. When exercising any rights or remedies under this paragraph OWNER shall not be required to obtain the lowest price for the Work performed.

C. Where CONTRACTOR's services have been so terminated by OWNER, the termination will not affect any rights or remedies of OWNER against CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of moneys due CONTRACTOR by OWNER will not release CONTRACTOR from liability.

15.03 *OWNER May Terminate For Convenience*

A. Upon seven days written notice to CONTRACTOR and ENGINEER, OWNER may, without cause and without prejudice to any other right or remedy of OWNER, elect to terminate the Contract. In such case, CONTRACTOR shall be paid (without duplication of any items):

1. for completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. for expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. for all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4. for reasonable expenses directly attributable to termination.

B. CONTRACTOR shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *CONTRACTOR May Stop Work or Terminate*

A. If, through no act or fault of CONTRACTOR, the Work is suspended for more than 90 consecutive days by OWNER or under an order of court or other public authority, or ENGINEER fails to act on any Application for Payment within 30 days after it is submitted, or OWNER fails for 30 days to pay CONTRACTOR any sum finally determined to be due, then CONTRACTOR may, upon

seven days written notice to OWNER and ENGINEER, and provided OWNER or ENGINEER do not remedy such suspension or failure within that time, terminate the Contract and recover from OWNER payment on the same terms as provided in paragraph 15.03. In lieu of terminating the Contract and without prejudice to any other right or remedy, if ENGINEER has failed to act on an Application for Payment within 30 days after it is submitted, or OWNER has failed for 30 days to pay CONTRACTOR any sum finally determined to be due, CONTRACTOR may, seven days after written notice to OWNER and ENGINEER, stop the Work until payment is made of all such amounts due CONTRACTOR, including interest thereon. The provisions of this paragraph 15.04 are not intended to preclude CONTRACTOR from making a Claim under paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to CONTRACTOR's stopping the Work as permitted by this paragraph.

ARTICLE 16 - DISPUTE RESOLUTION

16.01 *Methods and Procedures*

A. Dispute resolution methods and procedures, if any, shall be as set forth in the Supplementary Conditions.

If no method and procedure has been set forth, and subject to the provisions of paragraphs 9.09 and 10.05, OWNER and CONTRACTOR may exercise such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any dispute.

ARTICLE 17 - MISCELLANEOUS

17.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

A. When any period of time is referred to in the Contract Documents by days, it will be computed to

exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents, and the provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Agreement.

17.05 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

SUPPLEMENTAL GENERAL CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (No. 1910-8, 1996 Edition) and other provisions of the Contract Documents as indicated below. All provisions, which are not so amended or supplemental, remain in full force and effect.

The terms used in these Supplementary Conditions will have the meanings indicated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings indicated below, which are applicable to both the singular and plural thereof.

SC-6.10 Delete paragraph 6.10 in its entirety and insert the following in its place:

The owner qualifies for the state and local tax exemption in the purchase of certain materials and equipment the Contractor shall utilize the form provided herewith in exhibit "D".

SC-11.01 Delete paragraph 11.01 in its entirety.

SC-11.02 Delete paragraph 11.02 in its entirety.

SC-12.01B.25 & B.3. Delete paragraph 12.01B.2 & B.3 in its entirety.

SC-12.01.C.2 Delete paragraph 12.01.C.2 in its entirety.

SC Article 14.02 C.1 Replace "**Ten days**" with "**Thirty days**" to read as follows: Thirty days after presentation of the Application for Payment to OWNER with ENGINEER'S recommendation, the amount recommended will (subject to the provisions of paragraph 14.02.D) become due, and when due will be paid by OWNER TO CONTRACTOR.

SC Article 16 Add the following language at the end of the paragraph of Article 16:

There are no dispute resolution methods and procedures set forth in the Supplemental Conditions:

GENERAL PREVAILING WAGE LEGAL REQUIREMENTS

The Contractor's attention is called to Texas Government Code Chapter 2258, which must be complied with attached herewith as Exhibit "C"

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DOCUMENT 003132

GEOTECHNICAL DATA

PART 1 - GENERAL

1.1 GEOTECHNICAL DATA

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.
- B. A geotechnical investigation report for Project, will be provided.

END OF DOCUMENT 003132

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SECTION 010500

DEFINITIONS AND TERMINOLOGY

PART 1- GENERAL

1.1. SPECIFICATION TERMINOLOGY

- A. "Engineer" the Consulting Engineering Firm under contract with the Owner for this particular project, or its designated representative.
- B. "Furnish" means to supply, deliver and unload materials and equipment at the project site ready to install.
- C. "Install" means the operations at the project site including unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, training and similar operations required to prepare the materials and equipment for use, verify conformance with Contract Documents and prepare for acceptance and operation by the Owner.
- D. "Provide" means to furnish and install materials and equipment.
- E. "Perform" means to complete the operations necessary to comply with the Contract Documents.
- F. "Indicated" means graphic representations, notes, or schedules on drawings, or other requirements in Contract Documents. Words such as "shown", "noted", "scheduled", are used to help locate the reference. No limitation on the location is intended unless specifically noted.
- G. "Specified" means written representations in the bid documents or the technical specifications.
- H. "Regulation" means laws, statutes, ordinances, and lawful orders issued by authorities having jurisdiction, as well as, rules, conventions, and agreements within the construction industry that control performance of work, whether they are lawfully imposed by authorities having jurisdiction or not.
- I. "Installer" means an entity engaged by Contractor, either as an employee, subcontractor, or sub-subcontractor to install materials and/or equipment. Installers are to have successfully completed a minimum of five projects similar in size and scope to this project, have a minimum of five years of experience in the installation of similar materials and equipment, and comply with the requirements of the authority having jurisdiction.
- J. "Manufacturer" means an entity engaged by Contractor, as a subcontractor, or sub-subcontractor to furnish materials and/or equipment. Manufacturers are to have a minimum of five years experience in the manufacture of materials and equipment similar in size, capacity and scope to the specified materials and equipment.
- K. "Project site" means the space available to perform the work, either exclusively or in conjunction with others performing construction at the project site.

- L. "Testing laboratory" means an independent entity engaged to perform specific inspections or tests, either at the project site or elsewhere, and to report and interpret the results of those inspections or tests.
- M. "Listed" means equipment is included in a list published by a nationally recognized laboratory which makes periodic inspection of production of such equipment and states that such equipment meets nationally recognized standards or has been tested and found safe for use in a specified manner.
- N. "Labeled" means equipment that embodies a valid label, symbol, or other identifying mark of a nationally recognized testing laboratory such as Underwriters Laboratories, Inc. and production is periodically inspected in accordance with nationally recognized standards or tests to determine safe use in a specified manner.
- O. "Certified" used in context with materials and equipment means the material and equipment has been tested and found by a nationally recognized testing laboratory to meet specification requirements, or nationally recognized standards if requirements are not specified, and is safe for use in the specified manner. A nationally recognized testing laboratory must periodically inspect production of the equipment and the equipment must bear a label, tag, or other record of certification.
- P. "Certified" used in context with labor performance or ability to install materials and equipment means that the abilities of the proposed installer have been tested by an representative of the specified testing agency authorized to issue certificates of competency and has met the prescribed standards for certification.
- Q. "Certified" used in context with test reports, payment requests or other statements of fact means that the statements made on the document are a true statement as attested to by the certifying entity.

1.2 SPECIFICATION SENTENCE STRUCTURE

- A. Specifications are written in modified brief style. Requirements apply to all work of the same kind, class, and type even though the word "all" is not stated.
- B. Simple imperative sentence structure is used which places a verb as the first word in the sentence. It is understood that the words "furnish", "install", "provide", or similar words include the meaning of the phrase "The Contractor shall." before these words.
- C. It is understood that the words "directed", "designated", "requested", "authorized", "approved", "selected", or similar words include the meaning of the phrase "by the Engineer" after these words unless otherwise stated. Use of these words does not extend the Engineer's responsibility for construction supervision or responsibilities beyond those defined in the General Conditions.
- D. "At no additional cost to Owner", "With no extra compensation to Contractor", "At Contractor's own expense", or similar words mean that the Contractor will perform or provide specified operation of work without any increase in the Contract Amount. It is understood that the cost for performing all work is included in the amount bid and will be performed at no additional cost to the Owner unless specifically stated otherwise.

1.3 DOCUMENT ORGANIZATION

- A. Organization of Contract Documents is not intended to control or to lessen the responsibility of the Contractor when dividing work among subcontractors, or to establish the extent of work to be performed by any trade, subcontractor or vendor. Specification or details do not need to be indicated or specified in each specification or drawing. Items shown in the contract documents are applicable regardless of location in the Contract Documents.
- B. Standard paragraph titles and other identifications of subject matter in the specifications are intended to aid in locating and recognizing various requirements of the specifications. Titles do not define, limit, or otherwise restrict specification text.
- C. Capitalizing words in the text does not mean that these words convey special or unique meanings or have precedence over other parts of the Contract Documents. Specification text governs over titling and it is understood that the specification is to be interpreted as a whole.
- D. Drawings and specifications do not indicate or describe all of the work required to complete the project. Additional details required for the correct installation of selected products are to be provided by the Contractor and coordinated with the Engineer. Provide any work, materials or equipment required for a complete and functional system even if they are not detailed or specified.

1.4 INTERPRETATIONS OF DOCUMENTS

- A. Comply with the most stringent requirements where compliance with two (2) or more standards is specified, and they establish different or conflicting requirements for minimum quantities or quality levels, unless Contract Documents indicate otherwise.
 - 1. Quantity or quality level shown or indicated shall be minimum to be provided or performed in every instance.
 - 2. Actual installation may comply exactly with minimum quality indicated, or it may exceed that minimum within reasonable limits.
 - 3. In complying with these requirements, indicated numeric values are minimum or maximum values, as noted, or appropriate for context of requirements.
 - 4. Refer instances of uncertainty to the Engineer for a decision before proceeding.
- B. Provide materials and equipment comparable in quality to similar materials and equipment incorporated in the project or as required to meet the minimum requirements of the application if the materials and equipment are shown in the drawings but are not included in the specifications.

1.5 REFERENCE STANDARDS

- A. Comply with applicable construction industry standards as if bound or copied directly into the Contract Documents regardless of lack of reference in the Contract Documents. Apply provisions of the Contract Documents where Contract Documents include more stringent requirements than the referenced standards.
 - 1. Standards referenced directly in the Contract Documents take precedence over standards that are not referenced but recognized in the construction industry as applicable.
 - 2. Comply with standards not referenced but recognized in the construction industry as applicable for performance of the work except as otherwise limited by the Contract

Documents. The Engineer determines whether code or standard is applicable, or which of several are applicable.

- B. Consider a referenced standard to be the latest edition with supplements or amendments when a standard is referred to in an individual specification section but is not listed by title and date.
- C. Trade association names and title of general standards are frequently abbreviated. Acronyms or abbreviations used in the Contract Documents mean the recognized name of trade association, standards generating organization, authority having jurisdiction, or other entity applicable in the context of the Contract Documents. Refer to "Encyclopedia of Associations," published by Gale Research Company.
- D. Make copies of reference standards available as requested by Engineer or Owner.

1.6 SUBSTITUTIONS AND EQUAL PRODUCTS

- A. Provide materials and equipment manufactured by the entities specifically listed in each technical specification section. Submit a Contractor's Modification Request for substitution of materials and equipment of manufacturers not specifically listed or for materials and equipment that does not strictly comply with the Contract Documents.
- B. Contractor may provide "equal" products manufactured by manufacturers other than those specifically listed in the technical specification section unless it is specifically stated that only the materials and equipment of the specified manufacturers shall be provided. Provide a request for approval of proposed equals for any materials or equipment not specifically listed. Submit a Contractor's Modification Request for substitution of materials and equipment of other manufacturers or for materials and equipment that does not strictly comply with the Contract Documents. A Field Order or Change Order will be issued if the contract modification is approved.

END OF SECTION 010500

SECTION 011000

SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Project information.
- 2. Work covered by Contract Documents.
- 3. Phased construction.
- 4. Work by Owner.
- 5. Work under separate contracts.
- 6. Future work.
- 7. Purchase contracts.
- 8. Owner-furnished products.
- 9. Contractor-furnished, Owner-installed products.
- 10. Access to site.
- 11. Coordination with occupants.
- 12. Work restrictions.
- 13. Specification and drawing conventions.
- 14. Miscellaneous provisions.

- B. Related Requirements:

- 1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

- A. Project Identification: J.R. "Milo" Ponce Memorial Park Facility Improvements.

- 1. Project Location: FM 2812-2 miles East of U.S. 281, Edinburg, Texas.

- B. Owner: Hidalgo County.

- 1. Owner's Representative: Steven Cruz (956) 292-7000.

- C. Engineer: Halff Associates, Inc. (956) 664-0286.

Summary

011000 - 1

J. R. "Milo" Ponce Memorial Park Facility Improvements
Halff Project No. 31806 WA03

- D. Engineer's Consultants: The Engineer has retained the following design professionals who have prepared designated portions of the Contract Documents:
 - 1. Architecture: Megamorphosis Design
 - 2. Structural: Chanin Engineering
- E. Other Owner Consultants: The Owner has retained the following design professionals who have prepared designated portions of the Contract Documents:
 - a. Geotechnical Engineering: L & G Engineering.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:
 - 1. Park Improvements including parking, restrooms, irrigation, landscaping, and general improvements.
- B. Type of Contract:
 - 1. Project will be constructed under a single prime contract.

1.5 PHASED CONSTRUCTION

- A. The Work shall be conducted in one phase.

1.6 WORK BY OWNER

- A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

1.7 OWNER-FURNISHED PRODUCTS

- A. None.

1.8 CONTRACTOR-FURNISHED, OWNER-INSTALLED PRODUCTS

- A. None.

1.9 ACCESS TO SITE

- A. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine construction operations to areas shown.
 2. Limits: Limit site disturbance, including earthwork and clearing of vegetation, to 40 feet beyond building perimeter; 10 feet beyond surface walkways, patios, surface parking, and utilities less than 12 inches in diameter; 15 feet beyond primary roadway curbs and main utility branch trenches; and 25 feet beyond constructed areas with permeable surfaces (such as pervious paving areas, stormwater detention facilities, and playing fields) that require additional staging areas in order to limit compaction in the constructed area.
 3. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- B. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

1.10 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy site and existing building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.

1.11 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
1. Notify Engineer not less than two days in advance of proposed utility interruptions.
 2. Obtain Engineer's written permission before proceeding with utility interruptions.
- C. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
1. Notify Engineer not less than two days in advance of proposed disruptive operations.
 2. Obtain Engineer's written permission before proceeding with disruptive operations.
- D. Controlled Substances: Use of controlled substances on Project site is not permitted.

- E. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
- F. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
 - 1. Maintain list of approved screened personnel with Owner's representative.

1.12 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 - 2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.
 - 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012100

ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
 - 1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.
- B. Types of allowances include the following:
 - 1. Contingency allowances.
 - 2. Testing and inspecting allowances.
- C. Related Requirements:
 - 1. Section 014000 "Quality Requirements" for procedures governing the use of allowances for testing and inspecting.

1.3 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Engineer of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- B. At Engineer's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

1.4 ACTION SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

1.5 INFORMATIONAL SUBMITTALS

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.6 COORDINATION

- A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.7 CONTINGENCY ALLOWANCES

- A. Use the contingency allowance only as directed by Engineer for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.
- B. Contractor's Engineer related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, insurance, equipment rental, and similar costs.
- C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit margins are included in the Contractor's base bid.
- D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.8 TESTING AND INSPECTING ALLOWANCES

- A. Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.
- B. The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labor to assist the testing agency shall be included in the Contract Sum.
- C. Costs of services not required by the Contract Documents are not included in the allowance.
- D. At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1: Contingency Allowance: Include a contingency allowance of \$50,000.00 for use according to Owner's written instructions.
- B. Allowance No. 2: Testing and Inspection Allowance: Include the sum of \$3,000.00 for construction material.

END OF SECTION 012100

SECTION 012500

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.2 MINOR CHANGES IN THE WORK

- A. Engineer will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

1.3 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Engineer will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by Engineer are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request or 10 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - e. Quotation Form: Use forms acceptable to Engineer.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Engineer.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 1 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Engineer.

1.4 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Engineer will issue a Change Order for signatures of Owner and Contractor.

1.5 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Engineer may issue a Construction Change Directive. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order or Allowance Expenditure.
 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 012900

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections:
 - 1. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 2. Division 01 Section "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.
 - 3. Division 01 Section "Submittal Procedures" for administrative requirements governing the preparation and submittal of the submittal schedule.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Correlate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Engineer at earliest possible date but no later than fourteen days before the date scheduled for submittal of initial Applications for Payment.

- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Name of Engineer.
 - c. Engineer's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 2. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of Contract Sum.
 - a. Include separate line items under Contractor and principal subcontracts for project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
 4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
 6. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
 7. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate owner payments or deposits, if any, and balance to be paid by Contractor.
 8. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

- a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
9. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Engineer and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: Progress payments shall be submitted to Engineer by the fifth of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.
- C. Application for Payment Forms: Use included form for Applications for Payment. Contractor shall provide schedule of values using from acceptable to Owner.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Engineer will return incomplete applications without action.
 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 3. Provide summary documentation for stored materials indicating the following:
 - a. Materials previously stored and included in previous Applications for Payment.
 - b. Work completed for this Application utilizing previously stored materials.

- c. Additional materials stored with this Application.
 - d. Total materials remaining stored, including materials with this Application.
- F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Engineer by a method ensuring receipt. One copy shall include waivers of lien and similar attachments if required.
 - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
 - 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 - 2. When an application shows completion of an item, submit conditional final or full waivers.
 - 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 - 4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
 - 1. List of subcontractors.
 - 2. Schedule of values.
 - 3. Contractor's construction schedule (preliminary if not final).
 - 4. Products list (preliminary if not final).
 - 5. Submittal schedule (preliminary if not final).
 - 6. List of Contractor's staff assignments.
 - 7. List of Contractor's principal consultants.
 - 8. Copies of building permits.
 - 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 - 10. Initial progress report.
 - 11. Report of preconstruction conference.
 - 12. Certificates of insurance and insurance policies.
 - 13. Performance and payment bonds.
 - 14. Data needed to acquire Owner's insurance.
- I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
 - 1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 - 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. "Contractor's Affidavit of Payment of Debts and Claims."
5. "Contractor's Affidavit of Release of Liens."
6. "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

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SECTION 013100

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Coordination Drawings.
 - 2. Administrative and supervisory personnel.
 - 3. Project meetings.
 - 4. Requests for Interpretation (RFIs).
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.
- C. Related Sections include the following:
 - 1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.
 - 2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 3. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

- A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.4 COORDINATION

- A. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's Construction Schedule.
 2. Preparation of the Schedule of Values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Preinstallation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.
 9. Project closeout activities.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.5 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of Engineerural, structural, civil, mechanical, and electrical systems.
 - b. Indicate required installation sequences.

- c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Engineer for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 - 2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 24 by 36 inches.
 - 3. Number of Copies: Submit four opaque copies of each submittal. Engineer will return three copies.
 - 4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including mobile and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
- 1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.6 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
 - 1. Include special personnel required for coordination of operations with other contractors.

1.7 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
 - 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Engineer of scheduled meeting dates and times.
 - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 - 3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Engineer, within [three] days of the meeting.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Engineer, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, Engineer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for RFIs.
 - g. Procedures for testing and inspecting.
 - h. Procedures for processing Applications for Payment.
 - i. Distribution of the Contract Documents.
 - j. Submittal procedures.
 - k. Preparation of Record Documents.
 - l. Use of the premises and existing building.
 - m. Work restrictions.
 - n. Owner's occupancy requirements.
 - o. Responsibility for temporary facilities and controls.
 - p. Construction waste management and recycling.
 - q. Parking availability.
 - r. Office, work, and storage areas.
 - s. Equipment deliveries and priorities.
 - t. First aid.
 - u. Security.
 - v. Progress cleaning.
 - w. Working hours.
 3. Minutes: Record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Engineer of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. The Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.

- i. Possible conflicts.
 - j. Compatibility problems.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written recommendations.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
- 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 - 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings at biweekly intervals. Coordinate dates of meetings with preparation of payment requests.
- 1. Attendees: In addition to representatives of Owner, and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.

- 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Status of correction of deficient items.
 - 14) Field observations.
 - 15) RFIs.
 - 16) Status of proposal requests.
 - 17) Pending changes.
 - 18) Status of Change Orders.
 - 19) Pending claims and disputes.
 - 20) Documentation of information for payment requests.
3. Minutes: Record the meeting minutes.
 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- E. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of Owner, and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Combined Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Schedule Updating: Revise Combined Contractor's Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.

- c. Review present and future needs of each contractor present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Change Orders.
- 3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.8 REQUESTS FOR INTERPRETATION (RFIs)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
 - 1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
 - 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
 - 1. Project name.
 - 2. Date.
 - 3. Name of Contractor.
 - 4. Name of Engineer.
 - 5. RFI number, numbered sequentially.
 - 6. Specification Section number and title and related paragraphs, as appropriate.
 - 7. Drawing number and detail references, as appropriate.
 - 8. Field dimensions and conditions, as appropriate.
 - 9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 - 10. Contractor's signature.
 - 11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

- a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.
- C. Hard-Copy RFIs.
 - 1. Identify each page of attachments with the RFI number and sequential page number.
- D. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.
 - 1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- E. Engineer's Action: Engineer will review each RFI, determine action required, and return it. Allow seven working days for Engineer's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.
 - 1. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Engineer's actions on submittals.
 - f. Incomplete RFIs or RFIs with numerous errors.
 - 2. Engineer's action may include a request for additional information, in which case Engineer's time for response will start again.
 - 3. Engineer's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Engineer in writing within 10 days of receipt of the RFI response.
- F. On receipt of Engineer's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Engineer within seven days if Contractor disagrees with response.
- G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log bi-weekly. Include the following:
 - 1. Project name.
 - 2. Name and address of Contractor.
 - 3. Name and address of Engineer.
 - 4. RFI number including RFIs that were dropped and not submitted.
 - 5. RFI description.
 - 6. Date the RFI was submitted.
 - 7. Date Engineer's response was received.

8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

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SECTION 013200

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Preliminary Construction Schedule.
 - 2. Contractor's Construction Schedule.
 - 3. Submittals Schedule.
 - 4. Daily construction reports.
 - 5. Material location reports.
 - 6. Field condition reports.
 - 7. Special reports.
- B. Related Sections include the following:
 - 1. Division 01 Section "Payment Procedures" for submitting the Schedule of Values.
 - 2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
 - 3. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
 - 4. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the Schedule of Values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Engineer.

- C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- D. Event: The starting or ending point of an activity.
- E. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- F. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.
- G. Major Area: A story of construction, a separate building, or a similar significant construction element.
- H. Milestone: A key or critical point in time for reference or measurement.
- I. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 SUBMITTALS

- A. Qualification Data: For scheduling consultant.
- B. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:
 - 1. Scheduled date for first submittal.
 - 2. Specification Section number and title.
 - 3. Submittal category (action or informational).
 - 4. Name of subcontractor.
 - 5. Description of the Work covered.
 - 6. Scheduled date for Engineer's final release or approval.
- C. Preliminary Construction Schedule: Submit two opaque copies.
 - 1. Approval of cost-loaded preliminary construction schedule will not constitute approval of Schedule of Values for cost-loaded activities.
- D. Preliminary Network Diagram: two opaque copies, large enough to show entire network for entire construction period. Show logic ties for activities.
- E. Contractor's Construction Schedule: Submit two opaque copies of initial schedule, large enough to show entire schedule for entire construction period.

1. Submit an electronic copy of schedule, using software indicated, on CD-R, and labeled to comply with requirements for submittals. Include type of schedule (Initial or Updated) and date on label.
- F. Daily Construction Reports: Submit two copies at monthly intervals.
- G. Material Location Reports: Submit two copies at monthly intervals.
- H. Field Condition Reports: Submit two copies at time of discovery of differing conditions.
- I. Special Reports: Submit two copies at time of unusual event.

1.5 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
 1. Secure time commitments for performing critical elements of the Work from parties involved.
 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
 1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
 2. Initial Submittal: Submit concurrently with preliminary bar-chart schedule. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 - a. At Contractor's option, show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.
 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
- B. Time Frame: Extend schedule from date established for commencement of the Work to date of Substantial Completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than 21 days, unless specifically allowed by Engineer.
 - 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
 - 4. Startup and Testing Time: Include not less than 14 days for startup and testing.
 - 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Engineer's administrative procedures necessary for certification of Substantial Completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 - 1. Phasing: Arrange list of activities on schedule by phase.
 - 2. Work under More Than One Contract: Include a separate activity for each contract.
 - 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 - 4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 - 5. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.

6. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Startup and placement into final use and operation.
 7. Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Permanent space enclosure.
 - c. Completion of mechanical installation.
 - d. Completion of electrical installation.
 - e. Substantial Completion.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.
1. <Insert additional milestones not indicated elsewhere.>
 2. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned
- F. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

2.3 PRELIMINARY CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within seven days of date established for commencement of the Work.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for commencement of the Work. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 - 1. For construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.5 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 - 1. List of subcontractors at Project site.
 - 2. List of separate contractors at Project site.
 - 3. Approximate count of personnel at Project site.
 - 4. Equipment at Project site.
 - 5. Material deliveries.
 - 6. High and low temperatures and general weather conditions.
 - 7. Accidents.
 - 8. Meetings and significant decisions.
 - 9. Unusual events (refer to special reports).
 - 10. Stoppages, delays, shortages, and losses.
 - 11. Meter readings and similar recordings.
 - 12. Emergency procedures.
 - 13. Orders and requests of authorities having jurisdiction.
 - 14. Change Orders received and implemented.
 - 15. Construction Change Directives received and implemented.
 - 16. Services connected and disconnected.
 - 17. Equipment or system tests and startups.
 - 18. Partial Completions and occupancies.
 - 19. Substantial Completions authorized.
- B. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.
- C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.6 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Engineer, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

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SECTION 013000

SUBMITTALS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Submit documentation as required by the Contract Documents and as reasonably requested by the Owner and Engineer to:
 - 1. Record the products incorporated into the Project for the Owner.
 - 2. Provide information for operation and maintenance of the Project.
 - 3. Provide information for the administration of the Contract.
 - 4. Allow the Engineer to advise the Owner if products proposed for the project by the Contractor conform, in general, with the design concepts of the Contract Documents.
- B. Contractor's responsibility for full compliance with the Contract Documents is not relieved by the Engineer's review of submittals. Contract modifications may only be approved by Change Order or Field Order.

1.2 CONTRACTOR'S RESPONSIBILITIES

- A. Review all submittals prior to submission.
- B. Determine and verify:
 - 1. Field measurements.
 - 2. Field construction requirements.
 - 3. Location of all existing structures, utilities and equipment related to the submittals.
 - 4. Submittals are complete for their intended purpose.
 - 5. Conflicts between the submittals related to the various subcontractors and suppliers have been resolved.
 - 6. Quantities and dimensions shown on the submittals.
- C. Submit information per the procedures described in this section and the detailed specifications.
- D. Furnish the following submittals:
 - 1. As specified in the attached Submittal Schedule.
 - 2. Schedules, data and other documentation as described in detail in this section or referenced in the General Conditions.
 - 3. Submittals as required in the detailed specifications.
 - 4. Submittals not required will be returned without Engineer's review.
- E. Submit a schedule indicating the date submittals will be sent to the Engineer and proposed dates that the product will be incorporated into the project. Make submittals promptly in accordance with the schedule so as to cause no delay in the project.
 - 1. Submittals shall be sent to Engineer allowing a reasonable time for delivery, review and marking submittals. Time for review is to include time for resubmission if necessary and to allow adequate time for the ordering, fabrication, and delivery of the product.
 - 2. Schedule submittal to provide all information for interrelated work at one time. No review will be performed on submittals requiring coordination with other submittals. Engineer will return submittals for resubmission as a complete package.

- F. Installation of any products prior to the approval of shop drawings is done at the Contractor's risk. Products not meeting the requirements of Contract Documents are defective and may be rejected at the Owner's option.
- G. Payment will not be made for products for which submittals are required until the submittals have been received. Payment will not be made for products for which shop drawings or samples are required until these are approved by the Engineer.

1.3 QUALITY ASSURANCE

- A. Submit legible, accurate, complete documents presented in a clear, easily understood manner. Submittals not meeting these criteria will be returned without review.
- B. Demonstrate that the proposed products are in full and complete compliance with the design criteria and requirements of the Contract Documents including drawings and specifications as modified by Addenda, Field Orders, and Change Orders.
- C. Furnish and install products that fully comply with the information included in the submittal.
- D. Review and approve submittals prior to submitting them to the Engineer for review. Submittals will not be accepted from subcontractors, suppliers, or anyone other than the Contractor.

1.4 SUBMITTAL PROCEDURES

- A. Deliver submittals to the Engineer.
- B. Assign a number to the documents originated to allow tracking of the submittal during the review process.
 - 1. Assign a number consisting of a prefix, a sequence number, and a letter suffix. Prefixes shall be as follows:

Prefix	Description	Originator
CO	Change Order	Contractor
CMR	Contractor's Modification Request	Contractor
CTR	Certified Test Report	Contractor
EIR	Equipment Installation Report	Contractor
FO	Field Order	Engineer
NBC	Notification by Contractor	Contractor
O&M	Operation & Maintenance Manuals	Contractor

PCM	Proposed Contract Modification	Engineer
PR	Payment Request	Contractor
PP	Project Photographs	Contractor
RD	Record Data	Contractor
RFI	Request for Information	Contractor
SAM	Sample	Contractor
SD	Shop Drawing	Contractor
SCH	Schedule of Progress	Contractor

2. Issue sequence numbers in chronological order for each type of submittal.
 3. Issue numbers for re-submittals that have the same number as the original submittal followed by an alphabetical suffix indicating the number of times the same submittal has been sent to the Engineer for processing. For example: SD-025-A represents a shop drawing that is the twenty-fifth submittal of this type and is the second time this submittal has been sent for review.
 4. Clearly note the submittal number on each page or sheet of the submittal.
 5. Correct assignment of numbers is essential since different submittal types are processed in different ways.
- C. Submit documents with uniform markings and page sizes.
1. Paper size shall allow for ease of reproduction.
 - a. Submit documents on 8-1/2" X 11" paper where practical.
 - b. Use 11" X 17" paper for larger drawings and schematics.
 - c. Use full size blue-line sheets for fabrications and layout drawings. Reproducible drawings may be submitted in lieu of blue-lines.
 2. Mark submittals to:
 - a. Indicate Contractor's corrections in green.
 - b. Highlight items pertinent to the products being furnished in yellow and delete items that are not when the Manufacturer's standard drawings or information sheets are provided.
 - c. Cloud items and highlight in yellow where selections by the Engineer or Owner are required.
 - d. Mark dimensions with the prefix FD to indicate field verified dimensions on the drawings.
 - e. Provide a blank space 8" x 3" for Contractor's and Engineer's stamp.
- D. Mark submittals to reference the drawing number and/or section of the specifications, detail designation, schedule or location that corresponds with the data submitted. Other identification may also be required, such as layout drawings or schedules to allow the reviewer to determine where a particular product is to be used.

- E. The number of copies of each submittal to be sent by the Contractor and the number of copies of each submittal to be returned are:

Prefix	Description	No. of Copies Sent	No. of Copies Returned
CO	Change Order	2	1
CTR	Certified Test Report	2	0
EIR	Equipment Installation Report	2	0
NBC	Notification by Contractor	2	1
O&M	Preliminary O&M Manuals	2	1
O&M	Final O&M Manuals	4	0
PR	Payment Request	2	1
PP	Project Photographs (including videotapes)	2	0
RD	Record Data	2	0
RFI	Request for Information	2	1
SAM	Sample	2	0
SD	Shop Drawings	5	2
SCH	Schedule of Progress	2	0

1.5 REVIEW PROCEDURES

- A. Priority submittals will be reviewed before other submittals for this project which have been received but not reviewed.

1.6 REQUIREMENTS

- A. Certifications, Warranties and Service Agreements include documents as specified in the detailed specifications, as shown in the submittal schedule or as follows:
1. Certified Test Reports (CTR) - A report prepared by an approved testing agency giving results of tests performed on products to indicate their compliance with the specifications. (Refer to Section 01400, QUALITY CONTROL.)
 2. Certification of Local Field Service (CLS) - A certified letter stating that field service is available from a factory or supplier approved service organization located within a 300 mile radius of the project site. List names, addresses, and telephone numbers of approved service organizations on or attach to the certificate.

3. Extended Warranty (EW) - A guarantee of performance for the product or system beyond the normal one (1) year warranty described in the General Conditions. Issue the warranty certificate in the name of the Project Owner.
 4. Extended Service Agreement (ESA) - A contract to provide maintenance beyond that required to fulfill requirements for warranty repairs, or to perform routine maintenance for a definite period of time beyond the warranty period. Issue the service agreement in the name of the Project Owner.
 5. Certification of Adequacy of Design (CAD) - A certified letter from the manufacturer of the equipment stating that they have designed the equipment to be structurally stable and to withstand all imposed loads without deformation, failure, or adverse effects to the performance and operational requirements of the unit. The letter shall state that mechanical and electrical equipment is adequately sized to be fully operational for the conditions specified or normally encountered by the product's intended use.
 6. Certification of Applicator/Subcontractor (CSQ) - A certified letter stating that the Applicator or Subcontractor proposed to perform a specified function is duly designated as factory authorized and trained for the application of the specified product.
- B. Submit record data to provide information to allow the Owner to adequately identify the products incorporated into the project and allow replacement or repair at some future date.
1. Provide record data for all products. Record data is not required for items for which shop drawings and/or operations and maintenance manuals are required.
 2. Provide information only on the specified products. Submit a Contractor's Modification Request for approval of deviations or substitutions and obtain approval by Field Order or Change Order prior to submitting Record Data.
 3. Record data will be received by the Engineer, logged, and provided to Owner for his/her record.
 - a. Record data may be reviewed to see that the information provided is adequate for the purpose intended. Inadequate drawings may be returned as unacceptable.
 - b. Record data is not reviewed for compliance with the Contract Documents. Comments may be returned if deviations from the Contract Documents are noted during the cursory review performed to see that the information is adequate.

1.7 REQUESTS FOR DEVIATION

- A. Submit requests for deviation from the Contract Documents for any product that does not fully comply with the specifications.
- B. Submit request by Contractor's Modification Request (CMR). Identify the deviations and the reason the change is requested.
- C. Deviations that result in a reduction in cost shall also include the amount of the reduction to the Owner.
- D. A Change Order or Field Order will be issued by the Engineer for deviations approved by the Owner. Deviations from the Contract Documents may only be approved by Change Order or Field Order.

1.8 SUBMITTALS FOR SUBSTITUTIONS

- A. Substitutions are defined as any product that the Contractor proposes to provide for the Project in lieu of the specified product.

- B. If the Contractor desires to submit a manufacturer or product which is not specified, the Contractor must submit the following for consideration of approval of the substitution:
1. Contractor's Modification Request for deviation from the Contract Documents per Paragraph 1.07.
 2. Prove that the product is acceptable as a substitute. It is not the Engineer's responsibility to prove the product is not acceptable as a substitute.
 - a. Indicate on a point by point basis for each specified feature that the product is acceptable to meet the intent of the Contract Documents requirements.
 - b. Make a direct comparison with the specified manufacturer's published data sheets and available information. Provide this printed material with the submittal.
 - c. The decision of the Engineer regarding the acceptability of the proposed substituted product is final.
 3. Provide a typewritten certification that, in making the substitution request, the Contractor:
 - a. Has determined that the substituted product will perform in substantially the same manner and result in the same ability to meet the specified performance as the specified product.
 - b. Will provide the same warranties and/or bonds for the substituted product as specified or as would be provided by the Manufacturer of the specified product.
 - c. Will assume all responsibility to coordinate any modifications that may be necessary to incorporate the substituted product into the project and will waive all claims for additional work which may be necessary to incorporate the substituted product into the project which may subsequently become apparent.
 - d. Will maintain the same time schedule as for the specified product.
- C. Engineering cost for review of substitutions will be paid by the Contractor.
1. Cost for additional review time will be billed to the Owner by the Engineer for the actual hours required for the review and marking of shop drawings by Engineer and in accordance with the following rates:

Principal-in-Charge	\$ 190.00
Project Manager	\$ 130.00
Design Engineer	\$ 85.00
Engineering Technician	\$ 65.00
Clerk	\$ 55.00
 2. Cost for the additional review shall be paid to the Owner by the Contractor on a monthly basis.

1.9 GUARANTEES

- A. Warranties and guarantees shall be submitted as required by the Contract Documents and submitted with the shop drawings or record data.

1.10 RESUBMISSION REQUIREMENTS

- A. Make all corrections or changes in the submittals required by the Engineer and resubmit until approved.
- B. Need for more than one resubmission or any other delay of obtaining Engineer's review of submittals, will not entitle the Contractor to an extension of Contract Time. All costs associated with such delays shall be at the Contractor's expense.

1.11 ENGINEER'S DUTIES

- A. Review the submittals and return with reasonable promptness.
- B. Affix stamp, indicate approval, rejection, and the need for re-submittal.
- C. Distribute documents.

END OF SECTION 013300

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SECTION 0013300

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Sections include the following:
 - 1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the Schedule of Values.
 - 2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
 - 3. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.
 - 4. Division 01 Section "Quality Requirements" for submitting test and inspection reports.
 - 5. Division 01 Section "Closeout Procedures" for submitting warranties.
 - 6. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 7. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 8. Division 01 Section "Demonstration and Training" for submitting videotapes of demonstration of equipment and training of Owner's personnel.
 - 9. Divisions 02 through 16 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Engineer's responsive action.
- B. Informational Submittals: Written information that does not require Engineer's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings will be provided by Engineer for Contractor's use in preparing submittals.

- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
 4. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Engineer and to Engineer's consultants, allow 15 days for review of each submittal. Submittal will be returned to Engineer before being returned to Contractor.
- E. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Engineer.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Submittal number or other unique identifier, including revision identifier.
 - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 06100.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 06100.01.A).

- i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product is to be installed, as appropriate.
 - l. Other necessary identification.
- F. Deviations: Highlight, or otherwise specifically identify deviations from the Contract Documents on submittals.
- G. Additional Copies: Unless additional copies are required for final submittal, and unless Engineer observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
 - 1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Engineer.
 - 2. Additional copies submitted for maintenance manuals will not be marked with action taken and will be returned.
- H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Engineer will return submittals, without review, received from sources other than Contractor.
 - 1. Transmittal Form: Provide locations on form for the following information:
 - a. Project name.
 - b. Date.
 - c. Destination (To:).
 - d. Source (From:).
 - e. Names of subcontractor, manufacturer, and supplier.
 - f. Category and type of submittal.
 - g. Submittal purpose and description.
 - h. Specification Section number and title.
 - i. Drawing number and detail references, as appropriate.
 - j. Transmittal number.
 - k. Submittal and transmittal distribution record.
 - l. Remarks.
 - m. Signature of transmitter.
 - 2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Engineer on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.
- I. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
- J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

- K. Use for Construction: Use only final submittals.

1.5 CONTRACTOR'S USE OF ENGINEER'S CAD FILES

- A. General: At Contractor's written request, copies of Engineer's CAD files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:
 - 1. Signed agreement to Consultant's drawing release form.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
 - 1. Submit electronic submittals directly to extranet specifically established for Project.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts.
 - e. Manufacturer's catalog cuts.
 - f. Wiring diagrams showing factory-installed wiring.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Mill reports.
 - j. Standard product operation and maintenance manuals.
 - k. Compliance with specified referenced standards.
 - l. Testing by recognized testing agency.
 - m. Application of testing agency labels and seals.
 - n. Notation of coordination requirements.
 - 4. Submit Product Data before or concurrent with Samples.
 - 5. Number of Copies: Submit four copies of Product Data, unless otherwise indicated. Engineer will return minimum two copies. Mark up and retain one returned copy as a Project Record Document.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shopwork manufacturing instructions.
 - g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.
 - j. Compliance with specified standards.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.
 - m. Relationship to adjoining construction clearly indicated.
 - n. Seal and signature of professional engineer if specified.
 - o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 24 by 36 inches.
 3. Number of Copies: Submit four opaque (bond) copies of each submittal. Engineer will return one copy.
- D. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product.
 2. Number and name of room or space.
 3. Location within room or space.
 4. Number of Copies: Submit three copies of product schedule or list, unless otherwise indicated. Engineer will return two copies.
 - a. Mark up and retain one returned copy as a Project Record Document.
- E. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation" for Construction Manager's action.
- F. Submittals Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- G. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."
- H. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

- I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 2. Number and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.
 4. Number of Copies: Submit three copies of subcontractor list, unless otherwise indicated. Engineer will return two copies.
 - a. Mark up and retain one returned copy as a Project Record Document.

2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
 1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated. Engineer will not return copies.
 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 3. Test and Inspection Reports: Comply with requirements specified in Division 01 Section "Quality Requirements."
- B. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."
- C. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of Engineers and owners, and other information specified.
- E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

- H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- I. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- J. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- K. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- L. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- M. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."
- N. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- O. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- P. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- Q. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- R. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads.

Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

- S. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
 - 1. Preparation of substrates.
 - 2. Required substrate tolerances.
 - 3. Sequence of installation or erection.
 - 4. Required installation tolerances.
 - 5. Required adjustments.
 - 6. Recommendations for cleaning and protection.
- T. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
 - 1. Name, address, and telephone number of factory-authorized service representative making report.
 - 2. Statement on condition of substrates and their acceptability for installation of product.
 - 3. Statement that products at Project site comply with requirements.
 - 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 - 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 6. Statement whether conditions, products, and installation will affect warranty.
 - 7. Other required items indicated in individual Specification Sections.
- U. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- V. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Engineer.
 - 1. Engineer will not review submittals that include MSDSs and will return the entire submittal for resubmittal.

2.3 DELEGATED DESIGN

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design

professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ENGINEER'S ACTION

- A. General: Engineer will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or modifications required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
- C. Informational Submittals: Engineer will review each submittal and will not return it, or will return it if it does not comply with requirements. Engineer will forward each submittal to appropriate party.
- D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

SECTION 014000

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Engineer, Owner or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections include the following:
 - 1. Division 01 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
 - 2. Division 01 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
 - 3. Divisions 02 through 16 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

- C. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
- D. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- E. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- F. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- G. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- H. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Engineer for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Engineer for a decision before proceeding.

1.5 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

C. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirement for specialists shall not supersede building codes and regulations governing the Work.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
 - 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Engineer with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

1.7 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 - 2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
 - 3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 - 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."
- D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- E. Testing Agency Responsibilities: Cooperate with Engineer and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1. Notify Engineer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 - 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for commencement of the Work.
1. Distribution: Distribute schedule to Owner, Engineer testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.8 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:
 - 1. Date test or inspection was conducted.
 - 2. Description of the Work tested or inspected.
 - 3. Date test or inspection results were transmitted to Engineer.
 - 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Engineer's reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
 - 2. Comply with the Contract Document requirements for Division 01 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

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SECTION 015000

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Sections include the following:
 - 1. Division 01 Section "Summary" for limitations on utility interruptions and other work restrictions.
 - 2. Division 01 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
 - 3. Division 01 Section "Execution" for progress cleaning requirements.
 - 4. Divisions 02 through 16 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.
 - 5. Division 01 Section "Dewatering" for disposal of ground water at Project site.
 - 6. Division 02 Section "Termite Control" for pest control.
 - 7. Division 02 Section "Asphalt Paving" for construction and maintenance of asphalt paving for temporary roads and paved areas.
 - 8. Division 02 Section "Concrete Paving" for construction and maintenance of cement concrete pavement for temporary roads and paved areas.

1.3 DEFINITIONS

- A. Permanent Enclosure: As determined by Engineer, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 USE CHARGES

- A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Engineer, testing agencies, and authorities having jurisdiction.

- B. Sewer Service: Pay sewer service use charges for sewer usage by all entities for construction operations.
- C. Water Service: For existing construction only, Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- D. Electric Power Service: For existing construction only, Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.5 SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.6 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.7 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Pavement: Comply with Division 02 pavement Sections.
- B. Portable Chain-Link Fencing: Minimum 2-inch, 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide concrete bases for supporting posts.
- C. Lumber and Plywood: Comply with requirements in Division 06 Section "Rough Carpentry."
- D. Gypsum Board: Minimum 1/2 inch thick by 48 inches wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36/C 36M.

- E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
- F. Paint: Comply with requirements in Division 09 painting Sections.

2.2 TEMPORARY FACILITIES

- A. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment:
 - 1. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Water Service: In existing building only, use of Owner's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

- D. Electric Power Service: In existing building only, Use of Owner's existing electric power service will be permitted, as long as equipment is maintained in a condition acceptable to Owner.
- E. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 - 1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines. Comply with NFPA 241.
 - 2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- C. Parking: Provide temporary parking areas for construction personnel.
- D. Project Identification and Temporary Signs: Provide Project identification and other signs. Install signs prominently to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.
 - 1. Provide temporary, directional signs for construction personnel and visitors.
 - 2. Maintain and touchup signs so they are legible at all times.
 - 3. Project identification sign shall be 4'x4'x1/2" painted plywood supported by 4'x4' posts and shall include the following information:
 - a. Project name.
 - b. Names of County officials. Coordinate with Owner.
 - c. Contractor Name.
 - d. A/E firm names.
 Submit proposed sign for approval.
- E. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 01 Section "Execution" for progress cleaning requirements.
- F. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
 - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 - 1. Comply with work restrictions specified in Division 01 Section "Summary."
- B. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.
- C. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
- D. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.
 - 1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant plywood on construction operations side.
 - 2. Construct dustproof partitions with 2 layers of 3-mil polyethylene sheet on each side. Cover floor with 2 layers of 3-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant plywood.
 - 3. Insulate partitions to provide noise protection to occupied areas.
 - 4. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
 - 5. Protect air-handling equipment.
 - 6. Weather strip openings.
 - 7. Provide walk-off mats at each entrance through temporary partition.
- E. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
 - 1. Prohibit smoking in construction areas.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 - 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 - 2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
 - 3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION 015000

SECTION 015600

CONSTRUCTION TRAFFIC CONTROL

PART 1 - GENERAL

1.1 GENERAL DESCRIPTION OF WORK

- A. This item shall consist of the construction, manipulation, maintenance and removal, if required, of detours of the length and to the lines, grades and typical sections indicated and providing for installing, moving, replacing, maintaining, cleaning and removing upon completion of the work, as required, all detour markers, signs, barricades and other devices used in traffic control and handling at the construction site as indicated or as directed by the Engineer.
- B. This item shall also consist of providing installing, moving, replacing, maintaining, cleaning and removing temporary or permanent street closure barricades, signs or other devices required to handle the traffic in conformance with the current edition of the Texas Manual of Uniform traffic Control Devices of Street and Highways and as indicated or directed by the Engineer.

1.2 SUBMITTAL

- A. Conform to requirements of Section 013300, SUBMITTALS.
- B. Submit proposed traffic routing plan, in accordance with the Texas Manual on Uniform Traffic Control Devices (TxMUTCD), latest edition.

PART 2 - PRODUCTS

2.1 CONSTRUCTION TRAFFIC CONTROL SIGNS

- A Construction traffic control signs shall constructed by plywood.
 - 1. Construction traffic control signs used herein shall be fabricated using sheeting conforming to the requirements of the manufacturer.
 - 2. The substrate for construction signs need only be sufficiently durable to last the life of the project and sufficiently rigid to hold the sheeting in a flat plan.

2.2 SIGN SUPPORTS

- A. Supports for construction traffic control signs shall be grade #2 fir or yellow pine, pressure treated with pentachlorophenol.
- B. Supports shall have a minimum nominal size of 4-inches x 4-inches and conform to the details shown on the plans.

2.3 PORTABLE SIGN SUPPORT

- A. Materials for portable sign supports shall comply with the details shown on the plans. Portable sign supports other than those shown on the plans shall be submitted to the Project Manager for

approval prior to use.

2.4 BARRICADES

- A. Barricades shall be classified as Type I, Type II or Type III and shall comply with the details shown on the plans and the TxMUTCD.
 - 1. Barricade rails shall be fabricated using S4S Grade #2 fir or yellow pine and reflectorized sheeting conforming to the requirements.

2.5 VERTICAL PANELS

- A. Materials for vertical panels shall conform to the details shown on the plans. Vertical panels shall be reflectorized with orange and white reflective sheeting or tape in accordance with the requirements.

2.6 ABBREVIATED PAVEMENT MARKINGS FOR CONSTRUCTION

- A. The pavement-marking material shall consist of an adhesive-back reflective tape which can get applied to the pavement. Markings shall be of good appearance, have straight, unbroken edges and have a color that complies with all federal regulations.
 - 1. Color
 - (a) The markings, as well as retroreflected light from the markings, shall be white or yellow as indicated.
 - 2. Visibility
 - (a) The pavement markings (during daylight hours) shall be distinctively visible of a minimum of 300 feet unless sight distance is restricted by geometric roadway features.
 - (b) The pavement markings (when illuminated by automobile low beam headlights at night) shall be distinctively visible for a minimum of 160 feet unless sight distance is restricted by geometric features.
 - (c) The above day and night visibility requirements shall be met when viewed from an automobile traveling on the roadway.

2.7 CHANNELIZATION DEVICES

- A. Barrels
 - 1. Barrels shall be of metal or nonmetal composition approved by the Engineer and of 30 to 55 gallon capacity. Only one size may be used on the project. The barrels shall be reflectorized with orange and white reflective sheeting or tape in accordance with the requirements of TxMUTCD. The markings on the barrels shall be horizontal, circumferential, orange wide. There shall be a minimum of 55 alternating orange and white stripes on each barrel. Barrels shall also conform to the details shown on the plans.
 - 2. Type "B" barrels shall be equipped with either Type "A" low intensity or Type "C" steady-burn warning lights complying with the provisions to TMUTCD and the ITE standard for flashing and steady-burn lights. The use warning light shall be as directed by the Engineer.

B. Traffic Cones

1. Traffic cones shall conform to the details shown on the plans.

C. Tubular Traffic Markers

1. Post

- (a) The post shall be of a thermoplastic or pliable elastomer composition meeting the manufacturer's requirements.

- (b) Dimensions:

Outside Diameter	2.23 inches to 4 inches
Wall Thickness	0.125 inch minimum
Length	18 to 36 inches
Color	Orange

2. Base

- (a) The base shall be of thermoplastic or pliable elastomer composition meeting the manufacturer's requirements.

- (b) Dimensions:

Height	1.2 to 2 inches
Outside Diameter	7 to 12 inches
Color	black or same color as post

3. Assembly Units

- (a) Assembly units which are inherent with the particular marker shall be as per manufacturer's recommendations.

4. Adhesives

- (a) Adhesive shall be epoxy type (permanent installation or butyl type (temporary installation) as per manufacturer's recommendations.

5. Reflectorization

- (a) If used at night, tubular traffic markers shall have two 3-inch, circumferential reflective bands, no more than 2-inches from the top with no more than 6-inches separating the bands. Reflective material shall be SIA-250 or higher sheeting conforming to the provisions of this Section. The color of reflective material shall be as shown in the plans.

2.8 SEQUENTIAL ARROW DISPLAYS

- A. Sequential arrow displays shall be sequentially lighted and roof or trailer mounted. The minimum panel size shall be 30 inches high and 54-inches wide. The display shall have 22 hooded sealed beam amber lamps rated at a maximum intensity of 8800 candlepower.

- B. Light intensity shall be adjustable by dimmer switch. The operating modes shall be as follows:

1. Pass Left. 3 chevrons of 5 lamps each sequence in right to left pattern 40 to 50 times per minute.
2. Pass Right. 3 chevrons of 5 lamps each sequence in left to right pattern 40 to 50 times per minute.
3. Pass Either Side. The two outermost chevrons on each end of the panel pointing like arrowheads and flashing 40 to 50 times per minute with crossing row of lamps burning continuously.
4. Warning. 4 lamps, one at each corner of the panel, flashing 40 to 50 times per minute.

PART 3 - EXECUTION

3.1 CONSTRUCTION TRAFFIC CONTROL SIGNS AND SIGN SUPPORTS

- A. Construction traffic control signs and sign supports shall be installed at locations noted on the plans in conformance with the TMUTCD or as directed by the Engineer.

3.2 PORTABLE SIGN SUPPORTS

- A. Portable sign supports for traffic control devices for detours shall be furnished by the Contractor, shall be installed at the locations shown on the plans, unless otherwise shown on the plans, and shall remain the property of the Contractor.
- B. Unless otherwise specified, portable sign supports shall be of the dimensions shown on the plans.

3.3 BARRICADES

- A. Barricades shall be installed in conformity with the details noted on the plans or as directed by the Engineer.

3.4 VERTICAL PANELS

- A. Vertical panels shall be installed in conformity with the details noted on the plans or as directed by the Engineer.

3.5 ABBREVIATED PAVEMENT MARKINGS FOR CONSTRUCTION

- A. Abbreviated markings meeting all specification requirements shall be in place on all roadways on which traffic is allowed and where suitable standard pavement marking is not in place. The transverse location of the line(s) formed by the markings shall be as determined by the Engineer.
- B. Unless otherwise indicated, the abbreviated markings shall be placed as follows:

<u>Condition</u>	<u>Spacing</u>	<u>Length of Stripe</u>
Straight	40 feet approximately	48-inch
Curve greater than 2 degrees	20 feet maximum	48-inch
Curve less than or equal 2 degrees	40 feet maximum	48-inch

- C. Pavement markings shall be a minimum of 3 7/8 inches wide. Length and spacings will be in accordance with these specifications.
- D. The spacing of stripes may be modified by the Engineer. However the maximum spacing specified above shall not be exceeded in any case.
- E. The Contractor will be responsible for maintaining the abbreviated pavement markings until standard pavement markings are in place.

- F. Abbreviated pavement markings shall be removed after all permanent markings have been in place.

3.6 CHANNELIZATION DEVICES

A. Type "A" Barrels

- 1. Type "A" barrels shall be used during daylight hours only and shall not be equipped with warning lights of any type.

B. Type "B" Barrels

- 1. Type "B" barrels shall be equipped with warning lights. Type "B" barrels shall be used during nighttime hours only, unless otherwise shown on the plans or directed by the Project Manager.
- 2. The term "daylight hours" refers to those hours between dawn and dusk. The term "nighttime hours" refers to those hours between dusk and dawn.

C. Traffic Cones

- 1. Traffic cones shall be installed in conformity with the plans and the TMUTCD or as directed by the Engineer.

D. Tubular Traffic Markers

- 1. The metal, concrete or bituminous surface where the tubular traffic markers are to be placed shall be thoroughly cleaned.
- 2. Metal and concrete surfaces shall be sandblasted or wire brushed. Bituminous surfaces shall be cleaned in accordance with manufacturer's recommendations.
- 3. All loose sand, dust and other deleterious debris from cleaned mounting surfaces shall be removed.
- 4. Tubular traffic markers shall be installed in conformity with details and at locations shown on the plans or as directed by the Engineer and in accordance with the manufacturer's recommendation.
- 5. In the event that removal of an installation (temporary or permanent) is effected and the metal, concrete, or bituminous surface is damaged the Contractor shall repair and otherwise restore said surface to its original condition at no additional cost to the Owner.
- 6. All defective post(s), base(s), assembly unit(s), adhesive(s) or reflective sheeting contributing to the detriment of the intended function of the tubular traffic markers shall be replaced by the Contractor at no addition cost to the Owner.
- 7. Channelization devices shall be and installed in accordance with the details shown on the plans, except that barrels shall be as noted herein.

3.7 SEQUENTIAL ARROW DISPLAY

- A. Sequential arrow displays shall be used according to the requirements shown on the plans and shown in TMUTCD.

3.8 CONSTRUCTION DETOURS

- A. The detours shall be constructed at the locations and to the lines and grades indicated and it shall be the entire responsibility of the Contractor to provide for the passage of traffic in comfort and safety without creating a dust problem.

3.9 CONSTRUCTION METHODS

- A. Prior to commencing construction, suitable "Construction Traffic Control" devices shall be installed to protect the workers and the public.
- B. The Contractor shall be responsible for installing all markers, signs and barricades conforming to the Texas Manual on Uniform Traffic Control Devices and/or as indicated. If, in the opinion of the Engineer, additional markers, signs or barricades are needed in the interest of safety, the Contractor will install such as are required or as directed by the Engineer.

END OF SECTION 015600

SECTION 016000

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
- B. Related Sections include the following:
 - 1. Division 01 Section "Closeout Procedures" for submitting warranties for Contract closeout.
 - 2. Divisions 02 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other

designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.4 SUBMITTALS

- A. Product List: Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
 2. Form: Tabulate information for each product under the following column headings:
 - a. Specification Section number and title.
 - b. Generic name used in the Contract Documents.
 - c. Proprietary name, model number, and similar designations.
 - d. Manufacturer's name and address.
 - e. Supplier's name and address.
 - f. Installer's name and address.
 - g. Projected delivery date or time span of delivery period.
 - h. Identification of items that require early submittal approval for scheduled delivery date.
 3. Initial Submittal: Within 30 days after date of commencement of the Work, submit 3 copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.
 - a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
 4. Completed List: Within 60 days after date of commencement of the Work, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
 5. Engineer's Action: Engineer will respond in writing to Contractor within 15 days of receipt of completed product list. Engineer's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Engineer's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.
- B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Substitution Request Form: Use Contractor's standard form.
 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified material or product cannot be provided.

- b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. List of similar installations for completed projects with project names and addresses and names and addresses of Engineers and owners.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.
 - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Engineer will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
- a. Form of Acceptance: Change Order.
 - b. Use product specified if Engineer cannot make a decision on use of a proposed substitution within time allocated.
- C. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
- 1. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Engineer will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."

- b. Use product specified if Engineer cannot make a decision on use of a comparable product request within time allocated.
- D. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
 - 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Engineer will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
- C. Storage:
 - 1. Store products to allow for inspection and measurement of quantity or counting of units.
 - 2. Store materials in a manner that will not endanger Project structure.
 - 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 - 4. Store cementitious products and materials on elevated platforms.
 - 5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 - 6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 - 7. Protect stored products from damage and liquids from freezing.
 - 8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
 - 3. Refer to Divisions 02 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 - 4. Where products are accompanied by the term "as selected," Engineer will make selection.
 - 5. Where products are accompanied by the term "match sample," sample to be matched is Engineer's.
 - 6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
 - 7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Engineer's sample. Engineer's decision will be final on whether a proposed product matches.
 - a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.
10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
 - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Engineer will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
 - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Engineer will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

- A. Timing: Engineer will consider requests for substitution if received within 60 days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Engineer.
- B. Conditions: Engineer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Engineer will return requests without action, except to record noncompliance with these requirements:
 - 1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Engineer for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - 2. Requested substitution does not require extensive revisions to the Contract Documents.
 - 3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - 4. Substitution request is fully documented and properly submitted.
 - 5. Requested substitution will not adversely affect Contractor's Construction Schedule.
 - 6. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - 7. Requested substitution is compatible with other portions of the Work.
 - 8. Requested substitution has been coordinated with other portions of the Work.
 - 9. Requested substitution provides specified warranty.
 - 10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

2.3 COMPARABLE PRODUCTS

- A. Conditions: Engineer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Engineer will return requests without action, except to record noncompliance with these requirements:
 - 1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 - 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - 3. Evidence that proposed product provides specified warranty.
 - 4. List of similar installations for completed projects with project names and addresses and names and addresses of Engineers and owners, if requested.
 - 5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300

EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
 - 8. Correction of the Work.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for limits on use of Project site.
 - 2. Section 013300 "Submittal Procedures" for submitting surveys.
 - 3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
 - 4. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.

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- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- C. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
 - 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
 - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
 - 3. Products: List products to be used for patching and firms or entities that will perform patching work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
- D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- E. Certified Surveys: Submit two copies signed by land surveyor.
- F. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, notify Engineer of locations and details of cutting and await directions from Engineer before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
 - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 - 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in

reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Engineer's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
 - D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Engineer for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where

indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
1. Description of the Work.
 2. List of detrimental conditions, including substrates.
 3. List of unacceptable installation tolerances.
 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Engineer according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Engineer promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 2. Establish limits on use of Project site.
 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 4. Inform installers of lines and levels to which they must comply.
 5. Check the location, level and plumb, of every major element as the Work progresses.
 6. Notify Engineer when deviations from required lines and levels exceed allowable tolerances.
 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Engineer.

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Do not change or relocate existing benchmarks or control points without prior written approval of Engineer. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Engineer before proceeding.
 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
 - 1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
 - 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Engineer.
 2. Allow for building movement, including thermal expansion and contraction.
 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

SECTION 017320

SELECTIVE DEMOLITION

PART 1- GENERAL

1.1 DESCRIPTION OF WORK

This specification shall provide for the removal and disposal of old structures or portions of old structures, as noted on the plans, and shall include all excavation and backfilling necessary to complete the removal. The work shall be done in accordance with the provisions of these specifications.

PART 2- PRODUCTS [NOT USED]

PART 3- EXECUTION

3.1 METHOD OF REMOVAL

A. Steel Structures: Steel structures or steel portions of structures shall be dismantled in sections as determined by the Engineer. The sections shall be stored. Rivets and bolts connecting steel railing members, steel beams of beam spans and steel stringers of truss spans shall be removed by butting the heads with a "cold cut" and punching or drilling from the hole, or by such other method as will not injure the members for re-use and will meet the approval of the Engineer. The removal of rivets and bolts from connections of truss members, bracing members, and other similar members in the structure will not be required unless specifically called for on the plans or special provisions and the Contractor shall have the option of dismantling these members by flame-cutting the members immediately adjacent to the connections. Flame-Cutting will not be permitted, however, when plans or special provisions call for the structure unit to be salvaged in such manner as to permit re-erection. In such case, all members shall be carefully matchmarked with paint in accordance with diagram furnished by the Engineer prior to dismantling, and all rivets and bolts shall be removed from the connections in the manner specified in the first portion of this paragraph.

D. Timber Structures:

1. Timber structures or timber portions of structures shall be removed in such manner as to damage the timber for further use as little as possible. All bolts and nails shall be removed from such lumber as deemed salvable by the Engineer.
2. Unless otherwise specified on the plans, timber piles shall be either pulled or cut off at the point not less than 2 feet below ground line, with the choice between these two methods resting with the Contractor, unless otherwise specified.

E. Brick or Stone Structures:

1. Brick or stone structures or stone portions of structures shall be removed by blasting and/or sledging the masonry into sizes not larger than one cubic foot.

2. Portions of such structures below the permanent ground line, which will not in any manner interfere with the proposed construction, may be left in place, but removal shall be carried at least 2 feet below the permanent ground line and neatly squared off.

F. Salvage:

All material such as pipe, timbers, railings, etc., which the Engineer deems as salvageable for reuse, and all structural steel shall be in the property of City unless otherwise specified and delivered to a designated storage area.

All mechanical and electrical lift station material, which the Engineer deems as salvageable for reuse, including pumps and control panels shall be in the property of the City unless otherwise specified and delivered to a designated storage area.

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1. The I-beams, stringers, etc., which are specified to be dismantled without damage for reuse, and all steel members when match marked and dismantled for reuse, shall be blocked off the ground in an upright position to protect the members against further damage.
2. Materials, other than structural steel, which are not deemed salvable by the Engineer, shall become the property of the Contractor and shall be removed to suitable disposal sites off of the right-of-way arranged for by the Contractor, or otherwise disposed of in a manner satisfactory to the Engineer.
3. Where temporary structures are necessary for a detour adjacent to the present structure, the Contractor will be permitted to use the material in the old structure for the detour structure, but he shall dismantle and stack or dispose of the material as required above as soon as the new structure is opened for traffic.

H. Backfill:

1. All excavation made in connection with this specification and all openings below the natural ground line caused by the removal of old structures or portions thereof shall be backfilled to the level of the original ground line, unless otherwise provided on the plans.
2. That portion of the backfill which will support any portion of the roadbed or embankment shall be placed in layers of the same depth as those required for placing embankment. Material in each layer shall be wetted uniformly, if required, and shall be compacted to the density required in the adjoining embankment. In places inaccessible to blading and rolling equipment, mechanical or hand tamps or rammers shall be used to obtain the required compaction.
3. That portion of the backfill which will not support any portion of the roadbed or embankment shall be placed as directed by the Engineer in such manner and to such state of compaction as will preclude objectionable amount of settlement.

END OF SECTION 017320

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SECTION 017700
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Warranties.
 - 3. Final cleaning.
- B. Related Sections include the following:
 - 1. Division 01 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
 - 2. Division 01 Section "Execution" for progress cleaning of Project site.
 - 3. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 4. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 5. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
 - 6. Divisions 02 through 16 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Advise Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.

4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 8. Complete startup testing of systems.
 9. Submit test/adjust/balance records.
 10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 11. Advise Owner of changeover in heat and other utilities.
 12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
 13. Complete final cleaning requirements, including touchup painting.
 14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Engineer, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
 2. Submit certified copy of Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Engineer. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report and warranty.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videotapes.

- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 - 1. Organize list of spaces in sequential order.
 - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 - 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Engineer.
 - d. Name of Contractor.
 - e. Page number.

1.6 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Engineer for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Partial Occupancy: Submit properly executed warranties within 14 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - g. Sweep concrete floors broom clean in unoccupied spaces.
 - h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - j. Remove labels that are not permanent.

- k. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - l. Wipe surfaces of mechanical and electrical equipment[, elevator equipment,] and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - m. Replace parts subject to unusual operating conditions.
 - n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - p. Clean ducts, blowers, and coils if units were operated without filters during construction.
 - q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - r. Leave Project clean and ready for occupancy.
- C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 017700

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SECTION 017823

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Product maintenance manuals.
 - 5. Systems and equipment maintenance manuals.
- B. Related Requirements:
 - 1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Engineer will comment on whether content of operations and maintenance submittals are acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Engineer.
 - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft submittals.
 2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Engineer will return two copies.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Engineer will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Engineer will return copy with comments.
1. Correct or revise each manual to comply with Engineer's comments. Submit copies of each corrected manual within 15 days of receipt of Engineer's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
1. List of documents.
 2. List of systems.
 3. List of equipment.
 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to

ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name and contact information for Contractor.
 - 6. Name and contact information for Construction Manager.
 - 7. Name and contact information for Engineer.
 - 8. Name and contact information for Commissioning Authority.
 - 9. Names and contact information for major consultants to the Engineer that designed the systems contained in the manuals.
 - 10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
 - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 - 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily

navigated file tree. Configure electronic manual to display bookmark panel on opening file.

F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, post-type binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.

6. Water outage.
 7. System, subsystem, or equipment failure.
 8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
 2. Shutdown instructions for each type of emergency.
 3. Operating instructions for conditions outside normal operating limits.
 4. Required sequences for electric or electronic systems.
 5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if Contractor has delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
 2. Equipment or system break-in procedures.

3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Product Information: Include the following, as applicable:
1. Product name and model number.
 2. Manufacturer's name.
 3. Color, pattern, and texture.
 4. Material and chemical composition.
 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 1. Do not use original project record documents as part of operation and maintenance manuals.
 2. Comply with requirements of newly prepared record Drawings in Section 017839 "Project Record Documents."

- G. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

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SECTION 017839

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Product Data.
- B. Related Requirements:
 - 1. Section 017300 "Execution" for final property survey.
 - 2. Section 017700 "Closeout Procedures" for general closeout procedures.
 - 3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set of marked-up record prints.
 - 2. Number of Copies: Submit copies of record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit one paper-copy set(s) of marked-up record prints.
 - b. Final Submittal:
 - 1) Submit PDF electronic files of scanned record prints and three set(s) of prints.
 - 2) Print each drawing, whether or not changes and additional information were recorded.
- B. Record Product Data: Submit one paper copy of each submittal.
 - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding archive photographic documentation.
 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Engineer's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Engineer. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Annotated PDF electronic file with comment function enabled.
 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 3. Engineer will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
 - a. See Section 013300 "Submittal Procedures" for requirements related to use of Engineer's digital data files.
 - b. Engineer will provide data file layer information. Record markups in separate layers.
- C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Format: Annotated PDF electronic file with comment function enabled.
 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Engineer.
 - e. Name of Contractor.

2.2 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, and record Drawings where applicable.
- B. Format: Submit record Product Data as paper copy.
1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Engineer's reference during normal working hours.

END OF SECTION 017839

SECTION 024200

DEMOLITION OF EXISTING CIVIL SITE IMPROVEMENTS

PART 1- GENERAL

1.1 DESCRIPTION OF WORK

- A. This specification shall provide for the removal and disposal of old structures or portions of old structures, as noted on the plans, and shall include all excavation and backfilling necessary to complete the removal. The work shall be done in accordance with the provisions of these specifications.

PART 2- EXECUTION

2.1 METHOD OF REMOVAL

- A. Culverts or Sewers: Pipe shall be removed by careful excavation of all dirt on top and the sides in such manner that the pipe will not be damaged. Removal of sewer appurtenances shall be included for removal with the pipe. Those pipes which are deemed unsatisfactory for reuse by the Engineer may be removed in any manner the Contractor may select.
- B. Concrete Structures: Concrete structures or concrete portions of structures shall be removed by blasting and/or slogging the concrete into sizes not larger than one cubic foot. Portions of the old structure shall be removed to the lines and dimensions shown on the plans, and these materials shall be disposed of as shown on the plans or as directed by the Engineer. Any portion of the existing structure, outside of the limits designated for removal, damaged during the operations of the Contractor shall be restored to its original condition at his entire expense. Explosives shall not be used in the removal of portions of the existing structure unless approved by the Engineer, in writing.
- C. Concrete portions of structures below the permanent ground line, which will not interfere in any manner with the proposed construction, may be left in place, but removal shall be carried at least 2 feet below the permanent ground line and neatly squared off. Reinforcement shall be cut off close to the concrete.
- D. Steel Structures: Steel structures or steel portions of structures shall be dismantled in sections as determined by the Engineer. The sections shall be stored. Rivets and bolts connecting steel railing members, steel beams of beam spans and steel stringers of truss spans shall be removed by butting the heads with a "cold cut" and punching or drilling from the hole, or by such other method as will not injure the members for re-use and will meet the approval of the Engineer. The removal of rivets and bolts from connections of truss members, bracing members, and other similar members in the structure will not be required unless specifically called for on the plans or special provisions and the Contractor shall have the option of dismantling these members by flame-cutting the members immediately adjacent to the connections. Flame-Cutting will not be permitted, however, when plans or special provisions call for the structure unit to be salvaged in such manner as to permit re-erection. In such case, all members shall be carefully matchmarked with paint in accordance with

diagram furnished by the Engineer prior to dismantling, and all rivets and bolts shall be removed from the connections in the manner specified in the first portion of this paragraph.

E. Timber Structures:

1. Timber structures or timber portions of structures shall be removed in such manner as to damage the timber for further use as little as possible. All bolts and nails shall be removed from such lumber as deemed salvable by the Engineer.
2. Unless otherwise specified on the plans, timber piles shall be either pulled or cut off at the point not less than 2 feet below ground line, with the choice between these two methods resting with the Contractor, unless otherwise specified.

F. Brick or Stone Structures:

1. Brick or stone structures or stone portions of structures shall be removed by blasting and/or sledging the masonry into sizes not larger than one cubic foot.
2. Portions of such structures below the permanent ground line, which will not in any manner interfere with the proposed construction, may be left in place, but removal shall be carried at least 2 feet below the permanent ground line and neatly squared off.

G. Salvage:

1. All material such as pipe, timbers, railings, etc., which the Engineer deems as salvageable for reuse and all structural steel shall be in the property of City unless otherwise specified and delivered to a designated storage area.
2. All mechanical and electrical lift station material, which the Engineer deems as salvageable for reuse, including pumps and control panels shall be in the property of the City unless otherwise specified and delivered to a designated storage area.
3. The I-beams, stringers, etc., which are specified to be dismantled without damage for reuse, and all steel members when matchmarked and dismantled for reuse, shall be blocked off the ground in an upright position to protect the members against further damage.
4. Materials, other than structural steel, which are not deemed salvable by the Engineer, shall become the property of the Contractor and shall be removed to suitable disposal sites off of the right-of-way arranged for by the Contractor, or otherwise disposed of in a manner satisfactory to the Engineer.
5. Where temporary structures are necessary for a detour adjacent to the present structure, the Contractor will be permitted to use the material in the old structure for the detour structure, but he shall dismantle and stack or dispose of the material as required above as soon as the new structure is opened for traffic.

H. Backfill:

1. All excavation made in connection with this specification and all openings below the natural ground line caused by the removal of old structures or portions thereof shall be backfilled to the level of the original ground line, unless otherwise provided on the plans.
2. That portion of the backfill which will support any portion of the roadbed or embankment shall be placed in layers of the same depth as those required for placing embankment. Material in each layer shall be wetted uniformly, if required, and shall be compacted to the density required in the adjoining embankment. In places inaccessible to blading and rolling equipment, mechanical or hand tamps or rammers shall be used to obtain the required compaction.
3. That portion of the backfill which will not support any portion of the roadbed or embankment shall be placed as directed by the Engineer in such manner and to such state of compaction as will preclude objectionable amount of settlement.

END OF SECTION 024200

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SECTION 03 10 00
CONCRETE FORMS AND ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Formwork for cast-in place concrete.
 - 2. Shoring, bracing, and anchorage.
 - 3. Architectural form liners.
 - 4. Form accessories.
 - 5. Form stripping.
- B. Related Sections:
 - 1. Section 032000 - Concrete Reinforcement.
 - 2. Section 033000 - Cast-in-Place Concrete.

1.2 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
 - 2. ACI 301 - Specifications for Structural Concrete.
 - 3. ACI 318 - Building Code Requirements for Structural Concrete.
 - 4. ACI 347 - Guide to Formwork for Concrete.
- B. American Forest and Paper Association:
 - 1. AF&PA - National Design Specifications for Wood Construction.
- C. The Engineered Wood Association:
 - 1. APA/EWA PS 1 - Voluntary Product Standard for Construction and Industrial Plywood.
- D. ASTM International:
 - 1. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
 - 2. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
- E. West Coast Lumber Inspection Bureau:
 - 1. WCLIB - Standard Grading Rules for West Coast Lumber.

1.3 DESIGN REQUIREMENTS

- A. Design, engineer and construct formwork, shoring and bracing in accordance with ACI 318 to conform to design and applicable code requirements to achieve concrete shape, line and dimension as indicated on Drawings.

1.4 PERFORMANCE REQUIREMENTS

- A. Vapor Retarder Permeance: Maximum .03 perms when tested in accordance with ASTM E96, Procedure A.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 347 ACI 301 ACI 318.
- B. For wood products furnished for work of this Section, comply with AF&PA.
- C. Perform Work in accordance with State Municipality of Highways Public Work's standard.

1.6 COORDINATION

- A. Section 013000 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate this Section with other sections of work, requiring attachment of components to formwork.

PART 2 PRODUCTS

2.1 WOOD FORM MATERIALS

- A. Form Materials: At discretion of Contractor.

2.2 FORMWORK ACCESSORIES

- A. Vapor Retarder: Where indicated on Drawings, 10 mil thick polyethylene sheet manufacture by:
 - 1. Stego Wrap Class A: by Stego Industries LLC (887) 464-7834
 - 2. Griffolyn by Reef Industries (800) 231-6074
 - 3. VaporBlock 10 by Raven Industries (800) 635-3456
 - 4. Perminator Vapor – May by W.R. Meadows (800) 342-5976
 - 5. Xtreme by Tex-Trude (281) 452-5961
 - 6. Or Equivalent
- B. Bituminous Joint Filler: ASTM D1751.

- C. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Size, strength and character to maintain formwork in place while placing concrete.
- D. Water Stops: Rubber Polyvinyl chloride, minimum 1,750 psi tensile strength, minimum 50 degrees F to plus 175 degrees F working temperature range, inch wide, maximum possible lengths, ribbed profile, preformed corner sections, heat welded jointing.

***** OR *****

- E. Waterstop: Flexible strip of bentonite waterproofing compound in coil form for joints in concrete construction.
 - 1. Colloid Environmental Technologies Company Model.
 - 2. TC MiraDRi Model.
 - 3. Paramount Technical Products Model.
 - 4. Substitutions: Section 016000 - Product Requirements Not Permitted.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 013000 - Administrative Requirements: Coordination and project conditions.
- B. Verify lines, levels, and centers before proceeding with formwork. Verify dimensions agree with Drawings.
- C. When formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Architect/Engineer.

3.2 INSTALLATION

- A. Earth Forms:
 - 1. Earth forms are not permitted.
- B. Formwork - General:
 - 1. Provide top form for sloped surfaces steeper than 1.5 horizontal to 1 vertical to hold shape of concrete during placement, unless it can be demonstrated that top forms can be omitted.
 - 2. Construct forms to correct shape and dimensions, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations.
 - 3. Camber forms where necessary to produce level finished soffits unless otherwise shown on Drawings.
 - 4. Carefully verify horizontal and vertical positions of forms. Correct misaligned or misplaced forms before placing concrete.
 - 5. Complete wedging and bracing before placing concrete.
- C. Forms for Smooth Finish Concrete:

1. Use steel, plywood or lined board forms.
 2. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish.
 3. Install form lining with close-fitting square joints between separate sheets without springing into place.
 4. Use full size sheets of form lines and plywood wherever possible.
 5. Tape joints to prevent protrusions in concrete.
 6. Use care in forming and stripping wood forms to protect corners and edges.
 7. Level and continue horizontal joints.
 8. Keep wood forms wet until stripped.
- D. Erect formwork, shoring, and bracing to achieve design requirements, in accordance with requirements of ACI 301 ACI 318.
- E. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- F. Obtain Architect/Engineer's approval before framing openings in structural members not indicated on Drawings.
- G. Install fillet and chamfer strips on external corners of beams joists columns and.
- H. Install void forms in accordance with manufacturer's recommendations.
1. SureVoid Products, Inc., Englewood, CO (800) 458-5444.
- I. Do not reuse wood formwork more than times for concrete surfaces to be exposed to view. Do not patch formwork.

3.3 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Do not apply form release agent where concrete surfaces are indicated to receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.
- D. Reuse and Coating of Forms: Thoroughly clean forms and reapply form coating before each reuse. For exposed work, do not reuse forms with damaged faces or edges. Apply form coating to forms in accordance with manufacturer's specifications. Do not coat forms for concrete indicated to receive "scored finish". Apply form coatings before placing reinforcing steel.

3.4 INSTALLATION - INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Install formed openings for items to be embedded in or passing through concrete work.

- B. Locate and set in place items required to be cast directly into concrete.
- C. Coordinate with Work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.
- D. Install accessories straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- E. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- F. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.
- G. Form Ties:
 - 1. Use sufficient strength and sufficient quantity to prevent spreading of forms.
 - 2. Place ties at least 1 inch away from finished surface of concrete.
 - 3. Leave inner rods in concrete when forms are stripped.
 - 4. Space form ties equidistant, symmetrical and aligned vertically and horizontally unless otherwise shown on Drawings.
- H. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.
- I. Construction Joints:
 - 1. Install surfaced pouring strip where construction joints intersect exposed surfaces to provide straight line at joints.
 - 2. Just prior to subsequent concrete placement, remove strip and tighten forms to conceal shrinkage.
 - 3. Show no overlapping of construction joints. Construct joints to present same appearance as butted plywood joints.
 - 4. Arrange joints in continuous line straight, true and sharp.
- J. Openings for Items Passing Through Concrete:
 - 1. Frame openings in concrete where indicated on Drawings. Establish exact locations, sizes, and other conditions required for openings and attachment of work specified under other sections.
 - 2. Coordinate work to avoid cutting and patching of concrete after placement.
 - 3. Perform cutting and repairing of concrete required as result of failure to provide required openings.
- K. Screeds:
 - 1. Set screeds and establish levels for tops of concrete slabs and levels for finish on slabs.
 - 2. Slope slabs to drain where required or as shown on Drawings.
 - 3. Before depositing concrete, remove debris from space to be occupied by concrete and thoroughly wet forms. Remove freestanding water.

- L. Screed Supports:
 - 1. For concrete over waterproof membranes and vapor retarder membranes, use cradle, pad or base type screed supports which will not puncture membrane.
 - 2. Staking through membrane is not be permitted.
- M. Cleanouts and Access Panels:
 - 1. Provide removable cleanout sections or access panels at bottoms of forms to permit inspection and effective cleaning of loose dirt, debris and waste material.
 - 2. Clean forms and surfaces against which concrete is to be placed. Remove chips, saw dust and other debris. Thoroughly blow out forms with compressed air just before concrete is placed.

3.5 FORM CLEANING

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.
- C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

3.6 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads and removal has been approved by Architect/Engineer.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.
- D. Leave forms in place for minimum number of days as specified in ACI 347.

3.7 ERECTION TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 301 ACI 318.

***** OR *****

- B. Camber slabs and beams 1/4 inch per 10 feet in accordance with ACI 301 ACI 318.

3.8 FIELD QUALITY CONTROL

- A. Section 014000 - Quality Requirements 017000 - Execution Requirements: Field inspecting, testing, adjusting, and balancing.

- B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.
- C. Notify Architect/Engineer after placement of reinforcing steel in forms, but prior to placing concrete.
- D. Schedule concrete placement to permit formwork inspection before placing concrete.

END OF SECTION 031000

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SECTION 03 20 00

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Reinforcing bars.
 - 2. Welded wire fabric.
 - 3. Reinforcement accessories.
- B. Related Sections:
 - 1. Section 031000 - Concrete Forms and Accessories.
 - 2. Section 033000 - Cast-in-Place Concrete.
 - 3. Section 033500 - Concrete: Reinforcement for concrete floor toppings.

1.2 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 301 - Specifications for Structural Concrete.
 - 2. ACI 318 - Building Code Requirements for Structural Concrete.
 - 3. ACI 530.1 - Specifications for Masonry Structures.
 - 4. ACI SP-66 - ACI Detailing Manual.
- B. ASTM International:
 - 1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
 - 2. ASTM A184/A184M - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
 - 3. ASTM A496 - Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
 - 4. ASTM A497 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
 - 5. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 6. ASTM A704/A704M - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.
 - 7. ASTM A706/A706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
 - 8. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
 - 9. ASTM A775/A775M - Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
 - 10. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement.

11. ASTM A934/A934M - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
 12. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement.
 13. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Reinforcing Steel Bars.
- C. American Welding Society:
1. AWS D1.4 - Structural Welding Code - Reinforcing Steel.
- D. Concrete Reinforcing Steel Institute:
1. CRSI - Manual of Standard Practice.
 2. CRSI - Placing Reinforcing Bars.

1.3 SUBMITTALS

- A. Section 013300 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel and welded wire fabric, bending and cutting schedules, and supporting and spacing devices.
- C. Certificates: Submit AWS qualification certificate for welders employed on the Work.
- D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.
1. Submit certified copies of mill test report of reinforcement materials analysis.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with CRSI - Manual of Standard Practice, ACI 301, and ACI 318.
- B. Prepare shop drawings in accordance with ACI SP-66.

1.5 QUALIFICATIONS

- A. Welders: AWS qualified within previous 12 months.

1.6 COORDINATION

- A. Section 013000 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate with placement of formwork, formed openings and other Work.

PART 2 PRODUCTS

2.1 REINFORCEMENT

- A. Deformed and Plain Reinforcement: ASTM A615/A615M; 60 ksi yield strength, steel bars, unfinished.

2.2 ACCESSORY MATERIALS

- A. Tie Wire: Minimum 16 gage annealed.
- B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor retarder puncture.
- C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic tipped steel; size and shape to meet Project conditions.
- D. Reinforcing Splicing Devices: Mechanical type; full tension and compression; sized to fit joined reinforcing.
- E. Epoxy Coating Patching Material: Type as recommended by coating manufacturer.

2.3 FABRICATION

- A. Fabricate concrete reinforcement in accordance with CRSI Manual of Practice, and ACI 318, on and all applicable codes.
- B. Form standard hooks for 180 degree bends, 90 degree bend, stirrup and tie hooks, and seismic hooks as indicated on Drawings.
- C. Form reinforcement bends with minimum diameters in accordance with ACI 318 and all applicable codes.
- D. Fabricate column reinforcement with offset bends at reinforcement splices.
- E. Form spiral column reinforcement from minimum 3/8 inch diameter continuous deformed bar or wire.
- F. Form ties and stirrups from the following:
 - 1. For bars No. 10 and Smaller: No. 3 deformed bars.
 - 2. For bars No. 11 and Larger: No. 4 deformed bars.
- G. Weld reinforcement in accordance with AWS D1.4.
- H. Galvanized Epoxy-Coated Reinforcement: Clean surfaces, weld and re-protect welded joint in accordance with CRSI.

- I. Locate reinforcement splices not indicated on Drawings, at point of minimum stress. Review location of splices with Architect/Engineer.

2.4 SOURCE QUALITY CONTROL

- A. Section 014000 - Quality Requirements: Testing, inspection and analysis requirements.
- B. Make completed reinforcement available for inspection at manufacturer's factory prior to packaging for shipment. Notify Architect/Engineer at least seven days before inspection is allowed.
- C. When fabricator is approved by authority having jurisdiction, submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents.
 1. Specified shop tests are not required for Work performed by approved fabricator.

PART 3 EXECUTION

3.1 PLACEMENT

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position beyond specified tolerance.
 1. Do not weld crossing reinforcement bars for assembly.
- B. Do not displace or damage vapor retarder.
- C. Accommodate placement of formed openings.
- D. Space reinforcement bars with minimum clear spacing in accordance with ACI 318 of one bar diameter, but not less than 1 inch.
 1. Where bars are indicated in multiple layers, place upper bars directly above lower bars.
- E. Maintain concrete cover around reinforcement in accordance with ACI 318 applicable code as follows:

Footings and Concrete Formed Against Earth		3 inches
Concrete exposed to earth or weather	No. 6 bars and larger	2 inches
	No. 5 bars and smaller	1-1/2 inches
Supported Slabs, Walls, and Joists	No. 14 bars and larger	1-1/2 inches
	No. 11 bars and smaller	3/4 inches
Beams and Columns		1-1/2 inches
Shell and Folded	No. 6 bars and larger	3/4 inches

Plate Members	No. 5 bars and smaller	1/2 inches

3.2 ERECTION TOLERANCES

- A. Section 014000 - Quality Requirements: Tolerances.
- B. Install reinforcement within the following tolerances for flexural members, walls, and compression members:

Reinforcement Depth	Depth Tolerance	Concrete Cover Tolerance
Greater than 8 inches	plus or minus 3/8 inch	minus 3/8 inch
Less than 8 inches	plus or minus 1/2 inch	minus 1/2 inch

- C. Install reinforcement within the tolerances specified in ACI 530.1 for foundation walls.

3.3 FIELD QUALITY CONTROL

- A. Section 014000 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Field inspection and testing will be performed by Owner's testing laboratory in accordance with ACI 318 and IBC 2006.
- C. Provide free access to Work and cooperate with appointed firm.
- D. Reinforcement Inspection:
 - 1. Placement Acceptance: Specified and ACI 318 material requirements and specified placement tolerances.
 - 2. Welding: Inspect welds in accordance with AWS D1.1.
 - 3. Periodic Placement Inspection: Inspect for correct materials, fabrication, sizes, locations, spacing, concrete cover, and splicing.
 - 4. Weldability Inspection: Inspect for reinforcement weldability when formed from steel other than ASTM A706/A706M.
 - 5. Continuous Weld Inspection: Inspect reinforcement as required by ACI 318.
 - 6. Periodic Weld Inspection: Other welded connections.

3.4 SCHEDULES

- A. Reinforcement For Superstructure Framing Members: Deformed bars, unfinished.

- B. Reinforcement For Foundation Wall Framing Members and Slab-on-Grade: Deformed bars and wire fabric, galvanized finish.
- C. Reinforcement For Parking Structure Framing Members: Deformed bars, epoxy-coated finish.

END OF SECTION 032000

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes cast-in-place concrete for the following:
 - 1. Foundation walls.
 - 2. Supported slabs.
 - 3. Slabs on grade.
 - 4. Control, expansion and contraction joint devices.
 - 5. Equipment pads.
 - 6. Light pole base.
 - 7. Flagpole base.
- B. Related Sections:
 - 1. Section 031000 - Concrete Forms and Accessories: Formwork and accessories. Placement of joint device joint device anchors in formwork.
 - 2. Section 032000 - Concrete Reinforcement.
 - 3. Section 033500 - Concrete Finishing.
 - 4. Section 033900 - Concrete Curing.

1.2 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 301 - Specifications for Structural Concrete.
 - 2. ACI 305 - Hot Weather Concreting.
 - 3. ACI 306.1 - Standard Specification for Cold Weather Concreting.
 - 4. ACI 308.1 - Standard Specification for Curing Concrete.
 - 5. ACI 318 - Building Code Requirements for Structural Concrete.
- B. ASTM International:
 - 1. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - 2. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - 3. ASTM C33 - Standard Specification for Concrete Aggregates.
 - 4. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 5. ASTM C42/C42M - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
 - 6. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
 - 7. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
 - 8. ASTM C150 - Standard Specification for Portland Cement.

9. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
10. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
11. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
12. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
13. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.
14. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
15. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
16. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
17. ASTM C685/C685M - Standard Specification for Concrete Made By Volumetric Batching and Continuous Mixing.
18. ASTM C845 - Standard Specification for Expansive Hydraulic Cement.
19. ASTM C989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
20. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
21. ASTM C1064/C1064M - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
22. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
23. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
24. ASTM C1157 - Standard Performance Specification for Hydraulic Cement.
25. ASTM C1218 - Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.
26. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.
27. ASTM D994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
28. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
29. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
30. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
31. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
32. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
33. ASTM E1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.

34. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

1.3 PERFORMANCE REQUIREMENTS

- A. Vapor Retarder Permeance: Maximum .03 perm when tested in accordance with ASTM E96.

1.4 SUBMITTALS

- A. Section 013300 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data on joint devices, attachment accessories, admixtures.
- C. Design Data:
 1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
 - a. Hot and cold weather concrete work.
 - b. Air entrained concrete work.
 2. Identify mix ingredients and proportions, including admixtures.
 3. Identify chloride content of admixtures and whether or not chloride was added during manufacture.
- D. Manufacturer's Installation Instructions: Submit installation procedures and interface required with adjacent Work.

1.5 CLOSEOUT SUBMITTALS

- A. Section 017000 - Execution Requirements: Closeout procedures.
- B. Project Record Documents: Accurately record actual locations of embedded utilities and components concealed from view in finished construction.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301 and ACI 318.
- B. Conform to ACI 305 when concreting during hot weather.
- C. Conform to ACI 306.1 when concreting during cold weather.
- D. Acquire cement and aggregate from one source for Work.

1.7 COORDINATION

- A. Section 013000 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Section 016000 - Product Requirements: Environmental conditions affecting products on site.
- B. Maintain concrete temperature after installation at minimum 50 degrees F for minimum 7 days.

1.9 COORDINATION

- A. Section 013000 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

- A. Cement: ASTM C150, Type I - Normal
- B. Normal Weight Aggregates: ASTM C33.
 - 1. Coarse Aggregate Maximum Size: 1.5
- C. Water: ACI 318; potable, without deleterious amounts of chloride ions.

2.2 ADMIXTURES

- A. Air Entrainment: ASTM C260.
- B. Fly Ash: ASTM C618 type C or F.
- C. Silica Fume: ASTM C1240.

2.3 ACCESSORIES

- A. Vapor Retarder: ASTM E1745 Class A; 10 mil thick; type recommended for below grade application. Furnish joint tape recommended by manufacturer.

- B. Non-Shrink Grout: ASTM C1107, premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.

2.4 JOINT DEVICES AND FILLER MATERIALS

- A. Joint Filler; Asphalt impregnated fiberboard or felt, tongue and groove profile.

***** OR *****

- B. Joint Filler: ASTM D1752; Closed cell, resiliency of 95 percent if not compressed more than 50 percent of original thickness.
- C. Sealant: ASTM C309, Type I approved by Asphalt and Vinyl composition Tile Institute, 30% minimum solids content.

2.5 CONCRETE MIX

- A. Select proportions for normal weight concrete in accordance with ACI 301 Method 1
- B. Provide concrete for the following criteria:

Material and Property	Measurement
Compressive Strength (7 day)	2100 psi
Compressive Strength (28 day)	3000 psi
Cement Type	ASTM C150
Aggregate Size (maximum)	1.5 inch
Air Content	Do not use air entrainment for concrete mixes.
Slump	5 inches

- C. Admixtures: Include admixture types and quantities indicated in concrete mix designs only when approved by Architect/Engineer.
1. Use accelerating admixtures in cold weather. Use of admixtures will not relax cold weather placement requirements.
 2. Do not use calcium chloride nor admixtures containing calcium chloride.
 3. Use set retarding admixtures during hot weather.
- D. Site Mixed Concrete: No site mixed concrete is allowed.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 013000 - Administrative Requirements: Coordination and project conditions.
- B. Verify requirements for concrete cover over reinforcement.
- C. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

3.2 PREPARATION

- A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Remove laitance, coatings, and unsound materials.
- B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.
- C. Remove debris and ice from formwork, reinforcement, and concrete substrates.
- D. Remove water from areas receiving concrete before concrete is placed.

3.3 PLACING CONCRETE

- A. Place concrete in accordance with ACI 301.
- B. Notify testing laboratory and Architect/Engineer minimum 24 hours prior to commencement of operations.
- C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints, and are not disturbed during concrete placement.
- D. Install vapor retarder under interior slabs on grade in accordance with ASTM E1643. Lap joints minimum 6 inches and seal watertight by adhesive applied between overlapping edges and ends as per manufacturer recommendations.
- E. Repair vapor retarder damaged during placement of concrete reinforcing. Repair with vapor retarder material; lap over damaged areas minimum 6 inches and seal watertight.
- F. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
- G. Install joint device anchors. Maintain correct position to allow joint cover to be flush with floor finish.
- H. Install joint covers in one piece longest practical length, when adjacent construction activity is complete.

- I. Deposit concrete at final position. Prevent segregation of mix.
- J. Place concrete in continuous operation for each panel or section determined by predetermined joints.
- K. Consolidate concrete.
- L. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- M. Place concrete continuously between predetermined expansion, control, and construction joints.
- N. Do not interrupt successive placement; do not permit cold joints to occur.
- O. Saw cut joints within 12 hours after placing. Use 3/16 inch thick blade, cut into 1/4 depth of slab thickness.
- P. Screed floors and slabs on grade level, maintaining surface flatness of F_f of 35.

3.4 CONCRETE FINISHING

- A. Finish concrete floor surfaces to requirements of Section 03350.
- B. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains.

3.5 CURING AND PROTECTION

- A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
 - 1. Protect concrete footings from freezing for minimum 5 days.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Cure floor surfaces as specified in Section 03390.
- D. Ponding: Maintain 100 percent coverage of water over floor slab areas continuously for 7 days.
- E. Spraying: Spray water over floor slab areas and maintain wet for 7 days.

3.6 FIELD QUALITY CONTROL

- A. Section 014000 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

- B. Field inspection and testing will be performed by Owner's testing laboratory in accordance with ACI 318
- C. Provide free access to Work and cooperate with appointed firm.
- D. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of Work.
- E. Concrete Inspections:
 - 1. Continuous Placement Inspection: Inspect for proper installation procedures.
 - 2. Periodic Curing Inspection: Inspect for specified curing temperature and procedures.
- F. Strength Test Samples:
 - 1. Sampling Procedures: ASTM C172.
 - 2. Cylinder Molding and Curing Procedures: ASTM C31/C31M, cylinder specimens, standard cured field cured.
 - 3. Sample concrete and make one set of three cylinders for every 150 cu yds or less of each class of concrete placed each day and for every 5,000 sf of surface area for slabs and walls.
 - 4. When volume of concrete for any class of concrete would provide less than 3 sets of cylinders, take samples from three randomly selected batches, or from every batch when less than 3 batches are used.
 - 5. Make one additional cylinder during cold weather concreting, and field cure.
- G. Field Testing:
 - 1. Slump Test Method: ASTM C143/C143M.
 - 2. Air Content Test Method: ASTM C173/C173M.
 - 3. Temperature Test Method: ASTM C1064/C1064M.
 - 4. Measure slump and temperature for each compressive strength concrete sample.
 - 5. Measure air content in air entrained concrete for each compressive strength concrete sample.
- H. Cylinder Compressive Strength Testing:
 - 1. Test Method: ASTM C39.
 - 2. Test Acceptance: In accordance with ACI 318 .
 - 3. Test one cylinder at 7 days.
 - 4. Test two cylinders at 28 days.
 - 5. Dispose remaining cylinders when testing is not required.
- I. Core Compressive Strength Testing:
 - 1. Sampling and Testing Procedures: ASTM C42/C42M.
 - 2. Test Acceptance: In accordance with ACI 318.
 - 3. Drill three cores for each failed strength test from concrete represented by failed strength test.
- J. Water Soluble Chloride Ion Concentration Test Method: ASTM C1218; tested at 28 days.
 - 1. Maximum Concentration: As permitted by applicable code.

- K. Maintain records of concrete placement. Record date, location, quantity, air temperature and test samples taken.

3.7 PATCHING

- A. Allow Architect/Engineer to inspect concrete surfaces immediately upon removal of forms.
- B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect/Engineer upon discovery.
- C. Patch imperfections as directed by Architect/Engineer

3.8 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- B. Repair or replacement of defective concrete will be determined by Architect/Engineer.
- C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect/Engineer for each individual area.

3.9 SCHEDULE - CONCRETE TYPES AND FINISHES

- A. Foundation Walls: 3,000 psi 28 day concrete, form finish with honeycomb filled surface.
- B. Underside of Supported Floors and Structure Exposed to View: 4,000 psi 28 day concrete, sack rubbed finish.
- C. Exposed Portico Structure: 4,000 psi 28 day concrete, air entrained, smooth stone rubbed finish.

3.10 SCHEDULE - JOINT FILLERS

- A. Basement Floor Slab Perimeter: Joint filler Type A set 1/8 inch below floor slab elevation.
- B. Exterior Retaining Wall at Loading Dock: Joint filler Type F recessed 3/8 inch with sealant cover.

END OF SECTION 033000

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SECTION 03 35 00
CONCRETE FINISHING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Finishing concrete floors [and floor toppings].
 - 2. Floor surface treatment.
- B. Related Sections:
 - 1. Section 033000 - Cast-in-Place Concrete: [Prepared concrete floors ready to receive finish;] [control and formed expansion and contraction joints and joint devices].
 - 2. Section 03360 - Concrete Finishes: Exposed aggregate finish.
 - 3. Section 033900 - Concrete Curing.
 - 4. Section 079513 - Expansion Joint Cover Assemblies.
 - 5. Section 079200 - Joint Sealers.

1.2 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 301 - Specifications for Structural Concrete.
 - 2. ACI 302.1 - Guide for Concrete Floor and Slab Construction.
- B. ASTM International:
 - 1. ASTM E1155 - Standard Test Method for Determining Floor Flatness and of Levelness Using the F-number System.

1.3 SUBMITTALS

- A. Section 013300 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data on concrete hardener, sealer, curing compounds curing papers and slip resistant treatment, compatibilities, and limitations.

1.4 CLOSEOUT SUBMITTALS

- A. Section 017000 - Execution Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit data on maintenance renewal of applied coatings.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301 and ACI 302.1.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 016000 - Product Requirements: Product storage and handling requirements.
- B. Deliver materials in manufacturer's packaging including application instructions.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Section 016000 - Product Requirements: Environmental conditions affecting products on site.

1.8 COMPOUNDS - HARDENERS AND SEALERS

- A. Chemical Hardener: Magnesium fluorosilicate and zinc fluorosilicate blend

PART 2 EXECUTION

2.1 EXAMINATION

- A. Section 013000 - Administrative Requirements: Coordination and project conditions.
- B. Verify floor surfaces are acceptable to receive the Work of this section.

2.2 FLOOR FINISHING

- A. Finish concrete floor surfaces in accordance with ACI 301 and ACI 302.1.
- B. Wood float surfaces receiving quarry tile, ceramic tile, and cementitious terrazzo with full bed setting system.
- C. Steel trowel surfaces receiving carpeting, resilient flooring, seamless flooring, thin set terrazzo, thin set quarry tile, and thin set ceramic tile.
- D. Steel trowel surfaces which are scheduled to be exposed.

2.3 TOLERANCES

- A. Section 014000 - Quality Requirements: Tolerances.
- B. Measure for F(F) and F(L) tolerances for floors in accordance with ASTM E1155, within 48 hours after slab installation.
- C. Finish concrete to achieve the following tolerances:
 - 1. Under Glazed Tile on Setting Bed: F(F) 35 and F(L) 20.

2. Under Resilient Finishes: F(F) 75 and F(L) 50.
 3. Exposed to View and Foot Traffic: F(F) 75 and F(L) 40.
 4. Correct slab surface when actual F(F) or F(L) number for floor installation measures less than required.
- D. Correct defects in defined traffic floor by grinding or removal and replacement of defective Work. Areas requiring corrective Work will be identified. Re-measure corrected areas by same process.

END OF SECTION 033500

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SECTION 03 39 00
CONCRETE CURING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes initial and final curing of horizontal and vertical concrete surfaces.
- B. Related Sections:
 - 1. Section 033000 - Cast-In-Place Concrete.
 - 2. Section 033500 - Concrete Finishing.

1.2 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 301 - Specifications for Structural Concrete.
 - 2. ACI 302.1 - Guide for Concrete Floor and Slab Construction.
 - 3. ACI 308.1 - Standard Specification for Curing Concrete.
 - 4. ACI 318 - Building Code Requirements for Structural Concrete.
- B. ASTM International:
 - 1. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
 - 2. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - 3. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
 - 4. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting.

1.3 SUBMITTALS

- A. Section 013300 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data on curing compounds, mats, paper, film, compatibilities, and limitations.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Membrane Curing Compound Type 1.

- B. Membrane Curing Compound: ASTM C1315 Type I.
- C. Water: Potable, not detrimental to concrete.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 013000 - Administrative Requirements: Coordination and project conditions.
- B. Verify substrate surfaces are ready to be cured.

3.2 INSTALLATION - HORIZONTAL SURFACES

- A. Cure concrete in accordance with ACI 308.1.
- B. Ponding: Maintain 100 percent coverage of water over floor slab areas, continuously for 4 days.

***** [OR] *****

- C. Spraying: Spray water over floor slab areas and maintain wet for 7 days.

***** [OR] *****

- D. Absorptive Mat: Spread cotton fabric over floor slab areas. Spray with water until mats are saturated, and maintain in saturated condition for 7 days.

***** [OR] *****

- E. Absorptive Mat: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place for 7 days.

3.3 PROTECTION OF FINISHED WORK

- A. Section 017000 - Execution Requirements: Protecting finished Work.
- B. Do not permit traffic over unprotected floor surface.

3.4 SCHEDULES

- A. Storage Area Slabs: Absorptive mats, burlap-polyethylene type.

- B. Retaining Walls: Membrane curing compound, acrylic type, clear color.
- C. Concrete Pavement: Membrane curing compound, opaque color.
- D. Other Floor Areas: Membrane curing compound, acrylic type, translucent color.

END OF SECTION 033900

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SECTION 034500

PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes architectural precast concrete cladding[**and load-bearing**] units.

1.2 DEFINITIONS

- A. Design Reference Sample: Sample of approved architectural precast concrete color, finish and texture, preapproved by Architect.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at [**Project site**] <Insert location>.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.
- C. Shop Drawings:
 - 1. Detail fabrication and installation of architectural precast concrete units.
 - 2. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit.
 - 3. Indicate joints, reveals, drips, chamfers, and extent and location of each surface finish.
 - 4. Indicate details at building corners.
- D. Samples: Design reference samples for initial verification of design intent, for each type of finish indicated on exposed surfaces of architectural precast concrete units, in sets of three, representative of finish, color, and texture variations expected; approximately **12 by 12 by 2 inches** (300 by 300 by 50 mm).
- E. Delegated-Design Submittal: For architectural precast concrete indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

- B. Material certificates.
- C. Material Test Reports: For aggregates.
- D. Field quality-control[**and special inspection**] reports.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm that assumes responsibility for engineering architectural precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
 - 1. Designated as a PCI-certified plant for Group A, Category A1 - Architectural Cladding and Load Bearing Units[**at time of bidding**][**or designated as an APA-certified plant for production of architectural precast concrete products**].
- B. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel"; and AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."
- D. Sample Panels: After sample approval and before fabricating architectural precast concrete units, produce a minimum of [two] <Insert number> sample panels approximately [**16 sq. ft. (1.5 sq. m)**] <Insert dimension> in area for review by Architect. Incorporate full-scale details of architectural features, finishes, textures, and transitions in sample panels.

1.7 COORDINATION

- A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design architectural precast concrete units.
- B. Design Standards: Comply with **ACI 318 (ACI 318M)** and design recommendations of PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of architectural precast concrete units indicated.

- C. Calculated Fire-Test-Response Characteristics: Provide architectural precast concrete units with fire-resistance rating indicated as calculated according to [**ACI 216.1 (ACI 216.1M)**] [**PCI MNL 124, "Design for Fire Resistance of Precast Prestressed Concrete,"**] and acceptable to authorities having jurisdiction.
- D. Structural Performance: Provide architectural precast concrete units and connections capable of withstanding design loads indicated within limits and under conditions indicated.

2.2 REINFORCING MATERIALS

- A. [<Double click to insert sustainable design text for recycled content of steel products.>](#)
- B. Reinforcing Bars: ASTM A 615/A 615M, **Grade 60 (Grade 420)**, deformed.
- C. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
- D. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from [**as-drawn**] [**galvanized-**] steel wire into flat sheets.
- E. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.
- F. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 117.

2.3 PRESTRESSING TENDONS

- A. Prestressing Strand: ASTM A 416/A 416M, **Grade 270 (Grade 1860)**, uncoated, seven-wire, low-relaxation strand.
 - 1. Coat unbonded post-tensioning strand with post-tensioning coating complying with ACI 423.7 and sheath with polypropylene tendon sheathing complying with ACI 423.7. Include anchorage devices and coupler assemblies.

2.4 CONCRETE MATERIALS

- A. [<Double click to insert sustainable design text for regional materials \(concrete\).>](#)
- B. Portland Cement: ASTM C 150/C 150M, Type I or Type III, gray, unless otherwise indicated.
 - 1. For surfaces exposed to view in finished structure, use gray or white cement, of same type, brand, and mill source.
- C. Supplementary Cementitious Materials:
 - 1. Fly Ash: ASTM C 618, Class C or F, with maximum loss on ignition of 3 percent.
 - 2. Metakaolin: ASTM C 618, Class N.
 - 3. Silica Fume: ASTM C 1240, with optional chemical and physical requirement.
 - 4. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

5. Blended Hydraulic Cement: ASTM C 595, [Type IS, portland blast-furnace slag] [Type IP, portland-pozzolan] [Type I (PM), pozzolan-modified portland] [Type I (SM), slag-modified portland] cement.
- D. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33/C 33M, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.
 1. Face-Mixture-Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.
 - a. Gradation: [Uniformly graded] [Gap graded] [To match design reference sample].
 2. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand compatible with coarse aggregate; to match approved finish sample.
- E. Coloring Admixture: ASTM C 979/C 979M, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.
- F. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.
- G. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- H. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

2.5 STEEL CONNECTION MATERIALS

- A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.
- B. Carbon-Steel-Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished, AWS D1.1/D1.1M, Type A or Type B, with arc shields and with minimum mechanical properties of PCI MNL 117, Table 3.2.3.
- C. Carbon-Steel Plate: ASTM A 283/A 283M, Grade C.
- D. Malleable Iron Castings: ASTM A 47/A 47M, Grade 32510 or Grade 35028.
- E. Carbon-Steel Castings: ASTM A 27/A 27M, Grade 60-30 (Grade 415-205).
- F. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.
- G. Carbon-Steel Structural Tubing: ASTM A 500/A 500M, Grade B or Grade C.
- H. Wrought Carbon-Steel Bars: ASTM A 675/A 675M, Grade 65 (Grade 450).
- I. Deformed-Steel Wire or Bar Anchors: ASTM A 496/A 496M or ASTM A 706/A 706M.

- J. Carbon-Steel Bolts and Studs: **ASTM A 307, Grade A or ASTM F 1554, Grade 36 (ASTM F 568M, Property Class 4.6)**; carbon-steel, hex-head bolts and studs; carbon-steel nuts, **ASTM A 563 (ASTM A 563M)**; and flat, unhardened steel washers, ASTM F 844.
- K. High-Strength Bolts and Nuts: **ASTM A 325 (ASTM A 325M)**, Type 1, heavy hex steel structural bolts; heavy hex carbon-steel nuts, **ASTM A 563 (ASTM A 563M)**; and hardened carbon-steel washers, **ASTM F 436 (ASTM F 436M)**.
- L. Zinc-Coated Finish: For exterior steel items[, **steel in exterior walls,**] and items indicated for galvanizing, apply zinc coating by [**hot-dip process according to ASTM A 123/A 123M or ASTM A 153/A 153M**] [**electrodeposition according to ASTM B 633, SC 3, Types 1 and 2**].
 - 1. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035B or SSPC-Paint 20.
- M. Shop-Primed Finish: Prepare surfaces of nongalvanized steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3 and shop-apply [**lead- and chromate-free, rust-inhibitive primer, complying with performance requirements in MPI 79**] [**SSPC-Paint 25**] according to SSPC-PA 1.

2.6 GROUT MATERIALS

- A. Sand-Cement Grout: Portland cement, ASTM C 150/C 150M, Type I, and clean, natural sand, ASTM C 144 or ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 to 3 parts sand, by volume, with minimum water required for placement and hydration. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C 1218/C 1218M.
- B. Nonmetallic, Nonshrink Grout: Packaged, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C 1218/C 1218M.
- C. Epoxy-Resin Grout: Two-component, mineral-filled epoxy resin; ASTM C 881/C 881M, of type, grade, and class to suit requirements.

2.7 CONCRETE MIXTURES

- A. Prepare design mixtures for each type of precast concrete required.
- B. Limit use of fly ash and ground granulated blast-furnace slag to 20 percent of portland cement by weight; limit metakaolin and silica fume to 10 percent of portland cement by weight.
- C. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at architectural precast concrete fabricator's option.

- D. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by **ACI 318 (ACI 318M)** or PCI MNL 117 when tested according to ASTM C 1218/C 1218M.
- E. Normal-Weight Concrete Mixtures: Proportion mixtures by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28 Days): **5000 psi (34.5 MPa)** minimum.
- F. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to ASTM C 642, except for boiling requirement.
- G. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.
- H. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

2.8 FABRICATION

- A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.
 - 1. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."
- B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing architectural precast concrete units to supporting and adjacent construction.
- C. Cast-in reglets, slots, holes, and other accessories in architectural precast concrete units as indicated on the Contract Drawings.
- D. Reinforcement: Comply with recommendations in PCI MNL 117 for fabricating, placing, and supporting reinforcement.
- E. Reinforce architectural precast concrete units to resist handling, transportation, and erection stresses and specified in-place loads.
- F. Prestress tendons for architectural precast concrete units by either pretensioning or post-tensioning methods. Comply with PCI MNL 117.
- G. Comply with requirements in PCI MNL 117 and requirements in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

- H. Place face mixture to a minimum thickness after consolidation of the greater of **1 inch (25 mm)** or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover specified.
- I. Place concrete in a continuous operation to prevent cold joints or planes of weakness from forming in precast concrete units.
 - 1. Place backup concrete mixture to ensure bond with face-mixture concrete.
- J. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 117.
 - 1. Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants." Ensure adequate bond between face and backup concrete, if used.
- K. Comply with PCI MNL 117 for hot- and cold-weather concrete placement.
- L. Identify pickup points of architectural precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each architectural precast concrete unit on a surface that does not show in finished structure.
- M. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.
- N. Discard and replace architectural precast concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 117 and Architect's approval.

2.9 FABRICATION TOLERANCES

- A. Fabricate architectural precast concrete units to shapes, lines, and dimensions indicated so each finished unit complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

2.10 FINISHES

- A. Exposed faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight, and sharp. Finish exposed-face surfaces of architectural precast concrete units to match approved **[design reference sample] [sample panels] [mockups]** and as follows:
 - 1. Design Reference Sample: **<Insert description and identify fabricator and code number of sample>**.

2. PCI's "Architectural Precast Concrete - Color and Texture Selection Guide," of plate numbers indicated.
 3. As-Cast Surface Finish: Provide surfaces to match approved sample for acceptable surface, air voids, sand streaks, and honeycomb.
 4. Textured-Surface Finish: Impart by form liners or inserts.
 5. Bushhammer Finish: Use power or hand tools to remove matrix and fracture coarse aggregates.
 6. Exposed-Aggregate Finish: Use chemical retarding agents applied to concrete forms and washing and brushing procedures to expose aggregate and surrounding matrix surfaces after form removal.
 7. Abrasive-Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces.
 8. Acid-Etched Finish: Use acid and hot-water solution, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces. Protect hardware, connections, and insulation from acid attack.
 9. Honed Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.
 10. Polished Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.
 11. Sand-Embedment Finish: Use selected stones placed in a sand bed in bottom of mold, with sand removed after curing.
- B. Finish exposed **[top]** **[back]** surfaces of architectural precast concrete units to match face-surface finish.
 - C. Finish exposed **[top]** **[back]** surfaces of architectural precast concrete units with smooth, steel-trowel finish.
 - D. Finish unexposed surfaces of architectural precast concrete units with as cast finish.

2.11 SOURCE QUALITY CONTROL

- A. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements. If using self-consolidating concrete, also test and inspect according to PCI TR-6, ASTM C 1610/C 1610M, ASTM C 1611/C 1611M, ASTM C 1621/C 1621M, and ASTM C 1712.
- B. Owner will employ an independent testing agency to evaluate architectural precast concrete fabricator's quality-control and testing methods.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install clips, hangers, bearing pads, and other accessories required for connecting architectural precast concrete units to supporting members and backup materials.

- B. Erect architectural precast concrete level, plumb, and square within specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment of units until permanent connections are completed.
 - 1. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
 - 2. Unless otherwise indicated, maintain uniform joint widths of **3/4 inch (19 mm)**.
- C. Connect architectural precast concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.
- D. Welding: Comply with applicable requirements in AWS D1.1/D1.1M and AWS D1.4/D1.4M for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.
- E. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.
- F. Grouting or Dry-Packing Connections and Joints: Grout connections where required or indicated. Retain flowable grout in place until hard enough to support itself. Alternatively, pack spaces with stiff dry-pack grout material, tamping until voids are completely filled. Place grout and finish smooth, level, and plumb with adjacent concrete surfaces. Promptly remove grout material from exposed surfaces before it affects finishes or hardens. Keep grouted joints damp for not less than 24 hours after initial set.

3.2 ERECTION TOLERANCES

- A. Erect architectural precast concrete units level, plumb, square, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 117, Appendix I.

3.3 FIELD QUALITY CONTROL

- A. Special Inspections: **[Owner will engage] [Engage]** a qualified special inspector to perform the following special inspections and prepare reports:
 - 1. Erection of loadbearing precast concrete members.
 - 2. **<Insert special inspections>**.
- B. Testing Agency: **[Owner will engage] [Engage]** a qualified testing agency to perform tests and inspections and prepare test reports.
- C. Visually inspect field welds and test according to ASTM E 165 or to ASTM E 709 and ASTM E 1444. High-strength bolted connections are subject to inspections.
- D. Testing agency will report test results promptly and in writing to Contractor and Architect.
- E. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.

- F. Additional testing and inspecting, at Contractor's expense, shall be performed to determine compliance of replaced or additional work with specified requirements.

3.4 REPAIRS

- A. Repair architectural precast concrete units if permitted by Architect. Architect reserves the right to reject repaired units that do not comply with requirements.
- B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet (6 m).
- C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780/A 780M.
- D. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.
- E. Remove and replace damaged architectural precast concrete units when repairs do not comply with requirements.

3.5 CLEANING

- A. Clean surfaces of precast concrete units exposed to view.
- B. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.
- C. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.
 - 1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Protect other work from staining or damage due to cleaning operations.
 - 2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 034500

SECTION 03 60 00

GROUT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Portland cement grout.
 - 2. Rapid curing epoxy grout.
 - 3. Non-shrink cementitious grout.
- B. Related Sections:
 - 1. Section 033000 - Cast-in-Place Concrete.

1.2 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 301 - Specifications for Structural Concrete.
 - 2. ACI 318 - Building Code Requirements for Structural Concrete.
- B. American Society of Testing and Materials:
 - 1. ASTM C33 - Standard Specification for Concrete Aggregates.
 - 2. ASTM C40 - Test Method for Organic Impurities in Fine Aggregates for Concrete.
 - 3. ASTM C150 - Standard Specification for Portland Cement.
 - 4. ASTM C191 - Test Method for Time of Setting of Hydraulic Cement by Vicat Needle.
 - 5. ASTM C307 - Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing.
 - 6. ASTM C531 - Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
 - 7. ASTM C579 - Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts, monolithic Surfacing and Polymer Concretes.
 - 8. ASTM C827 - Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.
- C. U. S. Army Corps of Engineers Concrete Research Division (CRD):
 - 1. CRD C621 - Non-Shrink Grout.

PART 2 PRODUCTS

2.1 PORTLAND CEMENT GROUT MATERIALS

- A. Portland Cement: ASTM C150, Type I and II.
- B. Water:
1. Potable; containing no impurities, suspended particles, algae or dissolved natural salts in quantities capable of causing:
 - a. Corrosion of steel.
 - b. Volume change increasing shrinkage cracking.
 - c. Efflorescence.
 - d. Excess air entraining.
- C. Fine Aggregate:
1. Washed natural sand.
 2. Gradation in accordance with ASTM C33 and represented by smooth granulometric curve within required limits.
 3. Free from injurious amounts of organic impurities as determined by ASTM C40.
- D. Mix:
1. Portland cement, sand and water. Do not use ferrous aggregate or staining ingredients in grout mixes.

2.2 RAPID CURING EPOXY GROUT

- A. Rapid Curing Epoxy Grout: High strength, three component epoxy grout formulated with thermosetting resins and inert fillers. Rapid-curing, high adhesion, and resistant to ordinary chemicals, acids and alkalies.

Compressive Strength	ASTM C579	12,000 psi at 7 days
Tensile Strength	ASTM C307	2,000 psi minimum
Coefficient of Expansion	ASTM C531	30×10^{-6} in per degree F
Shrinkage	ASTM C827	None

2.3 NON-SHRINK CEMENTITIOUS GROUT

- A. Properties: Certified to maintain initial placement volume or expand after set and meet the following minimum properties when tested in accordance with CRD-C621, for Type D non-shrink grout:

Property	Test	Time	Result
Setting Time	ASTM C191	Initial	2 hours (Approx)
		Final	3 hours (Approx)
Expansion			0.10% - 0.4% Maximum

Compressive Strength	CRD-C621	1 day	4,000 psi
		7 days	7,000 psi
		28 days	10,000 psi to 10,800 psi

2.4 FORMWORK

- A. Refer to Section 031000 for formwork requirements.

2.5 CURING

- A. Prevent rapid loss of water from grout during first 48 hours by use of approved membrane curing compound or with use of wet burlap method.

PART 3 EXECUTION

3.1 PREPARATION

- A. Remove defective concrete, laitance, dirt, oil, grease and other foreign material from concrete surfaces by brushing, hammering, chipping or other similar means until sound, clean concrete surface is achieved.
- B. Rough concrete lightly, but not enough to interfere with placement of grout.
- C. Remove foreign materials from metal surfaces in contact with grout.
- D. Align, level and maintain final positioning of components to be grouted.
- E. Saturate concrete surfaces with clean water; remove excess water, leave none standing.

3.2 MIXING

- A. Portland Cement Grout:
 1. Use proportions of 2 parts sand and 1 part cement, measured by volume.
 2. Prepare grout with water to obtain consistency to permit placing and packing.
 3. Mix water and grout in two steps; pre-mix using approximately 2/3 of water; after partial mixing, add remaining water to bring mix to desired placement consistency and continue mixing 2 to 3 minutes.
 4. Mix only quantities of grout capable of being placed within 30 minutes after mixing.
 5. Do not add additional water after grout has been mixed.
 6. Capable of developing minimum compressive strength of 2400 psi in 48 hours and 7000 psi in 28 days.

***** [OR] *****

3.3 PLACING GROUT

- A. Place grout material quickly and continuously.
- B. Do not use pneumatic-pressure or dry-packing methods.
- C. Apply grout from one side only to avoid entrapping air.
- D. Do not vibrate placed grout mixture, or permit placement when area is being vibrated by nearby equipment.
- E. Thoroughly compact final installation and eliminate air pockets.
- F. Do not remove leveling shims for at least 48 hours after grout has been placed.

3.4 CURING

- A. Immediately after placement, protect grout from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. After grout has attained its initial set, keep damp for minimum of 3 days.

3.5 FIELD QUALITY CONTROL

- A. Submit proposed mix design of each class of grout to inspection and testing firm for review prior to commencement of Work.
- B. Tests of grout components may be performed to ensure conformance with specified requirements.

END OF SECTION 036000

SECTION 04 05 14

MASONRY MORTAR AND GROUT

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes mortar and grout for masonry.
- B. Related Sections:
 - 1. Section 042000 - Unit Masonry Assemblies: Installation of mortar and grout.
 - 2. Section 042016 - Reinforced Unit Masonry Assemblies: Installation of mortar and grout.

1.2 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 530 - Building Code Requirements for Masonry Structures.
 - 2. ACI 530.1 - Specifications for Masonry Structures.
- B. ASTM International:
 - 1. ASTM C5 - Standard Specification for Quicklime for Structural Purposes.
 - 2. ASTM C91 - Standard Specification for Masonry Cement.
 - 3. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
 - 4. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
 - 5. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
 - 6. ASTM C150 - Standard Specification for Portland Cement.
 - 7. ASTM C199 - Standard Test Method for Pier Test for Refractory Mortars.
 - 8. ASTM C206 - Standard Specification for Finishing Hydrated Lime.
 - 9. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
 - 10. ASTM C387 - Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete.
 - 11. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.
 - 12. ASTM C476 - Standard Specification for Grout for Masonry.
 - 13. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
 - 14. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
 - 15. ASTM C1019 - Standard Test Method for Sampling and Testing Grout.
 - 16. ASTM C1142 - Standard Specification for Extended Life Mortar for Unit Masonry.
 - 17. ASTM C1314 - Standard Test Method for Constructing and Testing Masonry Prisms Used to Determine Compliance with Specified Compressive Strength of Masonry.
 - 18. ASTM C1329 - Standard Specification for Mortar Cement.
 - 19. ASTM C1357 - Standard Test Method for Evaluating Masonry Bond Strength.

1.3 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Submittal requirements.
- B. Design Data: Submit design mix when Property specification of ASTM C270 is to be used, required environmental conditions, and admixture limitations.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 530 and ACI 530.1.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Section 016000 - Product Requirements.
- B. Cold Weather Requirements: In accordance with ACI 530.1 when ambient temperature or temperature of masonry units is less than 40 degrees F.
- C. Hot Weather Requirements: In accordance with ACI 530.1 when ambient temperature is greater than 100 degrees F or ambient temperature is greater than 90 degrees F with wind velocity greater than 8 mph.

PART 2 PRODUCTS

2.1 COMPONENTS

- A. Portland Cement: ASTM C150, Type I
- B. Calcium chloride is not permitted.

2.2 MIXES

- A. Mortar Mixes:
 - 1. Extended Life Mortar: ASTM C1142, Type RS
- B. Mortar Mixing:
 - 1. Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.
 - 2. Achieve uniformly damp sand immediately before mixing process.
 - 3. Re-temper only within two hours of mixing.
- C. Grout Mixes:
 - 1. Grout for Non-Structural Masonry: 3,000 psi strength at 28 days; 8-11 inches slump; mixed in accordance with ASTM C476 grout.
 - 2. Grout for Structural Masonry: 3,000 psi strength at 28 days; 8-11 inches slump; mixed in accordance with ASTM C476 grout.

- 3. Application:
 - a. Coarse Grout: For grouting spaces with minimum 4 inches dimension in every direction.
 - b. Fine Grout: For grouting other spaces.
- D. Grout Mixing:
 - 1. Mix grout in accordance with ASTM C94/C94M, modified to use ingredients complying with ASTM C476.
 - 2. Add admixtures; mix uniformly.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 013000 - Administrative Requirements: Coordination and project conditions.
- B. Request inspection of spaces to be grouted.

3.2 INSTALLATION

- A. Install mortar and grout in accordance with ACI 530.1 Specifications for Masonry Structures.

3.3 FIELD QUALITY CONTROL

- A. Establishing Mortar Mix: In accordance with ASTM C270.
- B. Testing Frequency: One set of specified tests for every 5,000 sf of completed wall area.
- C. Testing of Mortar Mix: In accordance with ASTM C780 for aggregate ratio and water content, air content, consistency, and compressive strength.
- D. Testing of Grout Mix: In accordance with ASTM C1019 for compressive strength, and in accordance with ASTM C143/C143M for slump.
- E. Test compressive strength of mortar and masonry to ASTM C1314; test in accordance with masonry unit sections specified.

END OF SECTION 040514

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SECTION 04 20 16

REINFORCED UNIT MASONRY ASSEMBLIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes concrete masonry units, reinforcement, anchorage, and accessories.
- B. Related Sections:
 - 1. Section 040514 - Masonry Mortar and Grout: Mortar and grout.

1.2 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 530 - Building Code Requirements for Masonry Structures.
 - 2. ACI 530.1 - Specifications for Masonry Structures.
- B. ASTM International:
 - 1. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 2. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - 3. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
 - 4. ASTM A580/A580M - Standard Specification for Stainless Steel Wire.
 - 5. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 6. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 7. ASTM A951 - Standard Specification for Masonry Joint Reinforcement.
 - 8. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction.
 - 9. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
 - 10. ASTM C27 - Standard Classification of Fireclay and High-Alumina Refractory Brick.
 - 11. ASTM C34 - Standard Specification for Structural Clay Load-Bearing Wall Tile.
 - 12. ASTM C55 - Standard Specification for Concrete Brick.
 - 13. ASTM C56 - Standard Specification for Structural Clay Non-Load-Bearing Tile.
 - 14. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale).
 - 15. ASTM C67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.

16. ASTM C73 - Standard Specification for Calcium Silicate Face Brick (Sand-Lime Brick).
17. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.
18. ASTM C126 - Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units.
19. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units.
20. ASTM C140 - Standard Test Methods of Sampling and Testing Concrete Masonry Units.
21. ASTM C212 - Standard Specification for Structural Clay Facing Tile.
22. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale).
23. ASTM C315 - Standard Specification for Clay Flue Linings.
24. ASTM C530 - Standard Specification for Structural Clay Non-Loadbearing Screen Tile.
25. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
26. ASTM C652 - Standard Specification for Hollow Brick (Hollow Masonry Units Made From Clay or Shale).
27. ASTM C744 - Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units.
28. ASTM C1261 - Standard Specification for Firebox Brick for Residential Fireplaces.
29. ASTM C1283 - Standard Practice for Installing Clay Flue Lining.
30. ASTM D226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
31. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
32. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

C. National Fire Protection Association:

1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

D. Underwriters Laboratories Inc.:

1. UL 723 - Tests for Surface Burning Characteristics of Building Materials.

1.3 PERFORMANCE REQUIREMENTS

A. Concrete Masonry Compressive Strength

1. Concrete Masonry Units: 1900 psi minimum net area compressive strength.

1.4 SUBMITTALS

- A. Section 013300 - Submittal Procedures: Submittal requirements.

B. Shop Drawings: Indicate bars sizes, spacings, locations, reinforcement quantities, bending and cutting schedules, supporting and spacing devices for reinforcement.

C. Product Data:

1. Submit data for masonry units and fabricated wire reinforcement.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 530 and ACI 530.1.

1.6 QUALIFICATIONS

A. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 016000 - Product Requirements.

B. Cold Weather Requirements: In accordance with ACI 530.1 when ambient temperature or temperature of masonry units is less than 40 degrees F.

C. Hot Weather Requirements: In accordance with ACI 530.1 when ambient temperature is greater than 100 degrees F or ambient temperature is greater than 90 degrees F with wind velocity greater than 8 mph.

PART 2 PRODUCTS

2.1 COMPONENTS

A. Hollow Load Bearing Concrete Masonry Units (CMU): ASTM C90; normal weight.

2.2 ACCESSORIES

A. Single Wythe Joint Reinforcement: ASTM A951; ladder type; 0.148 inch diameter side rods with 0.148 inch diameter cross ties.

B. Reinforcing Steel: ASTM A615/A615M, 60 ksi yield grade, deformed billet bars.

C. Anchor Rods: ASTM A307; Grade C; J-shaped or L-shaped; complete with washers and heavy hex nuts; sized for minimum 15 inch embedment.

1. Hot-Dipped Galvanizing: ASTM A153/A153M.

2. Mechanical Galvanizing: ASTM B695; Class 55.

D. Mortar and Grout: As specified in Section 04065.

- E. Joint Filler: Closed cell rubber; oversized 50 percent to joint width; self expanding.

2.3 SOURCE QUALITY CONTROL

- A. Section 014000 - Quality Requirements: Testing, inspection and analysis requirements.
- B. Test brick efflorescence in accordance with ASTM C67. Brick rated greater than “slightly effloresced” is not acceptable.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 013000 - Administrative Requirements: Coordination and project conditions.
- B. Verify field conditions are acceptable and are ready to receive work.
- C. Verify items provided by other sections of work are properly sized and located.
- D. Verify built-in items are in proper location, and ready for roughing into masonry work.

3.2 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied to other Sections.
- B. Furnish temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent support.
- C. Wet clay and shale brick before laying when initial rate of absorption is greater than 30 grams when tested in accordance with ASTM C67.

3.3 INSTALLATION

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form bed and head joints of uniform thickness.
- C. Coursing of Concrete Masonry Units:
 - 1. Bond: Running.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches.
 - 3. Mortar Joints: Concave.
- D. Placing And Bonding:
 - 1. Lay solid masonry units in full bed of mortar, with full head joints.
 - 2. Lay hollow masonry units with face shell bedding on head and bed joints.

3. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.
4. Remove excess mortar as Work progresses.
5. Interlock intersections and external corners.
6. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment is required, remove mortar and replace.
7. Perform job site cutting of masonry units with proper tools to assure straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
8. Isolate masonry from vertical structural framing members with movement joint .
9. Isolate top of masonry from horizontal structural framing members and slabs or decks.

E. Joint Reinforcement And Anchorage:

1. Install horizontal joint reinforcement 16 inches oc.
2. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
3. Place joint reinforcement continuous in first and second joint below top of walls.
4. Lap joint reinforcement ends minimum 6 inches.
5. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
6. Embed anchors embedded in concrete attached to structural steel members. Embed anchorages in every sixth brick.

F. Lintels:

1. Install precast concrete lintels over openings.
2. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled or indicated.
3. Openings Up To 42 inches Wide: Reinforce openings as indicated on Drawings.
4. Openings From 42 inches Up To 78 inches Wide: Reinforce openings as indicated on Drawings.
5. Openings Over 78 inches: Reinforce openings as indicated on Drawings.
6. Do not splice reinforcing bars.
7. Support and secure reinforcing bars from displacement.
8. Place and consolidate grout fill without displacing reinforcing.
9. Allow masonry lintels to attain specified strength before removing temporary supports.
10. Maintain minimum 8 inches bearing on each side of opening.

G. Grouted Components:

1. Reinforce bond beam with 1, No. 5 bar.
2. Reinforce pilaster with 1, No. 6 bar in each cell.
3. Lap splices bar diameters required by code.
4. Support and secure reinforcing bars from displacement.
5. Place and consolidate grout fill without displacing reinforcing.
6. At bearing locations, fill masonry cores with grout for minimum 12 inches either side of opening.

- H. Reinforced Masonry:
 - 1. Lay masonry units with cells vertically aligned and cavities between wythes clear of mortar and unobstructed.
 - 2. Place reinforcing, reinforcement bars, and grout as indicated on Drawings.
 - 3. Splice reinforcement in accordance with Section 03200.
 - 4. Support and secure reinforcement from displacement.
 - 5. Place and consolidate grout fill without displacing reinforcing.
 - 6. Place grout in accordance with ACI 530.1 Specification for Masonry Structures.
- I. Control And Expansion Joints:
 - 1. Install control and expansion joints at the following maximum spacings, unless otherwise indicated on Drawings:
 - a. Exterior Walls: 20 feet on center and within 10 feet on one side of each interior and exterior corner.
 - b. Interior Walls: 30 feet on center.
 - c. At changes in wall height.
 - 2. Do not continue horizontal joint reinforcement through control and expansion joints.
 - 3. Install preformed control joint device in continuous lengths. Seal butt and corner joints.
 - 4. Size control joint in accordance with Section 07900 for sealant performance.
 - 5. Form expansion joint by omitting mortar and cutting unit to form open space.
- J. Cutting And Fitting:
 - 1. Obtain Architect/Engineer's approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.4 ERECTION TOLERANCES

- A. Section 014000 - Quality Requirements: Tolerances.
- B. Maximum Variation From Alignment of Pilasters: 1/4 inch.
- C. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- D. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- E. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- F. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- G. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.
- H. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

- I. Maximum Variation for Steel Reinforcement:
 - 1. Install reinforcement within the tolerances specified in ACI 530.1 for foundation walls.
 - 2. Plus or minus 1/2 inch when distance from centerline of steel to opposite face of masonry is 8 inches or less.
 - 3. Plus or minus 1 inch when distance is between 8 and 24 inches.
 - 4. Plus or minus 1-1/4 inch when distance is greater than 24 inches.
 - 5. Plus or minus 2 inches from location along face of wall.

3.5 FIELD QUALITY CONTROL

- A. Concrete Masonry Units: Test each type in accordance with ASTM C140.

3.6 CLEANING

- A. Section 017000 - Execution Requirements: Final cleaning.
- B. Remove excess mortar and mortar smears as work progresses.
- C. Replace defective mortar. Match adjacent work.
- D. Clean soiled surfaces with cleaning solution.
- E. Use non-metallic tools in cleaning operations.

3.7 PROTECTION OF FINISHED WORK

- A. Section 017000 - Execution Requirements: Requirements for protecting finished Work.
- B. Protect exposed external corners subject to damage.
- C. Protect base of walls from mud and mortar splatter.
- D. Protect masonry and other items built into masonry walls from mortar droppings and staining caused by mortar.
- E. Protect tops of masonry work with waterproof coverings secured in place without damaging masonry. Provide coverings where masonry is exposed to weather when work is not in progress.

END OF SECTION 042016

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SECTION 042200
CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Decorative concrete masonry units.
3. Pre-faced concrete masonry units.
4. Steel reinforcing bars.

1.2 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- 1.
- B. Shop Drawings: For reinforcing steel. Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.
- C. Samples: For each type and color of the following:
1. **[Exposed] [Decorative]** CMUs.
 2. Pre-faced CMUs.
 3. **[Pigmented] [and] [colored-aggregate]** mortar.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type and size of product. For masonry units, include **[data on material properties] [material test reports substantiating compliance with requirements]**.
- B. Mix Designs: For each type of mortar **[and grout]**. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

1.5 QUALITY ASSURANCE

- A. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.
 1. Build sample panels for **[each type of exposed unit masonry construction]** **[typical exterior wall]** **[typical interior wall]** **[typical exterior and interior walls]** in sizes approximately **[48 inches (1200 mm)]** **[60 inches (1500 mm)]** <Insert dimension> long by **[36 inches (900 mm)]** **[48 inches (1200 mm)]** <Insert dimension> high **[by full thickness]**.

1.6 FIELD CONDITIONS

- A. 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 TMS 602/ACI 530.1/ASCE 6.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
 1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

- A. [<Double click to insert sustainable design text for regional materials.>](#)
- B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
- C. Integral Water Repellent: Provide units made with integral water repellent [**for exposed units**] [**and**] [**where indicated**].
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- D. Insulated CMUs: Where indicated, units shall contain rigid, specially shaped, cellular thermal insulation units complying with ASTM C 578, Type I, designed for installing in cores of masonry units.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- E. CMUs: ASTM C 90.
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of [**2150 psi (14.8 MPa)**] [**2800 psi (19.3 MPa)**] [**3050 psi (21.0 MPa)**] **<Insert value>**.
 2. Density Classification: [**Lightweight**] [**Medium weight**] [**Normal weight**][**unless otherwise indicated**].
- F. Concrete Building Brick: ASTM C 55.
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of [**2800 psi (19.3 MPa)**] [**3050 psi (21.0 MPa)**] [**3750 psi (25.86 MPa)**] [**4050 psi (27.92 MPa)**] **<Insert value>**.
 2. Density Classification: [**Lightweight**] [**Medium weight**] [**Normal weight**].
- G. Decorative CMUs: ASTM C 90.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
 2. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of [**2150 psi (14.8 MPa)**] [**2800 psi (19.3 MPa)**] [**3050 psi (21.0 MPa)**] **<Insert value>**.
 3. Density Classification: [**Lightweight**] [**Medium weight**] [**Normal weight**].
 4. Pattern and Texture:
 - a. Standard pattern, ground-face finish.[**Match Architect's samples.**]
 - b. Standard pattern, split-face finish.[**Match Architect's samples.**]
 - c. Standard pattern, split-ribbed finish.[**Match Architect's samples.**]
 - d. Scored vertically, standard finish.[**Match Architect's samples.**]

- H. Pre-faced CMUs: Lightweight [**hollow**] [**solid**] concrete units complying with ASTM C 90, with manufacturer's standard smooth resinous facing complying with ASTM C 744.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
 2. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of [**2150 psi (14.8 MPa)**] [**2800 psi (19.3 MPa)**] [**3050 psi (21.0 MPa)**] **<Insert value>**.
 3. Size: Manufactured with pre-faced surfaces having **1/16-inch- (1.5-mm-)** wide returns of facing to create **1/4-inch- (6.5-mm-)** wide mortar joints.
 4. Colors and Patterns: [**As indicated by manufacturer's designations**] [**Match Architect's samples**] [**As selected by Architect from manufacturer's full range**].

2.3 CONCRETE LINTELS

- A. Concrete Lintels: ASTM C 1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated.[**Provide lintels with net-area compressive strength not less than that of CMUs.**]

2.4 MORTAR AND GROUT MATERIALS

- A. [<Double click to insert sustainable design text for mortar and grout.>](#)
- B. Portland Cement: ASTM C 150/C 150M, 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.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- E. Masonry Cement: ASTM C 91/C 91M.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- F. 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 masonry mortar.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- G. Colored Cement Products: Packaged blend made from [**portland cement and hydrated lime**] [**or**] [**masonry cement**] and mortar pigments, all complying with specified requirements, and containing no other ingredients.
1. Colored Portland Cement-Lime Mix:
 - a. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2. Colored Masonry Cement:

- a. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

H. Aggregate for Mortar: ASTM C 144.

1. White-Mortar Aggregates: Natural white sand or crushed white stone.
2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

I. Aggregate for Grout: ASTM C 404.

J. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

K. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

L. Water: Potable.

2.5 REINFORCEMENT

A. Uncoated-Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, **Grade 60** (Grade 420).

B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from **0.148-inch (3.77-mm)** steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

C. Masonry-Joint Reinforcement, General: ASTM A 951/A 951M.

1. Interior Walls: [**Mill-**] [**Hot-dip**] galvanized, carbon steel.
2. Exterior Walls: [**Hot-dip galvanized carbon**] [**Stainless**] steel.
3. Wire Size for Side Rods: [**0.148-inch (3.77-mm)**] [**0.187-inch (4.76-mm)**] diameter.
4. Wire Size for Cross Rods: [**0.148-inch (3.77-mm)**] [**0.187-inch (4.76-mm)**] diameter.
5. Spacing of Cross Rods: Not more than **16 inches (407 mm)** o.c.
6. Provide in lengths of not less than **10 feet (3 m)**[, **with prefabricated corner and tee units**].

2.6 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
 2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
 3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Anchor Section for Welding to Steel Frame: Crimped **1/4-inch- (6.35-mm-)** diameter, hot-dip galvanized-steel wire.
 2. Tie Section: Triangular-shaped wire tie made from [**0.187-inch- (4.76-mm-)**] [**0.25-inch- (6.35-mm-)**] diameter, hot-dip galvanized-steel wire.
- C. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from [**0.060-inch- (1.52-mm-) thick steel sheet, galvanized after fabrication**] [**0.105-inch- (2.66-mm-) thick steel sheet, galvanized after fabrication**].
 2. Tie Section: Triangular-shaped wire tie made from [**0.187-inch- (4.76-mm-)**] [**0.25-inch- (6.35-mm-)**] diameter, hot-dip galvanized-steel wire.
 3. Corrugated-Metal Ties: Metal strips not less than **7/8 inch (22 mm)** wide with corrugations having a wavelength of **0.3 to 0.5 inch (7.6 to 12.7 mm)** and an amplitude of **0.06 to 0.10 inch (1.5 to 2.5 mm)** made from [**0.060-inch- (1.52-mm-) thick steel sheet, galvanized after fabrication**] [**0.075-inch- (1.90 mm-) thick steel sheet, galvanized after fabrication**] [**0.105-inch- (2.66-mm-) thick steel sheet, galvanized after fabrication**] with dovetail tabs for inserting into dovetail slots in concrete.
- D. Partition Top Anchors: **0.105-inch- (2.66-mm-) thick metal plate** with a **3/8-inch- (9.5-mm-) diameter metal rod 6 inches (152 mm)** long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- E. Rigid Anchors: Fabricate from steel bars **1-1/2 inches (38 mm)** wide by **1/4 inch (6.35 mm)** thick by **24 inches (610 mm)** long, with ends turned up **2 inches (51 mm)** or with cross pins unless otherwise indicated.
1. Corrosion Protection: [**Hot-dip galvanized to comply with ASTM A 153/A 153M**] [**Epoxy coating 0.020 inch (0.51 mm) thick**].

2.7 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with Section 076200 "Sheet Metal Flashing and Trim" and as follows:
1. Fabricate metal drip edges from stainless steel. Extend at least **3 inches (76 mm)** into wall and **1/2 inch (13 mm)** out from wall, with outer edge bent down 30 degrees[**and hemmed**].
 2. Fabricate metal sealant stops from stainless steel. Extend at least **3 inches (76 mm)** into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for **3/4 inch (19 mm)** and down into joint **1/4 inch (6 mm)** to form a stop for retaining sealant backer rod.
 3. Fabricate metal expansion-joint strips from [**stainless steel**] [**copper**] to shapes indicated.
- B. Flexible Flashing: Use[**one of**] the following unless otherwise indicated:
1. Copper-Laminated Flashing: [**5-oz./sq. ft. (1.5-kg/sq. m)**] [**7-oz./sq. ft. (2-kg/sq. m)**] copper sheet bonded between two layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
 - a. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
 2. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than [**0.030 inch (0.76 mm)**] [**0.040 inch (1.02 mm)**].
 - a. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
 3. Butyl Rubber Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than [**0.030 inch (0.76 mm)**] [**0.040 inch (1.02 mm)**].
 - a. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
 4. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy.
 - a. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
 5. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D 4637/D 4637M, **0.040 inch (1.0 mm)** thick.
 - a. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- C. Single-Wythe CMU Flashing System: System of CMU cell flashing pans and interlocking CMU web covers made from UV-resistant, high-density polyethylene. Cell flashing pans have integral weep spouts designed to be built into mortar bed joints and that extend into the cell to prevent clogging with mortar.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- D. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 "Sheet Metal Flashing and Trim."
- E. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.8 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. Preformed Control-Joint Gaskets: Made from [**styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805**] [**or**] [**PVC, complying with ASTM D 2287, Type PVC-65406**] and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).

2.9 MASONRY-CELL FILL

- A. Loose-Fill Insulation: Perlite complying with ASTM C 549, Type II (surface treated for water repellency and limited moisture absorption) or Type IV (surface treated for water repellency and to limit dust generation).
- B. Lightweight-Aggregate Fill: ASTM C 331/C 331M.

2.10 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. Use [**portland cement-lime**] [**or**] [**masonry cement**] mortar unless otherwise indicated.
 - 3. For exterior masonry, use [**portland cement-lime**] [**or**] [**masonry cement**] mortar.
 - 4. For reinforced masonry, use [**portland cement-lime**] [**or**] [**masonry cement**] mortar.
 - 5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended 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] [Property]** Specification. Provide the following types of mortar for applications stated unless another type is indicated.
1. For masonry below grade or in contact with earth, use **[Type M] [Type S]**.
 2. For reinforced masonry, use **[Type S] [Type N]**.
 3. For mortar parge coats, use **[Type S] [or] [Type N]**.
 4. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
 5. For interior nonload-bearing partitions, Type O may be used instead of Type N.
- D. 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.
 3. Application: Use pigmented mortar for exposed mortar joints with the following units:
 - a. Decorative CMUs.
 - b. Pre-faced CMUs.
- E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
1. Application: Use colored-aggregate mortar for exposed mortar joints with the following units:
 - a. Decorative CMUs.
 - b. Pre-faced CMUs.
- F. Grout for Unit Masonry: Comply with ASTM C 476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 2. Proportion grout in accordance with ASTM C 476, **[Table 1] [or] [paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa)]**.
 3. Provide grout with a slump of **[8 to 11 inches (200 to 280 mm)] [10 to 11 inches (250 to 280 mm)]** as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.2 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus **1/2 inch (12 mm)** or minus **1/4 inch (6 mm)**.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus **1/2 inch (12 mm)**.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus **1/4 inch (6 mm)** in a story height or **1/2 inch (12 mm)** total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than **1/4 inch in 10 feet (6 mm in 3 m)**, or **1/2-inch (12-mm)** maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than **1/8 inch in 10 feet (3 mm in 3 m)**, **1/4 inch in 20 feet (6 mm in 6 m)**, or **1/2-inch (12-mm)** maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than **1/4 inch in 10 feet (6 mm in 3 m)**, **3/8 inch in 20 feet (9 mm in 6 m)**, or **1/2-inch (12-mm)** maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than **1/8 inch in 10 feet (3 mm in 3 m)**, **1/4 inch in 20 feet (6 mm in 6 m)**, or **1/2-inch (12-mm)** maximum.
5. For lines and surfaces, do not vary from straight by more than **1/4 inch in 10 feet (6 mm in 3 m)**, **3/8 inch in 20 feet (9 mm in 6 m)**, or **1/2-inch (12-mm)** maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus **1/8 inch (3 mm)**, with a maximum thickness limited to **1/2 inch (12 mm)**.
2. For head and collar joints, do not vary from thickness indicated by more than plus **3/8 inch (9 mm)** or minus **1/4 inch (6 mm)**.
3. For exposed head joints, do not vary from thickness indicated by more than plus or minus **1/8 inch (3 mm)**.

3.3 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: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal **4-inch (100-mm)** horizontal face dimensions at corners or jambs.
- C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- E. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- F. Fill cores in hollow CMUs with grout **24 inches (600 mm)** under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Lay solid CMUs 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 joint thickness unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.5 MASONRY-CELL FILL

- A. Pour [**loose-fill insulation**] [**lightweight-aggregate fill**] into cavities to fill void spaces. Maintain inspection ports to show presence of fill at extremities of each pour area. Close the ports after filling has been confirmed. Limit the fall of fill to one story high, but not more than **20 feet (6 m)**.
- B. Install molded-polystyrene insulation units into masonry unit cells before laying units.

3.6 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of **5/8 inch (16 mm)** on exterior side of walls, **1/2 inch (13 mm)** elsewhere. Lap reinforcement a minimum of **6 inches (150 mm)**.
 - 1. Space reinforcement not more than **16 inches (406 mm)** o.c.
 - 2. Space reinforcement not more than **8 inches (203 mm)** o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than **8 inches (203 mm)** above and below wall openings and extending **12 inches (305 mm)** beyond openings[**in addition to continuous reinforcement**].
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.

3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
 - 1. Provide an open space not less than [**1/2 inch (13 mm)**] [**1 inch (25 mm)**] [**2 inches (50 mm)**] wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than **24 inches (610 mm)** o.c. vertically and **36 inches (915 mm)** o.c. horizontally.

3.8 FLASHING

- A. General: Install embedded flashing at ledges and other obstructions to downward flow of water in wall where indicated.
- B. Install flashing as follows unless otherwise indicated:
 - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, 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**].
 - 2. At lintels, extend flashing a minimum of **6 inches (150 mm)** into masonry at each end. At heads and sills, extend flashing **6 inches (150 mm)** at ends and turn up not less than **2 inches (50 mm)** to form end dams.
 - 3. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing **1/2 inch (13 mm)** back from outside face of wall, and adhere flexible flashing to top of metal drip edge.

4. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing **1/2 inch (13 mm)** back from outside face of wall, and adhere flexible flashing to top of metal flashing termination.
- C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

3.9 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 2. Limit height of vertical grout pours to not more than **[60 inches (1520 mm)] [12.67 ft. (3.86 m)]** <Insert height>.

3.10 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to Level **[B]** **[C]** in TMS 402/ACI 530/ASCE 5.
 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.

- D. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.
- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- G. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for [mortar air content] [and] [compressive strength].
- H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.
- I. Prism Test: For each type of construction provided, according to ASTM C 1314 at [seven days and at]28 days.

3.11 PARGING

- A. Parge exterior faces of below-grade masonry walls, where indicated, in two uniform coats to a total thickness of 3/4 inch (19 mm). Dampen wall before applying first coat, and scarify first coat to ensure full bond to subsequent coat.
- B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot (3 mm per 300 mm). Form a wash at top of parging and a cove at bottom.
- C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.12 REPAIRING, POINTING, AND CLEANING

- A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
 2. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.13 MASONRY WASTE DISPOSAL

- A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 1. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.

- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042200

SECTION 044313.13

ANCHORED STONE MASONRY VENEER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stone masonry anchored to unit masonry backup.

B. Related Requirements:

1. Section 042000 "Unit Masonry" for [**cavity-wall insulation**] [**concealed flashing**] [**horizontal joint reinforcement**] [**and**] [**veneer anchors**].
2. Section 055000 "Metal Fabrications" for furnishing steel [**lintels**] [**and**] [**shelf angles**] for stone masonry.

1.2 ACTION SUBMITTALS

A. Product Data: For each variety of stone, stone accessory, and manufactured product.

B. Sustainable Design Submittals:

1. <Double click to insert sustainable design text for regional materials.>

C. 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 ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is **40 deg F (4 deg C)** and above and will remain so until masonry has dried.

C. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 LIMESTONE <Insert drawing designation>

- A. Material Standard: Comply with ASTM C 568.
- B. [<Double click to insert sustainable design text for regional stone materials.>](#)
- C. Varieties and Sources: Subject to compliance with requirements, **[provide the following]** **[provide one of the following]** **[available stone varieties that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1. **<Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.**

2.2 MORTAR MATERIALS

- A. [<Double click to insert sustainable design text for mortar and grout.>](#)
- B. Portland Cement: ASTM C 150, 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.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Masonry Cement: ASTM C 91.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in stone masonry mortar.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- F. Colored Portland Cement-Lime Mix: Packaged blend of portland cement, hydrated lime, and mortar pigments. Mix shall produce color indicated or, if not indicated, as selected from manufacturer's standard colors. Pigments shall not exceed 10 percent of portland cement by weight.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- G. Colored Masonry Cement Mix: Packaged blend of masonry cement and mortar pigments. Mix shall produce color indicated or, if not indicated, as selected from manufacturer's standard colors. Pigments shall not exceed 5 percent of masonry cement by weight.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

H. Aggregate: ASTM C 144 and as follows:

1. For pointing mortar, use aggregate graded with 100 percent passing **No. 16 (1.18-mm)** sieve.
2. White Aggregates: Natural white sand or ground white stone.
3. Colored Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.

I. Water: Potable.

2.3 VENEER ANCHORS

A. Materials:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2.
2. Stainless-Steel Wire: ASTM A 580/A 580M, **[Type 304] [Type 316]**.
3. 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.
4. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, **[Type 304] [Type 316]**.

B. Wire Veneer Anchors: Wire ties formed from W1.7 or **0.148-inch- (3.8-mm-)** diameter, **[hot-dip galvanized] [stainless]-steel** wire.

C. Corrugated-Metal Veneer Anchors: Not less than **0.030-inch- (0.76-mm-)** thick by **7/8-inch- (22-mm-)** wide **[hot-dip galvanized] [stainless]-steel** sheet with corrugations having a wavelength of **0.3 to 0.5 inch (7.6 to 13 mm)** and an amplitude of **0.06 to 0.10 inch (1.5 to 2.5 mm)**.

D. Adjustable, Screw-Attached Veneer Anchors: Units consisting of a wire tie section and a metal anchor section 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:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. 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)**.
3. Fabricate sheet metal anchor sections and other sheet metal parts from **[0.067-inch- (1.7-mm-) thick, steel sheet, galvanized after fabrication] [0.097-inch- (2.5-mm-) thick, steel sheet, galvanized after fabrication] [0.078-inch- (2.0-mm-) thick, stainless-steel sheet] [0.109-inch- (2.8-mm-) thick, stainless-steel sheet]**.
4. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from **[0.188-inch- (4.8-mm-)] [0.25-inch- (6.4-mm-)]** diameter, **[hot-dip galvanized] [stainless]-steel** wire.

E. Seismic Veneer Anchors: Units consisting of a metal anchor section and a connector section designed to engage a continuous wire embedded in stone masonry mortar joint, complying with the following requirements:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. 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)**.
3. Fabricate sheet metal anchor sections and other sheet metal parts from [**0.067-inch- (1.7-mm-) thick, steel sheet, galvanized after fabrication**] [**0.097-inch- (2.5-mm-) thick, steel sheet, galvanized after fabrication**] [**0.078-inch- (2.0-mm-) thick, stainless-steel sheet**] [**0.109-inch- (2.8-mm-) thick, stainless-steel sheet**].
4. Fabricate wire connector sections from [**0.188-inch- (4.8-mm-)**] [**0.25-inch- (6.4-mm-) diameter, [hot-dip galvanized, carbon] [stainless]-steel wire**].
5. Continuous Wire: **0.188-inch- (4.8-mm-) diameter, [hot-dip galvanized] [stainless]-steel wire**.

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. Copper: ASTM B 370, Temper H00 or H01, cold-rolled copper sheet, **10-oz./sq. ft. (3-kg/sq. m)** weight or **0.0135 inch (0.34 mm)** thick for fully concealed flashing; **16-oz./sq. ft. (5-kg/sq. m)** weight or **0.0216 inch (0.55 mm)** thick elsewhere.
- B. Flexible Flashing: For flashing unexposed to the exterior, use[**one of**] the following unless otherwise indicated:
 1. Copper-Laminated Flashing: [**5-oz./sq. ft. (1.5-kg/sq. m)**] [**7-oz./sq. ft. (2-kg/sq. m)**] copper sheet bonded with asphalt between two layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
 - a. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
 2. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive, rubberized-asphalt compound, bonded to a high-density, cross-laminated, polyethylene film to produce an overall thickness of not less than [**0.030 inch (0.76 mm)**] [**0.040 inch (1.0 mm)**].
 - a. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2.5 MISCELLANEOUS MASONRY ACCESSORIES

- A. Cementitious Dampproofing[**for Limestone**]: Cementitious formulation recommended by ILI and nonstaining to stone, compatible with joint sealants, and noncorrosive to veneer anchors and attachments.

- B. Asphalt Dampproofing: [Cut-back asphalt complying with ASTM D 4479, Type I] [or] [asphalt emulsion complying with ASTM D 1227, Type III or Type IV].
- C. Weep/Vent Products: Use[**one of**] the following unless otherwise indicated:
 - 1. Wicking Material: Absorbent rope, made from [cotton] [or] [UV-resistant synthetic fiber], 1/4 to 3/8 inch (6 to 10 mm) in diameter, in length required to produce 2-inch (50-mm) exposure on exterior and 18 inches (450 mm) in cavity behind stone masonry. Use only for weeps.
 - 2. Round Plastic Tubing: Medium-density polyethylene, 3/8-inch (10-mm) OD by thickness of stone masonry.
- D. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
 - 2. 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.
 - b. Strips, not less than [3/4 inch (19 mm)] [1-1/2 inches (38 mm)] thick and 10 inches (250 mm) wide, with dimpled surface designed to catch mortar droppings and prevent weep holes from being clogged with mortar.
 - c. Sheets or strips full depth of cavity and installed to full height of cavity.
 - d. Sheets or strips not less than [3/4 inch (19 mm)] [1 inch (25 mm)] <Insert dimension> thick and installed to full height of cavity with additional strips 4 inches (100 mm) high at weep holes and thick enough to fill entire depth of cavity and prevent weep holes from being clogged with mortar.

2.6 CAVITY-WALL INSULATION

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, [Type IV] [Type X], closed-cell product extruded with an integral skin.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type I (aluminum-foil faced), Class 2 (glass-fiber reinforced).

2.7 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.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2.8 FABRICATION

- A. **[Cut] [Split] [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 **[sawed] [split]** beds.
- B. Thickness of Stone: Provide thickness indicated, but not less than the following:
1. Thickness: **4 inches (100 mm)** plus or minus **[1/4 inch (6 mm)] [1/2 inch (13 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: **[Split face] [Rock face (pitched face)] [Natural cleft] [Mixed split face and seam face] [Mixed split face, seam face, and rock face (pitched face)] [Smooth] [Sand rubbed] [As indicated]**.
 2. Finish for Sills: **[Smooth] [Sand rubbed] [Split face with sand-rubbed washes] [Rock face (pitched face) with sand-rubbed washes] [Rock face (pitched face) with tooled (boasted) washes]**.
 3. Finish for Lintels: **[Smooth] [Sand rubbed] [Split face] [Rock face (pitched face)]**.
 4. Finish for Copings: **[Smooth] [Sand rubbed] [Split face] [Rock face (pitched face), front and back; sand-rubbed top] [Rock face (pitched face), front and back; tooled (boasted) top]**.
 - a. Finish exposed ends of copings same as front and back faces.

2.9 MORTAR MIXES

- A. General: Do not use admixtures unless otherwise indicated.
1. Do not use calcium chloride.
 2. Use **[portland cement-lime] [masonry cement] [or] [mortar 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] [Type N]**.
 2. Mortar for Pointing Stone: **[Type N] [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] [or] [mortar 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 power saws to cut stone that is fabricated with saw-cut surfaces.
 2. Use hammer and chisel to split stone that is fabricated with split surfaces.
 3. 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 range ashlar pattern with course heights as indicated, **[uniform] [random]** lengths, and uniform joint widths, with offset between vertical joints as indicated.
- D. Arrange stones in broken-range ashlar pattern with uniform course heights, random lengths, and uniform joint widths.
- E. Arrange stones in three-course, random-range ashlar pattern with random course heights, random lengths (interrupted coursed), and uniform joint widths.
- F. Arrange stones in **[coursed] [uncoursed]** rubble pattern with joint widths within tolerances indicated.**[Insert small stones into spaces between larger stones as needed to produce joints as uniform in width as practical.]**
- G. Arrange stones with color and size variations uniformly dispersed for an evenly blended appearance.
- H. 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 **[1/4 inch (6 mm)] [3/8 inch (10 mm)]** at narrowest points or more than **[3/8 inch (10 mm)]**

[1/2 inch (13 mm)] [5/8 inch (16 mm)] [1 inch (25 mm)] [1-1/2 inches (38 mm)] at widest points.

- I. Provide sealant joints of widths and at locations indicated.
 - 1. Keep sealant joints free of mortar and other rigid materials.
 - 2. Sealing joints is specified in Section 079200 "Joint Sealants."
- J. 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 [8 inches (200 mm)] [12 inches (300 mm)] [16 inches (400 mm)], and behind weather barrier.
 - 2. At multiwythe masonry walls, including cavity walls, extend flashing through stone masonry, turned up a minimum of [4 inches (100 mm)] [8 inches (200 mm)] [12 inches (300 mm)] [16 inches (400 mm)], and extend into or through inner wythe to comply with requirements in Section 042000 "Unit Masonry."
 - 3. At concrete backing, extend flashing through stone masonry, turned up a minimum of [4 inches (100 mm)] [6 inches (150 mm)] [8 inches (200 mm)] [12 inches (300 mm)], and insert in reglet.[**Reglets are specified in Section 076200 "Sheet Metal Flashing and Trim."**]
 - 4. At lintels and shelf angles, extend flashing full length of angles but not less than 6 inches (150 mm) into masonry at each end.
 - 5. At sills, extend flashing not less than 4 inches (100 mm) at ends.
 - 6. At ends of head and sill flashing, turn up not less than 2 inches (50 mm) to form end dams.
 - 7. Extend sheet metal flashing 1/2 inch (13 mm) beyond masonry face at exterior, and turn flashing down to form a drip.
 - 8. Install metal drip edges beneath flexible flashing at exterior wall face. Stop flexible flashing 1/2 inch (13 mm) back from exterior wall face and adhere flexible flashing to top of metal drip edge.
 - 9. Install metal flashing termination beneath flexible flashing at exterior wall face. Stop flexible flashing 1/2 inch (13 mm) back from exterior wall face and adhere flexible flashing to top of metal flashing termination.
 - 10. Cut flexible flashing flush with wall face after completing masonry wall construction.
- K. Coat limestone with cementitious dampproofing as follows:
 - 1. Stone at Grade: Beds, joints, and back surfaces to at least 12 inches (300 mm) above finish-grade elevations.
 - 2. Stone Extending below Grade: Beds, joints, back surfaces, and face surfaces below grade.
- L. 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] [open head joints] 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 [16 inches (400 mm)] [24 inches (600 mm)] o.c.

4. Space weep holes formed from [**plastic tubing**] [**or**] [**wicking material**] 16 inches (400 mm) o.c.
 5. Trim wicking material used in weep holes flush with exterior wall face after mortar has set.
 6. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.
- M. Install vents in head joints at top of each continuous cavity at spacing indicated. Use [**round plastic tubing**] [**or**] [**open head joints**] to form vents.

3.3 CONSTRUCTION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (10 mm in 6 m), or 1/2 inch in 40 feet (13 mm in 12 m) or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m) or 1/2 inch in 40 feet (13 mm in 12 m) 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 (6 mm in 6 m) or 1/2 inch in 40 feet (13 mm in 12 m) or more.
- C. Variation of Linear Building Line: For position shown in plan, do not exceed 1/2 inch in 20 feet (13 mm in 6 m) or 3/4 inch in 40 feet (19 mm in 12 m) or more.

3.4 INSTALLATION OF ANCHORED STONE MASONRY

- A. Anchor stone masonry to concrete with corrugated-metal veneer anchors unless otherwise indicated. Secure anchors by inserting dovetailed ends into dovetail slots in concrete.
- B. Anchor stone masonry to unit masonry with [**corrugated-metal**] [**or**] [**individual wire**] veneer anchors unless otherwise indicated. Embed anchors in unit masonry mortar joints or grouted cells at a distance of at least one-half of unit masonry thickness.
- C. Anchor stone masonry to unit masonry with wire anchors unless otherwise indicated. Connect anchors to masonry joint reinforcement by inserting pintles into eyes of masonry joint reinforcement projecting from unit masonry.
- D. Anchor stone masonry to unit masonry with wire anchors unless otherwise indicated. Connect anchors to masonry joint reinforcement with vertical rods inserted through anchors and through eyes of masonry joint reinforcement projecting from unit masonry.
- E. Anchor stone masonry to stud framing with [**adjustable, screw-attached**] [**seismic**] veneer anchors unless otherwise indicated. Fasten anchors through sheathing to framing with two screws.
- F. Embed veneer anchors in mortar joints of stone masonry at least halfway, but not less than 1-1/2 inches (38 mm), through stone masonry and with at least a 5/8-inch (16-mm) cover on exterior face.

1. Install continuous wire reinforcement in horizontal joints and attach to seismic veneer anchors as stone is set.
- G. Space anchors to provide not less than one anchor per **2 sq. ft. (0.2 sq. m)** of wall area. Install additional anchors within **12 inches (300 mm)** of openings, sealant joints, and perimeter at intervals not exceeding **12 inches (300 mm)**.
- H. Space anchors not more than **16 inches (400 mm)** o.c. vertically and **24 inches (600 mm)** o.c. horizontally. Install additional anchors within **12 inches (300 mm)** of openings, sealant joints, and perimeter at intervals not exceeding **12 inches (300 mm)**.
- I. Space anchors not more than **18 inches (450 mm)** o.c. vertically and **32 inches (800 mm)** o.c. horizontally, with not less than one anchor per **2.67 sq. ft. (0.25 sq. m)** of wall area. Install additional anchors within **12 inches (300 mm)** of openings, sealant joints, and perimeter at intervals not exceeding **12 inches (300 mm)**.
- J. Set stone in full bed of mortar with full head joints unless otherwise indicated. Build anchors into mortar joints as stone is set.
- K. Fill **[collar joint] [space between back of stone masonry and weather-resistant sheathing paper]** with mortar as stone is set.
- L. Provide **[1-inch (25-mm)] [2-inch (50-mm)]** 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.
 2. Do not attempt to trowel or remove mortar fins protruding into cavity.
- M. Rake out joints for pointing with mortar to depth of not less than **[1/2 inch (13 mm)] [3/4 inch (19 mm)]** before setting mortar has hardened. Rake joints to uniform depths with square bottoms and clean sides.

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 (10 mm)** deep until a uniform depth is formed.
- B. Point stone joints by placing and compacting pointing mortar in layers of not more than **3/8 inch (10 mm)** deep. Compact each layer thoroughly and allow to it become thumbprint hard before applying next layer.
- C. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile:
 1. Joint Profile: **[Concave] [Smooth, flat face slightly below edges of stone] [Smooth, flat face recessed 1/4 inch (6 mm) below edges of stone (raked joint)] [Flush, with a 3/8-inch (10-mm) half-round raised bead in middle of joint] [As indicated].**

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.
- B. Disposal as Fill Material: Dispose of clean masonry waste, including mortar and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.
 - 1. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.

END OF SECTION 044313.13

SECTION 05 12 00
STRUCTURAL STEEL

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Structural shapes.
 - 2. Channels and angles.
 - 3. Hollow structural sections.
 - 4. Structural pipe.
 - 5. Structural plates and bars.
 - 6. Fasteners, connectors, and anchors.
 - 7. Fasteners, connectors, and anchors.
 - 8. Grout.
- B. Related Sections:
 - 1. Section 036000 - Grout: Grout for setting base plates.
 - 2. Section 052100 - Steel Joists.
 - 3. Section 053123 - Steel Roof Deck
 - 4. Section 055000 – Metal Fabrications: Steel Fabrications affecting structural steel work.

1.2 REFERENCES

- A. American Institute of Steel Construction:
 - 1. AISC Code of Standard Practice for Steel Buildings and Bridges.
 - 2. AISC Load and Resistance Factor Design (LRFD) Specification for Structural Steel Buildings.
 - 3. AISC Load and Resistance Factor Design Specification for Single-Angle Members.
 - 4. AISC Seismic Provisions for Structural Steel Buildings.
 - 5. AISC Specification for Allowable Stress Design of Single-Angle Members.
 - 6. AISC Specification for the Design of Steel Hollow Structural Sections.
 - 7. AISC Specification for Structural Steel Buildings Allowable Stress Design, and Plastic Design.
- B. ASTM International:
 - 1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
 - 2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 3. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
 - 4. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

5. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
6. ASTM A193/A193M - Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
7. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
8. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
9. ASTM A354 - Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners.
10. ASTM A449 - Standard Specification for Quenched and Tempered Steel Bolts and Studs.
11. ASTM A490 - Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.
12. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
13. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
14. ASTM A514/A514M - Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding.
15. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
16. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
17. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
18. ASTM A588/A588M - Standard Specification for High-Strength Low-Alloy Structural Steel with 50 ksi (345 MPa) Minimum Yield Point to 4-in. (100-mm) Thick.
19. ASTM A618 - Standard Specification for Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing.
20. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
21. ASTM A847 - Standard Specification for Cold-Formed Welded and Seamless High Strength, Low Alloy Structural Tubing with Improved Atmospheric Corrosion Resistance.
22. ASTM A852/A852M - Standard Specification for Quenched and Tempered Low-Alloy Structural Steel Plate with 70 ksi (485 MPa) Minimum Yield Strength to 4 in. (100 mm) Thick.
23. ASTM A913/A913M - Standard Specification for High-Strength Low-Alloy Steel Shapes of Structural Quality, Produced by Quenching and Self-Tempering Process (QST).
24. ASTM A992/A992M - Standard Specification for Structural Steel Shapes.
25. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
26. ASTM E94 - Standard Guide for Radiographic Examination.
27. ASTM E164 - Standard Practice for Ultrasonic Contact Examination of Weldments.

28. ASTM E165 - Standard Test Method for Liquid Penetrant Examination.
 29. ASTM E709 - Standard Guide for Magnetic Particle Examination.
 30. ASTM F436 - Standard Specification for Hardened Steel Washers.
 31. ASTM F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.
 32. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
 33. ASTM F1852 - Standard Specification for Twist Off Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
- C. American Welding Society:
1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
 2. AWS D1.1 - Structural Welding Code - Steel.
- D. Research Council on Structural Connections:
1. RCSC - Specification for Structural Joints Using ASTM A325 or A490 Bolts.
- E. SSPC: The Society for Protective Coatings:
1. SSPC - Steel Structures Painting Manual.
 2. SSPC Paint 15 - Steel Joist Shop Paint.
 3. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).
 4. SSPC SP 3 - Power Tool Cleaning.
 5. SSPC SP 6 - Commercial Blast Cleaning.
 6. SSPC SP 10 - Near-White Blast Cleaning.

1.3 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings:
1. Indicate profiles, sizes, spacing, and locations of structural members, openings, attachments, and fasteners.
 2. Connections.
 3. Cambers
 4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Mill Test Reports: Submit indicating structural strength and destructive and non-destructive test analysis.
- D. Manufacturer's Mill Certificate: Certify products meet or exceed specified requirements.
- E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualifications within previous 12 months.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with the following:
 - 1. AISC Code of Standard Practice for Steel Buildings and Bridges.
 - 2. AISC Code of Standard Practice for Steel Buildings and Bridges. Section 10.
 - 3. AISC Seismic Provisions for Structural Steel Buildings.
 - 4. AISC Specification for Structural Steel Buildings Allowable Stress Design, and Plastic Design.
 - 5. AISC Load and Resistance Factor Design (LRFD) Specification for Structural Steel Buildings.
 - 6. AISC Specification for the Design of Steel Hollow Structural Sections.
 - 7. AISC Specification for Allowable Stress Design of Single-Angle Members.
 - 8. AISC Load and Resistance Factor Design Specification for Single-Angle Members.
 - 9. RCSC Specification for Structural Joints Using ASTM A 325 or A 490 Bolts.
 - 10. ASCE 19.

1.5 COORDINATION

- A. Section {013000 - Administrative Requirements}: Requirements for coordination.

PART 2 PRODUCTS

2.1 STRUCTURAL STEEL

- A. Structural W-Shapes: ASTM A992/A992M; Grade 50
- B. Structural M-Shapes: ASTM A36/A36M; Grade 50
- C. Structural T-Shapes: Cut from structural W-shapes.
- D. Channels and Angles: ASTM A36/A36M.
- E. Round Hollow Structural Sections: ASTM A500, Grade B.
- F. Square and Rectangular Hollow Structural Sections: ASTM A500, Grade B.
- G. Structural Plates and Bars: ASTM A36/A36M.

2.2 FASTENERS, CONNECTORS, AND ANCHORS

- A. Bolts: ASTM A307; Grade A or B.
 - 1. Finish: Unfinished
- B. High Strength Bolts: ASTM A325; Type 1 or ASTM A490; Type 1.

- 1. Finish: Unfinished
- C. Nuts: ASTM A563 heavy hex type.
 - 1. Finish: Unfinished
- D. Washers: ASTM F436; Type 1, circular
 - 1. Finish: Unfinished
- E. Threaded Rods: ASTM A36/A36M; Grade A.
 - 1. Finish: Unfinished
- F. Forged Structural Steel Hardware:
 - 1. Clevises and Turnbuckles: ASTM A108; Grade 1085.
 - 2. Eye Nuts and Eye Bolts: ASTM A108; Grade 1030.
 - 3. Sleeve Nuts: ASTM A108; Grade 1018.
 - 4. Rod Ends, Yoke Ends and Pins, Cotter Pins, and Coupling Nuts: Carbon steel.

2.3 WELDING MATERIALS

- A. Welding Materials: AWS D1.1; type required for materials being welded.

2.4 ACCESSORIES

- A. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing minimum compressive strength of 7,000 psi at 28 days
- B. Shop and Touch-Up Primer: SSPC Paint 15, Type 1, red oxide.

2.5 FABRICATION

- A. Continuously seal joined members by continuous welds. Grind exposed welds smooth.
- B. Fabricate connections for bolt, nut, and washer connectors.
- C. Develop required camber for members.

2.6 FINISH

- A. Prepare structural component surfaces in accordance with SSPC SP 3.
- B. Shop prime structural steel members.
- C. Galvanizing for Structural Steel Members: ASTM A123/A123M; minimum 1.2 oz/sq ft coating thickness; galvanize after fabrication.

- D. Galvanizing for Fasteners, Connectors, and Anchors:
 - 1. Hot-Dipped Galvanizing: ASTM A153/A153M.
 - 2. Mechanical Galvanizing: ASTM B695; Class 50 minimum.

2.7 SOURCE QUALITY CONTROL AND TESTS

- A. Section 014000 - Quality Requirements: Testing, inspection and analysis requirements.
- B. Shop test bolted and welded connections as specified for field quality control tests.
- C. When fabricator is approved by authority having jurisdiction, submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents.
 - 1. Specified shop tests are not required for Work performed by approved fabricator.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 013000 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify bearing surfaces are at correct elevation.
- C. Verify anchors rods are set in correct locations and arrangements with correct exposure for steel attachment.

3.2 PREPARATION

- A. Furnish templates for installation of anchor rods and embedments in concrete and masonry work.

3.3 ERECTION

- A. Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in alignment until completion of erection and installation of permanent bracing.
- B. Field weld components and shear connectors indicated on Drawings.
- C. Field connect members with threaded fasteners; tighten to snug tight for bearing type connections.
- D. Do not field cut or alter structural members without approval of Architect/Engineer.

- E. After erection, touch up welds and abrasions to match shop finishes.

3.4 GROUT INSTALLATION

- A. Grout [under base plates in accordance with Section 036000.
- B. Shim bearing plates and equipment supports to proper elevation, snug tighten anchor bolts.
- C. Fill void under bearing surface with grout. Install and pack grout to remove air pockets.
- D. Moist cure grout.
- E. Remove forms after grout is set. Trim grout edges to form smooth surface, splayed 45 degrees.
- F. Tighten anchor bolts after grout has cured for a minimum of 3 days.

3.5 ERECTION TOLERANCES

- A. Section 014000 - Quality Requirements: Tolerances.
- B. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- C. Maximum Offset From Alignment: 1/4 inch.

3.6 FIELD QUALITY CONTROL

- A. Section 014000 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Bolted Connections: Inspect in accordance with AISC specifications.
 - 1. Visually inspect all bolted connections.
 - 2. For Direct Tension Indicators, comply with requirements of ASTM F959. Verify that gaps are less than gaps specified in Table 2.
- C. Welding: Inspect welds in accordance with AWS D1.1.
 - 1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
 - 2. Visually inspect all welds.
 - 3. Ultrasonic Inspection: ASTM E164; perform on all full penetration welds.
 - 4. Liquid Penetrant Inspection: ASTM E165.
- D. Correct defective bolted connections and welds.

END OF SECTION 051200

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SECTION 05 40 00

COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes load bearing formed steel stud exterior wall, interior wall; and formed steel purlin, framing and bridging.
- B. Related Sections:
 - 1. Section 053110 - Steel Floor Deck: Metal floor decking supported by wall stud metal framing.
 - 2. Section 053123 - Steel Roof Deck: Metal roof decking supported by wall stud metal framing.
 - 3. Section 061000 - Framing and Sheathing.
 - 4. Section 092216 - Non-Load-Bearing Metal Framing System.

1.2 REFERENCES

- A. American Iron and Steel Institute:
 - 1. AISI General - Standard for Cold-Formed Steel Framing - General Provisions.
 - 2. AISI Header - Standard for Cold-Formed Steel Framing - Header Design.
 - 3. AISI NASPEC - North American Specification for Design of Cold-Formed Steel Structural Members.
 - 4. AISI - Residential Steel Framing Manual.
- B. ASTM International:
 - 1. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 - 3. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
 - 4. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 - 5. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 - 6. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.

7. ASTM C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
- C. American Welding Society:
 1. AWS D1.1 - Structural Welding Code - Steel.
 2. AWS D1.3 - Structural Welding Code - Sheet Steel.
- D. National Association of Architectural Metal Manufacturers:
 1. NAAMM ML/SFA 540 - Lightweight Steel Framing Systems Manual.
- E. SSPC: The Society for Protective Coatings:
 1. SSPC Paint 15 - Steel Joist Shop Paint.
 2. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).
- F. Steel Stud Manufacturers Association:
 1. SSMA - Product Technical Information.

1.3 SYSTEM DESCRIPTION

- A. Size components to withstand design loads as follows:
 1. Vertical Assembly: 25 psf positive and 30 psf negative.
 2. Horizontal Assembly: 20 psf live loads.
- B. Maximum Allowable Deflection: 1: 360 of span.
- C. Wall System:
 1. Design to AISI NASPEC, AISC General, and AISC Header.
 2. Design to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
 3. Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

1.4 PERFORMANCE REQUIREMENTS

- A. Select stud thickness to resist minimum 5 psf uniform load and maximum 1/360 deflection.

1.5 SUBMITTALS

- A. Section 013300 - Submittal Procedures: Submittal requirements.
- B. Shop Drawings:

1. Indicate component details, framed openings, bearing, anchorage, loading, welds, type and location of fasteners, and accessories or items required of related Work.
 2. Indicate stud, floor joist, ceiling joist, roof joist, roof rafter, roof truss, and layout.
 3. Submit calculations for loadings and stresses of specially fabricated framing, and roof trusses, under Professional engineer's seal.
- C. Product Data: Submit data on standard framing members; describe materials and finish, product criteria, and limitations.
- D. Manufacturer's Installation Instructions: Submit special procedures and perimeter conditions requiring special attention.

1.6 QUALITY ASSURANCE

- A. Calculate structural properties of framing members in accordance with AISI NASPEC.
- B. Furnish framing materials in accordance with SSMA - Product Technical Information.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
1. Current member of Steel Stud Manufacturers Association.
- B. Installer: Company specializing in performing Work of this section with minimum 3 years documented experience or as approved by manufacturer.
- C. Design structural elements under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Texas.

1.8 COORDINATION

- A. Section 013000 - Administrative Requirements: Coordination and project conditions.

PART 2 PRODUCTS

2.1 COLD-FORMED METAL FRAMING

- A. Manufacturers:
1. Clark Steel Framing Systems
 2. Harrison Manufacturing Co.
 3. Marino\Ware
 4. Unimast Incorporated

- 5. Dietrich Metal Framing
- 6. Substitutions: Section 016000 - Product Requirements

B. Cold-Formed Metal Framing: ASTM C955.

2.2 FRAMING COMPONENTS

A. Steel Sheet: ASTM A1003/A1003M; Structural Grade, Type H

- 1. Grade: ST50H.

2.3 ACCESSORIES

- A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined by performance requirements specified.
- B. Plates, Gussets, Clips: Formed sheet steel, thickness determined by performance requirements specified.
- C. Touch-Up Paint: Match shop primer and finish paint.

2.4 FASTENERS

- A. Self-drilling, Self-tapping Screws, Bolts, Nuts, and Washers: Steel, hot dip galvanized.
- B. Anchorage Devices: Power actuated, drilled expansion bolts, and screws with sleeves.
- C. Welding: In conformance with AWS D1.1 and AWS D1.3.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 013000 - Administrative Requirements: Coordination and project conditions.
- B. Verify substrate surfaces and building framing components are ready to receive Work.
- C. Verify rough-in utilities are in proper location.

3.2 ERECTION OF STUDS

- A. Align floor and ceiling tracks; locate to partition layout. Secure in place with fasteners by welding at maximum 24 inches oc.

- B. Place studs at 16 inches oc; not more than 2 inches from abutting walls and at each side of openings.
- C. Construct corners using minimum three studs. Double stud wall openings, door jambs, and window jambs.
- D. Erect load bearing studs one piece full length. Splicing of studs is not permitted.
- E. Erect load bearing studs, brace, and reinforce to develop full strength, to achieve design requirements.
- F. Fully seat axial loaded studs in receiving tracks maximum 1/16 inch gap between stud and track web).
- G. Install intermediate studs above and below openings to align with wall stud spacing.
- H. Install studs with deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.
- I. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.
- J. Touch-up field welds and damaged metallic coatings surfaces with primer to match shop coating.

3.3 ERECTION OF JOISTS PURLINS

- A. Install framing components.
- B. Make provisions for erection stresses. Install temporary bracing to maintain alignment, until permanent bracing and attachments are installed.
- C. Set purlins parallel and level, with lateral bracing and bridging.
- D. Locate joist end bearing directly over load bearing studs or install load distributing member to top of stud track.
- E. Touch-up field welds and damaged metallic coatings surfaces with primer to match shop coating.

END OF SECTION 054000

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SECTION 055313

BAR GRATINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes metal bar gratings and metal frames and supports for gratings.

1.2 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Clips and anchorage devices for gratings.
 - 2. Paint products.
- B. Sustainable Design Submittals:
 - 1. [<Double click to insert sustainable design text for recycled content.>](#)
- C. Shop Drawings: Include plans, sections, details, and attachments to other work.
- D. Delegated-Design Submittal: For gratings, including [**manufacturers' published load tables**] [**analysis data signed and sealed by the qualified professional engineer responsible for their preparation**].

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design gratings.
- B. Structural Performance: Gratings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Floors: Uniform load of **125 lbf/sq. ft. (6.00 kN/sq. m)** or concentrated load of **2000 lbf (8.90 kN)**, whichever produces the greater stress.
 - 2. Floors: Uniform load of **250 lbf/sq. ft. (11.97 kN/sq. m)** or concentrated load of **3000 lbf (13.40 kN)**, whichever produces the greater stress.

3. Walkways and Elevated Platforms Other Than Exits: Uniform load of 60 lbf/sq. ft. (2.87 kN/sq. m).
 4. Walkways and Elevated Platforms Used as Exits: Uniform load of 100 lbf/sq. ft. (4.79 kN/sq. m).
 5. Sidewalks and Vehicular Driveways, Subject to Trucking: Uniform load of 250 lbf/sq. ft. (11.97 kN/sq. m) or concentrated load of 8000 lbf (35.60 kN), whichever produces the greater stress.
 6. Limit deflection to $[L/360]$ <Insert deflection ratio> or 1/4 inch (6.4 mm), whichever is less.
- C. Seismic Performance: Gratings shall withstand the effects of earthquake motions determined according to [ASCE/SEI 7] <Insert requirement>.
1. Component Importance Factor: 1.5.

2.3 METAL BAR GRATINGS

- A. Metal Bar Grating Standards: Comply with [NAAMM MBG 531, "Metal Bar Grating Manual"] and [NAAMM MBG 532, "Heavy-Duty Metal Bar Grating Manual"].
- B. Welded Steel Grating [MBG-~~<#>~~]:
1. Bearing Bar Spacing: [7/16 or 1/2 inch (11 or 13 mm)] [11/16 inch (17 mm)] [15/16 inch (24 mm)] [1-3/16 inches (30 mm)] [1-3/8 inches (35 mm)] [1-7/8 inches (48 mm)] [2-3/8 inches (60 mm)] <Insert dimension(s)> o.c.
 2. Bearing Bar Depth: [3/4 inch (19 mm)] [1 inch (25 mm)] [1-1/4 inches (32 mm)] [1-1/2 inches (38 mm)] [1-3/4 inches (44 mm)] [2 inches (51 mm)] [2-1/4 inches (57 mm)] [2-1/2 inches (64 mm)] [As required to comply with structural performance requirements].
 3. Bearing Bar Thickness: [1/8 inch (3.2 mm)] [3/16 inch (4.8 mm)] [1/4 inch (6.4 mm)] [3/8 inch (9.5 mm)] [As required to comply with structural performance requirements].
 4. Crossbar Spacing: [2 inches (51 mm)] [4 inches (102 mm)] o.c.
 5. Traffic Surface: [Plain] [Serrated] [Knurled] [Applied abrasive finish consisting of aluminum-oxide aggregate in an epoxy-resin adhesive] [As indicated].
 6. Steel Finish: [Shop primed] [Hot-dip galvanized with a coating weight of not less than 1.8 oz./sq. ft. (550 g/sq. m) of coated surface].
- C. Pressure-Locked Steel Grating [MBG-~~<#>~~]: Fabricated by [pressing rectangular flush-top crossbars into slotted bearing bars] [or] [swaging crossbars between bearing bars].
1. Bearing Bar Spacing: [7/16 or 1/2 inch (11 or 13 mm)] [11/16 inch (17 mm)] [15/16 inch (24 mm)] [1-3/16 inches (30 mm)] <Insert dimension(s)> o.c.
 2. Bearing Bar Depth: [3/4 inch (19 mm)] [1 inch (25 mm)] [1-1/4 inches (32 mm)] [1-1/2 inches (38 mm)] [1-3/4 inches (44 mm)] [2 inches (51 mm)] [2-1/4 inches (57 mm)] [2-1/2 inches (64 mm)] [As required to comply with structural performance requirements] <Insert depth>.
 3. Bearing Bar Thickness: [1/8 inch (3.2 mm)] [3/16 inch (4.8 mm)] [As required to comply with structural performance requirements] <Insert thickness>.
 4. Crossbar Spacing: [2 inches (51 mm)] [4 inches (102 mm)] o.c.

5. Traffic Surface: **[Plain]** **[Serrated]** **[Knurled]** **[Applied abrasive finish consisting of aluminum-oxide aggregate in an epoxy-resin adhesive]** **[As indicated]**.
 6. Steel Finish: **[Shop primed]** **[Hot-dip galvanized with a coating weight of not less than 1.8 oz./sq. ft. (550 g/sq. m) of coated surface]**.
- D. Pressure-Locked, Stainless-Steel Grating **[MBG-<#>]**: Fabricated by **[pressing rectangular flush-top crossbars into slotted bearing bars]** **[or]** **[swaging crossbars between bearing bars]**.
1. Bearing Bar Spacing: **[7/16 or 1/2 inch (11 or 13 mm)]** **[11/16 inch (17 mm)]** **[15/16 inch (24 mm)]** **[1-3/16 inches (30 mm)]** **[1-3/8 inches (35 mm)]** **[1-7/8 inches (48 mm)]** **[2-3/8 inches (60 mm)]** **<Insert dimension(s)> o.c.**
 2. Bearing Bar Depth: **[3/4 inch (19 mm)]** **[1 inch (25 mm)]** **[1-1/4 inches (32 mm)]** **[1-1/2 inches (38 mm)]** **[1-3/4 inches (44 mm)]** **[2 inches (51 mm)]** **[2-1/4 inches (57 mm)]** **[2-1/2 inches (64 mm)]** **[As required to comply with structural performance requirements]**.
 3. Bearing Bar Thickness: **[1/8 inch (3.2 mm)]** **[3/16 inch (4.8 mm)]** **[1/4 inch (6.4 mm)]** **[3/8 inch (9.5 mm)]** **[As required to comply with structural performance requirements]**.
 4. Crossbar Spacing: **[2 inches (51 mm)]** **[4 inches (102 mm)]** **o.c.**
 5. Traffic Surface: **[Plain]** **[Serrated]** **[Knurled]** **[Applied abrasive finish consisting of aluminum-oxide aggregate in an epoxy-resin adhesive]** **[As indicated]**.
 6. Finish: **[Mill finish]** **[Abrasive blasted]** **[Electropolished]**.
- E. Pressure-Locked, Rectangular-Bar Aluminum Grating **[MBG-<#>]**: Fabricated by **[pressing rectangular flush-top crossbars into slotted bearing bars]** **[or]** **[swaging crossbars between bearing bars]**.
1. Bearing Bar Spacing: **[7/16 or 1/2 inch (11 or 13 mm)]** **[11/16 inch (17.5 mm)]** **[15/16 inch (24 mm)]** **[1-3/16 inches (30 mm)]** **<Insert dimension(s)> o.c.**
 2. Bearing Bar Depth: **[1 inch (25 mm)]** **[1-1/4 inches (32 mm)]** **[1-1/2 inches (38 mm)]** **[1-3/4 inches (44 mm)]** **[2 inches (51 mm)]** **[2-1/4 inches (57 mm)]** **[2-1/2 inches (64 mm)]** **[As required to comply with structural performance requirements]**.
 3. Bearing Bar Thickness: **[1/8 inch (3.2 mm)]** **[3/16 inch (4.8 mm)]** **[1/4 inch (6.4 mm)]** **[As required to comply with structural performance requirements]**.
 4. Crossbar Spacing: **[2 inches (51 mm)]** **[4 inches (102 mm)]** **o.c.**
 5. Traffic Surface: **[Plain]** **[Applied abrasive finish consisting of aluminum-oxide aggregate in an epoxy-resin adhesive]** **[As indicated]**.
 6. Aluminum Finish: **[Mill finish]** **[Class I, clear, anodized finish]**.
- F. Pressure-Locked, Aluminum I-Bar Grating **[MBG-<#>]**: Fabricated by **swaging crossbars between bearing bars**.
1. Bearing Bar Spacing: **[7/16 or 1/2 inch (11 or 13 mm)]** **[11/16 inch (17 mm)]** **[15/16 inch (24 mm)]** **[1-3/16 inches (30 mm)]** **<Insert dimension(s)> o.c.**
 2. Bearing Bar Depth: **[1 inch (25 mm)]** **[1-1/4 inches (32 mm)]** **[1-1/2 inches (38 mm)]** **[1-3/4 inches (44 mm)]** **[2 inches (51 mm)]** **[2-1/4 inches (57 mm)]** **[2-1/2 inches (64 mm)]** **[As required to comply with structural performance requirements]**.
 3. Bearing Bar Flange Width: **1/4 inch (6.4 mm)**.
 4. Crossbar Spacing: **[2 inches (51 mm)]** **[4 inches (102 mm)]** **o.c.**

5. Traffic Surface: **[Plain]** **[Grooved]** **[Applied abrasive finish consisting of aluminum-oxide aggregate in an epoxy-resin adhesive]** **[As indicated]**.
6. Aluminum Finish: **[Mill finish]** **[Class I, clear, anodized finish]**.

2.4 FERROUS METALS

- A. [<Double click to insert sustainable design text for recycled content.>](#)
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Bars for Bar Gratings: ASTM A 36/A 36M or steel strip, ASTM A 1011/A 1011M or ASTM A 1018/A 1018M.
- D. Wire Rod for Bar Grating Crossbars: **ASTM A 510** (**ASTM A 510M**).
- E. Uncoated Steel Sheet: ASTM A 1011/A 1011M, structural steel, **Grade 30** (**Grade 205**).
- F. Galvanized-Steel Sheet: ASTM A 653/A 653M, structural quality, **Grade 33** (**Grade 230**), with **G90** (**Z275**) coating.
- G. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 240/A 240M, **[Type 304]** **[Type 316L]**.
- H. Stainless-Steel Bars and Shapes: ASTM A 276, **[Type 304]** **[Type 316L]**.

2.5 FASTENERS

- A. General: Unless otherwise indicated, provide **[Type 304]** **[Type 316]** stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or **ASTM F 1941** (**ASTM F 1941M**), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 1. Provide stainless-steel fasteners for fastening aluminum.
 2. Provide stainless-steel fasteners for fastening stainless steel.
- B. Post-Installed Anchors: **[Torque-controlled expansion]** **[or]** **[chemical]** anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

2.6 MISCELLANEOUS MATERIALS

- A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

2.7 FABRICATION

- A. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately **1/32 inch (1 mm)** unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- B. Fit exposed connections accurately together to form hairline joints.

2.8 GRATING FRAMES AND SUPPORTS

- A. Fabricate from metal shapes, plates, and bars of welded construction to sizes, shapes, and profiles indicated and as necessary to receive gratings. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items.
 - 1. Unless otherwise indicated, fabricate from same basic metal as gratings.
 - 2. Equip units indicated to be cast into concrete or built into masonry with integrally welded anchors. Unless otherwise indicated, space anchors **24 inches (600 mm)** o.c. and provide minimum anchor units in the form of steel straps **1-1/4 inches (32 mm)** wide by **1/4 inch (6 mm)** thick by **8 inches (200 mm)** long.
- B. Galvanize steel frames and supports in the following locations:
 - 1. Exterior.
 - 2. Interior[, **where indicated**].

2.9 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I.

2.10 STEEL FINISHES

- A. Finish gratings, frames, and supports after assembly.
- B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
- C. Shop prime gratings, frames, and supports[**not indicated to be galvanized**] unless otherwise indicated.
- D. Preparation for Shop Priming: Prepare surfaces to comply with [SSPC-SP 6/NACE No. 3, "**Commercial Blast Cleaning.**"] [SSPC-SP 7/NACE No. 4, "**Brush-off Blast Cleaning.**"]
- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
- B. Fit exposed connections accurately together to form hairline joints.
 - 1. 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 that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Attach toeplates to gratings by welding at locations indicated.
- D. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.2 INSTALLING METAL BAR GRATINGS

- A. General: Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.
- B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.
- C. Attach nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

3.3 ADJUSTING AND CLEANING

- A. Touchup 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 touching up shop-painted surfaces.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055313

SECTION 061000
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Framing with engineered wood products.
3. Shear wall panels.
4. Rooftop equipment bases and support curbs.
5. Wood blocking[, **cants**,] and nailers.
6. Wood furring[**and grounds**].
7. Wood sleepers.
8. Plywood backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

B. Sustainable Design Submittals:

1. [<Double click to insert sustainable design text for regional materials.>](#)
2. [<Double click to insert sustainable design text for certified wood.>](#)
3. [<Double click to insert sustainable design text for certified wood.>](#)
4. [<Double click to insert sustainable design text for composite wood.>](#)
5. [<Double click to insert sustainable design text for installation adhesives.>](#)

1.3 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-preservative-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.

1.4 QUALITY ASSURANCE

- A. [<Double click to insert sustainable design text for manufacturer qualifications.>](#)
- B. [<Double click to insert sustainable design text for vendor qualifications.>](#)

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. [<Double click to insert sustainable design text for regional materials.>](#)
- B. [<Double click to insert sustainable design text for certified wood.>](#)
- C. 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**] [**or**] [**omit grade stamp and provide certificates of grade compliance issued by grading agency**].
 - 3. Dress lumber, S4S, unless otherwise indicated.
- D. Maximum Moisture Content of Lumber: [**19 percent**] [**15 percent for 2-inch nominal (38-mm actual) thickness or less; 19 percent for more than 2-inch nominal (38-mm actual) thickness**] [**19 percent for 2-inch nominal (38-mm actual) thickness or less; no limit for more than 2-inch nominal (38-mm actual) thickness**] unless otherwise indicated.
- E. 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 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2[**for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground**].
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.[**Do not use inorganic boron (SBX) for sill plates.**]

- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat **[all rough carpentry unless otherwise indicated.] [items indicated on Drawings, and the following:]**
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, **[furring,] [stripping,]** and similar concealed members in contact with masonry or concrete.
 - 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 - 4. Wood framing members that are less than **18 inches (460 mm)** above the ground in crawlspaces or unexcavated areas.
 - 5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply 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 Lumber and 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 lumber and 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 lumber after treatment to maximum moisture content of 19 percent.**[Kiln-dry plywood after treatment to maximum moisture content of 15 percent.]**
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- E. Application: Treat **[all rough carpentry unless otherwise indicated.] [items indicated on Drawings, and the following:]**
 - 1. Framing for raised platforms.

2. Framing for stages.
3. Concealed blocking.
4. Framing for non-load-bearing partitions.
5. Framing for non-load-bearing exterior walls.
6. Roof construction.
7. Plywood backing panels.

2.4 DIMENSION LUMBER FRAMING

- A. Non-Load-Bearing Interior Partitions: [**Construction or No. 2**] [**Construction, Stud, or No. 3**] [**Standard, Stud, or No. 3**] grade.
 1. Application: [**All interior partitions**] [**Interior partitions not indicated as load bearing**].
 2. Species:
 - a. Southern pine or mixed southern pine; SPIB.
 - b. Northern species; NLGA.
 - c. Eastern softwoods; NeLMA.
 - d. Western woods; WCLIB or WWP.
- B. Framing Other Than Non-Load-Bearing Partitions: [**No. 2**] [**Construction or No. 2**] [**Construction, Stud, or No. 3**] grade.
 1. Application: Framing other than [**interior partitions**] [**interior partitions not indicated as load bearing**].
 2. Species:
 - a. Hem-fir (north); NLGA.
 - b. Southern pine; SPIB.
 - c. Douglas fir-larch; WCLIB or WWP.
 - d. Southern pine or mixed southern pine; SPIB.
 - e. Spruce-pine-fir; NLGA.
 - f. Douglas fir-south; WWP.
 - g. Hem-fir; WCLIB or WWP.
 - h. Douglas fir-larch (north); NLGA.
 - i. Spruce-pine-fir (south); NeLMA, WCLIB, or WWP.
- C. Framing Other Than Non-Load-Bearing Partitions: Any species and grade with a modulus of elasticity of at least [**1,500,000 psi (10 350 MPa)**] [**1,300,000 psi (8970 MPa)**] [**1,100,000 psi (7590 MPa)**] [**1,000,000 psi (6900 MPa)**] [**900,000 psi (6210 MPa)**] and an extreme fiber stress in bending of at least [**1000 psi (6.9 MPa)**] [**850 psi (5.86 MPa)**] [**700 psi (4.83 MPa)**] [**600 psi (4.14 MPa)**] [**500 psi (3.45 MPa)**] for 2-inch nominal (38-mm actual) thickness and 12-inch nominal (286-mm actual) width for single-member use.
 1. Application: Framing other than [**interior partitions**] [**interior partitions not indicated as load-bearing**].

- D. Exposed Framing: Hand-select material for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.

1. Species and Grade: As indicated above for load-bearing construction of same type.

2.5 ENGINEERED WOOD PRODUCTS

- A. [<Double click to insert sustainable design text for composite wood products.>](#)

- B. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Extreme Fiber Stress in Bending, Edgewise: [**3100 psi (21.3 MPa)**] [**2900 psi (20.0 MPa)**] [**2600 psi (17.9 MPa)**] [**2250 psi (15.5 MPa)**] **<Insert value>** for **12-inch nominal-** (286-mm actual-) depth members.
3. Modulus of Elasticity, Edgewise: [**2,000,000 psi (13 700 MPa)**] [**1,800,000 psi (12 400 MPa)**] [**1,500,000 psi (10 300 MPa)**] **<Insert value>**.

- C. Wood I-Joists: Prefabricated units, I-shaped in cross section, made with solid or structural composite lumber flanges and wood-based structural panel webs, let into and bonded to flanges. Comply with material requirements of and with structural capacities established and monitored according to ASTM D 5055.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Web Material: [**Either OSB or plywood, complying with DOC PS 1 or DOC PS 2, Exposure 1**] [**Plywood, complying with DOC PS 1 or DOC PS 2, Exposure 1**] [**Plywood, complying with DOC PS 1, Exterior grade**].
3. Structural Properties: Depths and design values not less than those indicated.
4. Comply with APA PRI-400. Factory mark I-joists with APA-EWS trademark indicating nominal joist depth, joist class, span ratings, mill identification, and compliance with APA-EWS standard.

- D. Rim Boards: Product designed to be used as a load-bearing member and to brace wood I-joists at bearing ends, complying with research or evaluation report for I-joists.

1. Manufacturer: Provide products by same manufacturer as I-joists.
2. Material: [**All-veneer product**] [**glued-laminated wood**] [**or**] [**product made from any combination solid lumber, wood strands, and veneers**].
3. Thickness: [**1 inch (25 mm)**] [**1-1/8 inches (28 mm)**] [**1-1/4 inches (32 mm)**].
4. Comply with APA PRR-401, [**rim board**] [**rim board plus**] grade. Factory mark rim boards with APA-EWS trademark indicating thickness, grade, and compliance with APA-EWS standard.

- E. Insulated Rim Boards: Insulated product designed to be used as a load-bearing member and to brace wood I-joists at bearing ends, complying with research/evaluation report for I-joists.

1. Manufacturer: Provide products by same manufacturer as I-joists.

2. Rim Board Material: **[All-veneer product] [glued-laminated wood] [or] [product made from any combination solid lumber, wood strands, and veneers].**
3. Rim Board Thickness: **[1 inch (25 mm)] [1-1/8 inches (28 mm)] [1-1/4 inches (32 mm)].**
4. Insulation: **1-1/2-inch- (38-mm-)** thick polyisocyanurate foam complying with ASTM C 1289.
5. Inside Facing: **7/16-inch- (11-mm-)** thick OSB.
6. Comply with APA PRR-401, **[rim board] [rim board plus]** grade. Factory mark rim boards with APA-EWS trademark indicating thickness, grade, and compliance with APA-EWS standard.

2.6 SHEAR WALL PANELS

- A. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- B. Wood-Framed Shear Wall Panels: Prefabricated assembly consisting of wood perimeter framing, tie downs, and Exposure I, Structural I plywood or OSB sheathing.
- C. Steel-Framed Shear Wall Panels: Prefabricated assembly consisting of cold-formed galvanized-steel panel, steel top and bottom plates, and wood studs.
- D. Allowable design loads, as published by manufacturer, shall meet or exceed those **[indicated] [of basis-of-design products] [of products of manufacturers listed]**. 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.

2.7 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 1. Blocking.
 2. Nailers.
 3. Rooftop equipment bases and support curbs.
 4. Cants.
 5. Furring.
 6. Grounds.
- B. Dimension Lumber Items: **[Construction or No. 2] [Standard, Stud, or No. 3]** grade lumber of any species.
- C. Concealed Boards: **[15] [19]** percent maximum moisture content and **[any of]** the following species and grades:
 1. Mixed southern pine or southern pine; No. **[2] [3]** grade; SPIB.
 2. Eastern softwoods; No. **[2] [3]** Common grade; NeLMA.
 3. Northern species; No. **[2] [3]** Common grade; NLGA.

4. Western woods; [**Construction or No. 2 Common**] [**Standard or No. 3 Common**] grade; WCLIB or WWP.

2.8 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, [**Exterior, A-C**] [**Exterior, C-C Plugged**] [**Exposure 1, C-D Plugged**], [**fire-retardant treated**], in thickness indicated or, if not indicated, not less than [**1/2-inch (13-mm)**] [**3/4-inch (19-mm)**] nominal thickness.

2.9 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 fasteners[**with hot-dip zinc coating complying with ASTM A 153/A 153M**] [**of Type 304 stainless steel**].
- 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**] [**ICC-ES AC58**] [**ICC-ES AC193**] [**or**] [**ICC-ES AC308**] as appropriate for the substrate.

2.10 METAL FRAMING ANCHORS

- A. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- B. Allowable design loads, as published by manufacturer, shall meet or exceed those [**indicated**] [**of basis-of-design products**] [**of products of manufacturers listed**]. 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. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.
- C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, **G60 (Z180)** coating designation.
 1. Use for interior locations unless otherwise indicated.
- D. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); **G185 (Z550)** coating designation; and not less than **0.036 inch (0.9 mm)** thick.
 1. Use for wood-preservative-treated lumber and where indicated.

2.11 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; **1-inch (25-mm)** nominal thickness, compressible to **1/32 inch (0.8 mm)**; selected from manufacturer's standard widths to suit width of sill members indicated.
- B. Sill-Sealer Gaskets: Closed-cell neoprene foam, **1/4 inch (6.4 mm)** thick, selected from manufacturer's standard widths to suit width of sill members indicated.
- C. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, [**butyl rubber**] [or] [**rubberized-asphalt**] compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than **0.025 inch (0.6 mm)**.
- D. Adhesives for Gluing [**Furring**] [**and**] [**Sleepers**] to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
 - 1. <Double click to insert sustainable design text for VOC content of adhesive.>
 - 2. <Double click to insert sustainable design text for low emitting adhesives.>

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**] [**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 061000

SECTION 074113.16
STANDING-SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes standing-seam metal roof panels.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]** <Insert location>.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
- C. Samples: For each type of metal panel indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Warranties: Sample of special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: [**Two**] <Insert number> years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Finish Warranty Period: [**20**] [**10**] <Insert number> years from date of Substantial Completion.
- C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
 - 1. Warranty Period: [**20**] <Insert number> years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. [<Double click to insert sustainable design text for recycled content.>](#)
- B. [<Double click to insert sustainable design text for solar reflectance index.>](#)
- C. Energy Performance: Provide roof panels that are listed on the EPA/DOE's ENERGY STAR "Roof Product List" for [**low**] [**steep**]-slope roof products.
- D. Energy Performance: Provide roof panels according to one of the following when tested according to CRRC-1:
 - 1. Three-year, aged solar reflectance of not less than [**0.55**] <Insert value> and emissivity of not less than [**0.75**] <Insert value>.
 - 2. Three-year, aged Solar Reflectance Index of not less than [**64**] <Insert value> when calculated according to ASTM E 1980.
- E. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: [**As indicated on Drawings**] <Insert loads>.
 - 3. Deflection Limits: For wind loads, no greater than [**1/180**] [**1/240**] <Insert deflection> of the span.
 - 4. <Insert serviceability requirements>.

- F. Air Infiltration: Air leakage of not more than **0.06 cfm/sq. ft. (0.3 L/s per sq. m)** when tested according to ASTM E 1680[**or ASTM E 283**] at the following test-pressure difference:
 - 1. Test-Pressure Difference: [**1.57 lbf/sq. ft. (75 Pa)**] [**6.24 lbf/sq. ft. (300 Pa)**].
- G. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646[**or ASTM E 331**] at the following test-pressure difference:
 - 1. Test-Pressure Difference: [**2.86 lbf/sq. ft. (137 Pa)**] [**6.24 lbf/sq. ft. (300 Pa)**].
- H. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.
- I. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
 - 1. Uplift Rating: [**UL 30**] [**UL 60**] [**UL 90**].
- J. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
 - 1. Fire/Windstorm Classification: Class 1A-[**60**] [**75**] [**90**] [**105**] [**120**] **<Insert number>**.
 - 2. Hail Resistance: [**MH**] [**SH**].
- K. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. 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 (67 deg C), ambient; 180 deg F (100 deg C), material surfaces**] **<Insert temperature range>**.

2.2 STANDING-SEAM METAL ROOF PANELS

- A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
 - 1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
 - 2. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1637.
- B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels **<Insert drawing designation>**: Formed with vertical ribs at panel edges and [**intermediate stiffening ribs symmetrically spaced**] [**a flat pan**] between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, **G90 (Z275)** coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, **Class AZ50 (Class AZM150)** coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Nominal Thickness: [**0.022 inch (0.56 mm)**] [**0.028 inch (0.71 mm)**] [**0.034 inch (0.86 mm)**] [**0.040 inch (1.02 mm)**] [**0.052 inch (1.32 mm)**].
 - b. Exterior Finish: [**Two-coat fluoropolymer**] [**Three-coat fluoropolymer**] [**Siliconized polyester**] <Insert finish>.
 - c. Color: [**As indicated by manufacturer's designations**] [**Match Architect's samples**] [**As selected by Architect from manufacturer's full range**] <Insert color>.
3. Aluminum Sheet: Coil-coated sheet, **ASTM B 209 (ASTM B 209M)**, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
 - a. Thickness: [**0.032 inch (0.81 mm)**] [**0.040 inch (1.02 mm)**].
 - b. Surface: [**Smooth, flat**] [**Embossed**] finish.
 - c. Exterior Finish: [**Two-coat fluoropolymer**] [**Three-coat fluoropolymer**] [**Siliconized polyester**] <Insert finish>.
 - d. Color: [**As indicated by manufacturer's designations**] [**Match Architect's samples**] [**As selected by Architect from manufacturer's full range**] <Insert color>.
4. Clips: [**One-piece fixed**] [**Two-piece floating**] to accommodate thermal movement.
 - a. Material: [**0.028-inch- (0.71-mm-)**] [**0.064-inch- (1.63-mm-)**] nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
 - b. Material: [**0.025-inch- (0.64-mm-)**] [**0.062-inch- (1.59-mm-)**] thick, stainless-steel sheet.
5. Joint Type: [**Single folded**] [**Double folded**] [**As standard with manufacturer**].
6. Panel Coverage: [**12 inches (305 mm)**] [**14 inches (356 mm)**] [**16 inches (406 mm)**] [**18 inches (457 mm)**] [**20 inches (508 mm)**] [**24 inches (610 mm)**] <Insert dimension>.
7. Panel Height: [**1.5 inches (38 mm)**] [**2.0 inches (51 mm)**] [**2.5 inches (64 mm)**] <Insert dimension>.

2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of **30 mils (0.76 mm)** thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.
 1. Thermal Stability: Stable after testing at **240 deg F (116 deg C)**; ASTM D 1970.
 2. Low-Temperature Flexibility: Passes after testing at minus **20 deg F (29 deg C)**; ASTM D 1970.

3. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- B. Felt Underlayment: ASTM D 226/D 22M, Type II (No. 30), asphalt-saturated organic felts.
- C. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.4 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, **G90** (**Z275 hot-dip galvanized**) coating designation or ASTM A 792/A 792M, **Class AZ50** (**Class AZM150**) coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum **1-inch- (25-mm-)** thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Gutters and Downspouts: Formed from same material as roof panels according to SMACNA's "Architectural Sheet Metal Manual." Finish to match **[metal roof panels] [roof fascia and rake trim]**.
- E. Roof Curbs: Fabricated from same material as roof panels, **[0.048-inch (1.2-mm)]** **<Insert dimension>** nominal thickness; with bottom of skirt profiled to match roof panel profiles and with welded top box and integral full-length cricket. Fabricate curb subframing of **0.060-inch- (1.52-mm-)** nominal thickness, angle-, C-, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads of size and height indicated. Finish roof curbs to match metal roof panels.
- F. Panel Fasteners: Self-tapping screws designed to withstand design loads.
- G. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C 920; as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.5 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

2.6 FINISHES

- A. Panels and Accessories:
 1. Two-Coat Fluoropolymer: [AAMA 621] [AAMA 2605]. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat.
 2. Three-Coat Fluoropolymer: [AAMA 621] [AAMA 2605]. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.
 3. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.
 4. Concealed Finish: White or light-colored acrylic or polyester backer finish.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.2 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated [below] [on Drawings], wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). [Extend underlayment into gutter trough.] Roll laps with roller. Cover underlayment within 14 days.
 - 1. Apply over the entire roof surface.
 - 2. Apply over the roof area indicated below:
 - a. Roof perimeter for a distance up from eaves of [24 inches (610 mm)] [36 inches (914 mm)] <Insert dimension> beyond interior wall line.
 - b. Valleys, from lowest point to highest point, for a distance on each side of [18 inches (460 mm)] <Insert dimension>. Overlap ends of sheets not less than 6 inches (152 mm).
 - c. Rake edges for a distance of [18 inches (460 mm)] <Insert dimension>.
 - d. Hips and ridges for a distance on each side of [12 inches (305 mm)] <Insert dimension>.
 - e. Roof-to-wall intersections for a distance from wall of [18 inches (460 mm)] <Insert dimension>.
 - f. Around dormers, chimneys, skylights, and other penetrating elements for a distance from element of [18 inches (460 mm)] <Insert dimension>.
- B. Felt Underlayment: Apply at locations indicated [below] [on Drawings], in shingle fashion to shed water, and with lapped joints of not less than 2 inches (50 mm).
 - 1. Apply over the entire roof surface.
 - 2. Apply on roof not covered by self-adhering sheet underlayment. Lap over edges of self-adhering sheet underlayment not less than 3 inches (75 mm), in shingle fashion to shed water.
- C. Slip Sheet: Apply slip sheet over underlayment before installing metal roof panels.
- D. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

3.3 METAL PANEL INSTALLATION

- A. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
1. Install clips to supports with self-tapping fasteners.
 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
 4. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
 5. Watertight Installation:
 - a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
 - b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 - c. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.
- B. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
- C. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

3.4 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION 074113.16

SECTION 079200

JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Urethane joint sealants.
4. Immersible joint sealants.
5. Mildew-resistant joint sealants.
6. Latex joint sealants.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]** <Insert location>.

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.

- B. Sustainable Design Submittals:

1. <Double click to insert sustainable design text for sealants.>

- C. Samples: For each kind and color of joint sealant required.

- D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.

- B. Preconstruction laboratory test reports.

- C. Preconstruction field-adhesion-test reports.

- D. Field-adhesion-test reports.
- E. Sample warranties.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.
 - 3. Stain Testing: Use ASTM C 1248 to determine stain potential of sealant when in contact with [stone] [masonry] <Insert substrate> substrates.
- B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates. Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

1.7 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: [Two] <Insert number> years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: [Five] <Insert number> years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. [<Double click to insert sustainable design text for sealants and primers.>](#)

1. [<Double click to insert sustainable design text for sealants.>](#)

- B. Colors of Exposed Joint Sealants: [**As indicated by manufacturer's designations**] [**Match Architect's samples**] [**As selected by Architect from manufacturer's full range**].

2.2 SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- B. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- C. Silicone, S, NS, 35, NT: Single-component, nonsag, plus 35 percent and minus 35 percent movement capability. nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 35, Use NT.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- D. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- E. Silicone, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- F. Silicone, S, NS, 50, T, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Uses T and NT.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- G. Silicone, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Uses T and NT.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- H. Silicone, S, P, 100/50, T, NT: Single-component, pourable, plus 100 percent and minus 50 percent movement capability traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade P, Class 100/50, Uses T and NT.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- I. Silicone, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- J. Silicone, M, P, 100/50, T, NT: Multicomponent, pourable, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type M, Grade P, Class 100/50, Uses T and NT.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2.3 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.

- B. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- C. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- D. Silicone, Nonstaining, S, NS, 100/50, T, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- E. Silicone, Nonstaining, M, NS, 50, NT: Nonstaining, multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type M, Grade NS, Class 50, Use NT.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2.4 URETHANE JOINT SEALANTS

- A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- B. Urethane, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- C. Urethane, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Uses T and NT.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- D. Urethane, S, P, 35, T, NT: Single-component, pourable, plus 35 percent and minus 35 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 35, Uses T and NT.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- E. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- F. Urethane, M, NS, 50, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 50, Use NT.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- G. Urethane, M, NS, 25, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 25, Use NT.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- H. Urethane, M, NS, 50, T, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 50, Uses T and NT.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- I. Urethane, M, NS, 25, T, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 25, Uses T and NT.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- J. Urethane, M, P, 50, T, NT: Multicomponent, pourable, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade P, Class 50, Uses T and NT.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- K. Urethane, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 Urethane, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade P, Class 25, Uses T and NT.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2.5 IMMERSIBLE JOINT SEALANTS

- A. Immersible Joint Sealants. Suitable for immersion in liquids; ASTM C 1247, [**Class 1**] [**Class 2**]; tested in deionized water unless otherwise indicated

- B. Urethane, Immersible, S, NS, 100/50, NT, I: Immersible, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses NT, and I.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- C. Urethane, Immersible, S, NS, 35, NT, I: Immersible, single-component, nonsag, plus 35 percent and minus 35 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 35, Use NT and I.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- D. Urethane, Immersible, S, NS, 50, T, NT, I: Immersible, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Uses T, NT, and I.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- E. Urethane, Immersible, S, NS, 35, T, NT, I: Immersible, single-component, nonsag, plus 35 percent and minus 35 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 35, Uses T, NT, and I.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- F. Urethane, Immersible, S, NS, 25, T, NT, I: Immersible, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Uses T, NT, and I.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- G. Urethane, Immersible, S, P, 50, T, NT, I: Immersible, single-component, pourable, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 50, Uses T, NT, and I.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- H. Urethane, Immersible, S, P, 25, T, NT, I: Immersible, single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T, NT, and I.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- I. Urethane, Immersible, M, NS, 50, T, NT, I: Immersible, multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 50, Uses T, NT, and I.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- J. Urethane, Immersible, M, NS, 25, T, NT, I: Immersible, multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 25, Uses T, NT, and I.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- K. Urethane, Immersible, M, P, 25, T, NT, I: Immersible, multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade P, Class 25, Uses T, NT, and I.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2.6 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- C. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2.7 JOINT-SEALANT BACKING

- A. Cylindrical Sealant Backings: ASTM C 1330, [**Type C (closed-cell material with a surface skin)**] [**Type O (open-cell material)**] [**Type B (bicellular material with a surface skin)**] [**or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated**], and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.8 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove laitance and form-release agents from concrete.
 - 2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces.

3.2 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with ASTM C 1193 and joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

- B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
- C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 1. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.3 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
 - 1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform [10] <Insert number> tests for the first [1000 feet (300 m)] <Insert dimension> of joint length for each kind of sealant and joint substrate.
 - b. Perform one test for each [1000 feet (300 m)] <Insert dimension> of joint length thereafter or one test per each floor per elevation.
 - 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
- B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.4 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces[<JS-#>].
 - 1. Joint Locations:

- a. Control and expansion joints in brick pavers.
 - b. Isolation and contraction joints in cast-in-place concrete slabs.
 - c. Joints between plant-precast architectural concrete paving units.
 - d. Joints in stone paving units[, **including steps**].
 - e. Tile control and expansion joints.
 - f. Joints between different materials listed above.
 - g. **<Insert other joints>**.
 - h. Other joints as indicated on Drawings.
 2. Joint Sealant: [**Urethane, M, P, 50, T, NT**] **<Insert joint sealant>**.
 3. Joint-Sealant Color: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range of colors**] **<Insert color>**.
- B. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces subject to water immersion[**<JS-#>**].
1. Joint Locations:
 - a. Joints in pedestrian plazas.
 - b. Joints in swimming pool decks.
 - c. **<Insert other joints>**.
 - d. Other joints as indicated on Drawings.
 2. Joint Sealant: [**Urethane, immersible, S, P, 25, T, NT, I**] **<Insert joint sealant>**.
 3. Joint-Sealant Color: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range of colors**] **<Insert color>**.
- C. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces[**<JS-#>**].
1. Joint Locations:
 - a. Construction joints in cast-in-place concrete.
 - b. Joints between plant-precast architectural concrete units.
 - c. Control and expansion joints in unit masonry.
 - d. Joints in dimension stone cladding.
 - e. **<Insert other joints>**.
 - f. Other joints as indicated on Drawings.
 2. Joint Sealant: [**Silicone, nonstaining, S, NS, 50, NT**] **<Insert joint sealant>**.
 3. Joint-Sealant Color: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range of colors**] **<Insert color>**.
- D. Joint-Sealant Application: Interior joints in horizontal traffic surfaces[**<JS-#>**].
1. Joint Locations:
 - a. Isolation joints in cast-in-place concrete slabs.

- b. Control and expansion joints in stone flooring.
 - c. Control and expansion joints in brick flooring.
 - d. Control and expansion joints in tile flooring.
 - e. **<Insert other joints>.**
 - f. Other joints as indicated on Drawings.
 - 2. Joint Sealant: **[Urethane, S, P, 25, T, NT] <Insert joint sealant>.**
 - 3. Joint-Sealant Color: **[As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from manufacturer's full range of colors] <Insert color>.**
- E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces[**<JS-#>**].
- 1. Joint Locations:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Tile control and expansion joints.
 - c. Vertical joints on exposed surfaces of **[unit masonry] [concrete] [walls] [and] [partitions]**.
 - d. Joints on underside of plant-precast structural concrete **[beams] [and] [planks]**.
 - e. **<Insert other joints>.**
 - f. Other joints as indicated on Drawings.
 - 2. Joint Sealant: **[Urethane, S, NS, 25, NT] <Insert joint sealant>.**
 - 3. Joint-Sealant Color: **[As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from manufacturer's full range of colors] <Insert color>.**
- F. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement[**<JS-#>**].
- 1. Joint Locations:
 - a. Control joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints between interior wall surfaces and frames of **[interior doors] [windows] [and] [elevator entrances]**.
 - c. **<Insert other joints>.**
 - d. Other joints as indicated on Drawings.
 - 2. Joint Sealant: **[Acrylic latex] <Insert joint sealant>.**
 - 3. Joint-Sealant Color: **[As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from manufacturer's full range of colors] <Insert color>.**
- G. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces[**<JS-#>**].
- 1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.

- b. Tile control and expansion joints where indicated.
 - c. **<Insert other joints>.**
 - d. Other joints as indicated on Drawings.
 - 2. Joint Sealant: [**Silicone, mildew resistant, acid curing, S, NS, 25, NT**] **<Insert joint sealant>.**
 - 3. Joint-Sealant Color: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range of colors**] **<Insert color>.**
- H. Joint-Sealant Application: Concealed mastics[**<JS-#>**].
- 1. Joint Locations:
 - a. Aluminum thresholds.
 - b. Sill plates.
 - c. **<Insert other joints>.**
 - d. Other joints as indicated on Drawings.
 - 2. Joint Sealant: [**Butyl-rubber based**] **<Insert joint sealant>.**
 - 3. Joint-Sealant Color: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range of colors**] **<Insert color>.**

END OF SECTION 079200

SECTION 081113

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes hollow-metal work.

1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include elevations, door edge details, frame profiles, metal thicknesses, preparations for hardware, and other details.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required.
- E. Schedule: Prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings[**and**

temperature-rise limits] indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
- B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

- A. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3. **[At locations indicated in the Door and Frame Schedule] <Insert locations>.**
 1. Physical Performance: Level A according to SDI A250.4.
 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: **1-3/4 inches (44.5 mm)**.
 - c. Face: Metallic-coated steel sheet, minimum thickness of **0.053 inch (1.3 mm)**, with minimum **A40 (ZF120)** coating.
 - d. Edge Construction: **[Model 1, Full Flush] [Model 2, Seamless] [Model 3, Stile and Rail]**.
 - e. Core: **[Polystyrene] [Polyurethane] [Polyisocyanurate] [Manufacturer's standard insulation material]**.
 3. Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than **[2.1 deg F x h x sq. ft./Btu (0.370 K x sq. m/W)] <Insert R-value>** when tested according to ASTM C 1363.
 4. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of **0.053 inch (1.3 mm)**, with minimum **A40 (ZF120)** coating.
 - b. Construction: **[Knocked down] [Face welded] [Full profile welded]**.
 5. Exposed Finish: **[Prime] [Factory]**.

2.4 FRAME ANCHORS

- A. Jamb Anchors:
 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than **0.042 inch (1.0 mm)** thick, with corrugated or perforated straps not less than **2 inches (51 mm)** wide by **10 inches (254 mm)** long; or wire anchors not less than **0.177 inch (4.5 mm)** thick.

2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
 3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
 4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch (9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch (1.0 mm), and as follows:
1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at finish floor surface.

2.5 MATERIALS

- A. <Double click to insert sustainable design text for recycled content.>
- B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- E. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- F. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- G. Power-Actuated Fasteners in Concrete: From corrosion-resistant materials.
- H. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.
- I. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing).
- J. Glazing: Section 088000 "Glazing."
- K. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat.

2.6 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Doors:
 - 1. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 - 2. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated.
- C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. **[Sidelite] [and] [Transom Bar]** Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 - 4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 - 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than **16 inches (406 mm)** from top and bottom of frame. Space anchors not more than **32 inches (813 mm)** o.c., to match coursing, and as follows:
 - 1) Two anchors per jamb up to **60 inches (1524 mm)** high.
 - 2) Three anchors per jamb from **60 to 90 inches (1524 to 2286 mm)** high.
 - 3) Four anchors per jamb from **90 to 120 inches (2286 to 3048 mm)** high.
 - 4) Four anchors per jamb plus one additional anchor per jamb for each **24 inches (610 mm)** or fraction thereof above **120 inches (3048 mm)** high.
 - b. Stud-Wall Type: Locate anchors not more than **18 inches (457 mm)** from top and bottom of frame. Space anchors not more than **32 inches (813 mm)** o.c. and as follows:
 - 1) Three anchors per jamb up to **60 inches (1524 mm)** high.
 - 2) Four anchors per jamb from **60 to 90 inches (1524 to 2286 mm)** high.
 - 3) Five anchors per jamb from **90 to 96 inches (2286 to 2438 mm)** high.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each **24 inches (610 mm)** or fraction thereof above **96 inches (2438 mm)** high.
 - c. Compression Type: Not less than two anchors in each frame.

- d. Postinstalled Expansion Type: Locate anchors not more than **6 inches (152 mm)** from top and bottom of frame. Space anchors not more than **26 inches (660 mm)** o.c.
 - 6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- D. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
 - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 - 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- E. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with [**butted**] [**or**] [**mitered**] hairline joints.
 - 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
 - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 - 4. Provide loose stops and moldings on inside of hollow-metal work.
 - 5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.7 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - 1. Shop Primer: SDI A250.10.
- B. Factory Finish: SDI A250.3.
 - 1. Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range**] <Insert color and gloss>.

2.8 ACCESSORIES

- A. Louvers: Provide [**sightproof**] [**lightproof**] louvers for interior doors, where indicated, which comply with SDI 111C, with blades or baffles formed of **0.020-inch- (0.5-mm-)** thick, cold-rolled steel sheet set into **0.032-inch- (0.8-mm-)** thick steel frame.

1. Fire-Rated Automatic Louvers: Movable blades closed by actuating fusible link, and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated.
- B. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- C. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
 6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 7. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.

8. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus **1/16 inch (1.6 mm)**, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus **1/16 inch (1.6 mm)**, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus **1/16 inch (1.6 mm)**, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus **1/16 inch (1.6 mm)**, measured at jambs at floor.
- B. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
 1. Non-Fire-Rated Steel Doors:
 - a. Between Door and Frame Jambs and Head: **1/8 inch (3.2 mm)** plus or minus **1/32 inch (0.8 mm)**.
 - b. Between Edges of Pairs of Doors: **1/8 inch (3.2 mm)** to **1/4 inch (6.3 mm)** plus or minus **1/32 inch (0.8 mm)**.
 - c. At Bottom of Door: [**3/4 inch (19.1 mm)**] [**5/8 inch (15.8 mm)**] plus or minus **1/32 inch (0.8 mm)**.
 - d. Between Door Face and Stop: **1/16 inch (1.6 mm)** to **1/8 inch (3.2 mm)** plus or minus **1/32 inch (0.8 mm)**.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.
- C. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.
 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than **9 inches (230 mm)** o.c. and not more than **2 inches (51 mm)** o.c. from each corner.

3.2 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

- E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

SECTION 099113
EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on [**exterior substrates.**] [**the following exterior substrates:**]
 - 1. Concrete.
 - 2. Concrete masonry units (CMUs).
 - 3. Galvanized metal.
 - 4. Wood.

1.2 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
- B. Sustainable Design Submittals:
 - 1. [<Double click to insert sustainable design text for VOC content of paints.>](#)
- C. Samples: For each type of paint system and each color and gloss of topcoat.

1.4 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- B. Products: Subject to compliance with requirements, **[provide product] [provide one of the products] [available products that may be incorporated into the Work include, but are not limited to products]** listed in the Exterior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. [<Double click to insert sustainable design text for VOC content of paints.>](#)
- D. Colors: **[As selected by Architect from manufacturer's full range] [Match Architect's samples] [As indicated in a color schedule] <Insert requirements>**.
 - 1. **[Ten] [Twenty] [Thirty] <Insert number>** percent of surface area will be painted with deep tones.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Fiber-Cement Board: 12 percent.
 - 3. Masonry (Clay and CMUs): 12 percent.
 - 4. Wood: 15 percent.
 - 5. Portland Cement Plaster: 12 percent.
 - 6. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

- A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

- 1. Latex System [**MPI EXT 3.1A**] [**MPI EXT 3.1K**]:
 - a. Prime Coat: Primer, alkali resistant, water based[, **MPI #3**].
 - 1) **<Insert manufacturer's name; product name or designation>.**
 - b. Prime Coat: Latex, exterior, matching topcoat.
 - c. Intermediate Coat: Latex, exterior, matching topcoat.
 - d. Topcoat: Latex, exterior, flat (MPI Gloss Level 1)[, **MPI #10**].
 - 1) **<Insert manufacturer's name; product name or designation>.**
 - e. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4)[, **MPI #15**].
 - 1) **<Insert manufacturer's name; product name or designation>.**
 - f. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5)[, **MPI #11**].
 - 1) **<Insert manufacturer's name; product name or designation>.**
 - g. Topcoat: Latex, exterior, gloss (MPI Gloss Level 6)[, **MPI #119**].
 - 1) **<Insert manufacturer's name; product name or designation>.**
- 2. Latex over Latex Aggregate System[**MPI EXT 3.1B**]:
 - a. Prime Coat: Textured coating, latex, flat[, **MPI #42**].
 - 1) **<Insert manufacturer's name; product name or designation>.**
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, flat (MPI Gloss Level 1)[, **MPI #10**].
 - 1) **<Insert manufacturer's name; product name or designation>.**
 - d. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4)[, **MPI #15**].
 - 1) **<Insert manufacturer's name; product name or designation>.**

- e. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5)[, **MPI #11**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - f. Topcoat: Latex, exterior, gloss (MPI Gloss Level 6)[, **MPI #119**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - 3. Latex Aggregate System[**MPI EXT 3.1N**]:
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Textured coating, latex, nonflat[, **MPI #41**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - d. Topcoat: Textured coating, latex, flat[, **MPI #42**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - 4. High-Build Latex System[**MPI EXT 3.1L**]: Dry film thickness of not less than **10 mils** (0.25 mm).
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Latex, exterior, high build[, **MPI #40**].
 - 1) <Insert manufacturer's name; product name or designation>.
- B. Concrete Substrates, Traffic Surfaces:
- 1. Latex Floor Paint System[**MPI EXT 3.2A**]:
 - a. Prime Coat: Floor paint, latex, matching topcoat.
 - b. Intermediate Coat: Floor paint, latex, matching topcoat.
 - c. Topcoat: Floor paint, latex, low gloss (maximum MPI Gloss Level 3)[, **MPI #60**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - 2. Alkyd Floor Enamel System[**MPI EXT 3.2D**]:
 - a. Prime Coat: Floor enamel, matching topcoat.
 - b. Intermediate Coat: Floor enamel, matching topcoat.
 - c. Topcoat: Floor enamel, alkyd, gloss (MPI Gloss Level 6)[, **MPI #27**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - d. Additive: Manufacturer's standard additive to increase skid resistance of painted surface.
 - 3. Clear Water-Based Sealer System[**MPI EXT 3.2H**]:

- a. Prime Coat: Sealer, water based, matching topcoat.
- b. Intermediate Coat: Sealer, water based, matching topcoat.
- c. Topcoat: Sealer, water based, for concrete floors[, **MPI #99**].

1) **<Insert manufacturer's name; product name or designation>.**

4. Clear Sealer System[**MPI EXT 3.2G**]:

- a. Prime Coat: Sealer, solvent based, matching topcoat.
- b. Intermediate Coat: Sealer, solvent based, matching topcoat.
- c. Topcoat: Sealer, solvent based, for concrete floors[, **MPI #104**].

1) **<Insert manufacturer's name; product name or designation>.**

C. CMU Substrates:

1. Latex System[**MPI EXT 4.2A**]:

- a. Prime Coat: Block filler, latex, interior/exterior[, **MPI #4**].

1) **<Insert manufacturer's name; product name or designation>.**

- b. Intermediate Coat: Latex, exterior, matching topcoat.
- c. Topcoat: Latex, exterior, flat (MPI Gloss Level 1)[, **MPI #10**].

1) **<Insert manufacturer's name; product name or designation>.**

- d. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4)[, **MPI #15**].

1) **<Insert manufacturer's name; product name or designation>.**

- e. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5)[, **MPI #11**].

1) **<Insert manufacturer's name; product name or designation>.**

- f. Topcoat: Latex, exterior, gloss (MPI Gloss Level 6)[, **MPI #119**].

1) **<Insert manufacturer's name; product name or designation>.**

2. Latex over Alkali-Resistant Primer System[**MPI EXT 4.2L**]:

- a. Prime Coat: Primer, alkali resistant, water based[, **MPI #3**].

1) **<Insert manufacturer's name; product name or designation>.**

- b. Intermediate Coat: Latex, exterior, matching topcoat.
- c. Topcoat: Latex, exterior, flat (MPI Gloss Level 1)[, **MPI #10**].

1) **<Insert manufacturer's name; product name or designation>.**

- d. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4)[, **MPI #15**].

- 1) <Insert manufacturer's name; product name or designation>.
 - e. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5)[, **MPI #11**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - f. Topcoat: Latex, exterior, gloss (MPI Gloss Level 6)[, **MPI #119**].
 - 1) <Insert manufacturer's name; product name or designation>.
 3. Latex Aggregate System[**MPI EXT 4.2B**]:
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Textured coating, latex, nonflat[, **MPI #41**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - d. Topcoat: Textured coating, latex, flat[, **MPI #42**].
 - 1) <Insert manufacturer's name; product name or designation>.
 4. High-Build Latex System[**MPI EXT 4.2K**]: Dry film thickness of not less than **10 mils (0.25 mm)**.
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Latex, exterior, high build[, **MPI #40**].
 - 1) <Insert manufacturer's name; product name or designation>.
- D. Galvanized-Metal Substrates:
1. Latex System[**MPI EXT 5.3H**]:
 - a. Prime Coat: Primer, galvanized, water based[, **MPI #134**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, flat (MPI Gloss Level 1)[, **MPI #10**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - d. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4)[, **MPI #15**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - e. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5)[, **MPI #11**].
 - 1) <Insert manufacturer's name; product name or designation>.

- f. Topcoat: Latex, exterior, gloss (MPI Gloss Level 6)[, **MPI #119**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - 2. Water-Based Light Industrial Coating System[**MPI EXT 5.3J**]:
 - a. Prime Coat: Primer, galvanized, water based[, **MPI #134**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
 - c. Topcoat: Light industrial coating, exterior, water based (MPI Gloss Level 3)[, **MPI #161**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - d. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5)[, **MPI #163**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - e. Topcoat: Light industrial coating, exterior, water based, gloss (MPI Gloss Level 6)[, **MPI #164**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - 3. Alkyd System[**MPI EXT 5.3B**]:
 - a. Prime Coat: Primer, galvanized, cementitious[, **MPI #26**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
 - c. Topcoat: Alkyd, exterior, flat (MPI Gloss Level 5)[, **MPI #8**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - d. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5)[, **MPI #94**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - e. Topcoat: Alkyd, exterior, gloss (MPI Gloss Level 6)[, **MPI #9**].
 - 1) <Insert manufacturer's name; product name or designation>.
- E. Wood Substrates: Exposed framing.
 - 1. Latex over Latex Primer System[**MPI EXT 6.2M**]:
 - a. Prime Coat: Primer, latex for exterior wood[, **MPI #6**].

- 1) <Insert manufacturer's name; product name or designation>.
- b. Intermediate Coat: Latex, exterior, matching topcoat.
- c. Topcoat: Latex, exterior, flat (MPI Gloss Level 1)[, **MPI #10**].
 - 1) <Insert manufacturer's name; product name or designation>.
- d. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4)[, **MPI #15**].
 - 1) <Insert manufacturer's name; product name or designation>.
- e. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5)[, **MPI #11**].
 - 1) <Insert manufacturer's name; product name or designation>.
- f. Topcoat: Latex, exterior, gloss (MPI Gloss Level 6)[, **MPI #119**].
 - 1) <Insert manufacturer's name; product name or designation>.
2. Latex over Alkyd Primer System[**MPI EXT 6.2A**]:
 - a. Prime Coat: Primer, alkyd for exterior wood[, **MPI #5**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, flat (MPI Gloss Level 1)[, **MPI #10**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - d. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4)[, **MPI #15**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - e. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5)[, **MPI #11**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - f. Topcoat: Latex, exterior, gloss (MPI Gloss Level 6)[, **MPI #119**].
 - 1) <Insert manufacturer's name; product name or designation>.
3. Alkyd System[**MPI EXT 6.2C**]:
 - a. Prime Coat: Primer, alkyd for exterior wood[, **MPI #5**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
 - c. Topcoat: Alkyd, exterior, flat (MPI Gloss Level 5)[, **MPI #8**].
 - 1) <Insert manufacturer's name; product name or designation>.

- d. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5)[, **MPI #94**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - e. Topcoat: Alkyd, exterior, gloss (MPI Gloss Level 6)[, **MPI #9**].
 - 1) <Insert manufacturer's name; product name or designation>.
- F. Wood Substrates: [**Wood trim**] [**Architectural woodwork**] [**Doors**] [**Windows**] [**Wood board siding**] [**and**] [**wood fences**].
- 1. Latex over Latex Primer System[**MPI EXT 6.3L**]:
 - a. Prime Coat: Primer, latex for exterior wood[, **MPI #6**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, flat (MPI Gloss Level 1)[, **MPI #10**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - d. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4)[, **MPI #15**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - e. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5)[, **MPI #11**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - f. Topcoat: Latex, exterior, gloss (MPI Gloss Level 6)[, **MPI #119**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - 2. Latex System[**MPI EXT 6.3A**]:
 - a. Prime Coat: Primer, alkyd for exterior wood[, **MPI #5**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, flat (MPI Gloss Level 1)[, **MPI #10**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - d. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4)[, **MPI #15**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - e. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5)[, **MPI #11**].
 - 1) <Insert manufacturer's name; product name or designation>.

- f. Topcoat: Latex, exterior, gloss (MPI Gloss Level 6)[, **MPI #119**].
 - 1) <Insert manufacturer's name; product name or designation>.
- 3. Alkyd System[**MPI EXT 6.3B**]:
 - a. Prime Coat: Primer, alkyd for exterior wood[, **MPI #5**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
 - c. Topcoat: Alkyd, exterior, flat (MPI Gloss Level 5)[, **MPI #8**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - d. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5)[, **MPI #94**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - e. Topcoat: Alkyd, exterior, gloss (MPI Gloss Level 6)[, **MPI #9**].
 - 1) <Insert manufacturer's name; product name or designation>.
- G. Wood Substrates: Wood-based panel products.
 - 1. Latex over Latex Primer System[**MPI EXT 6.4K**]:
 - a. Prime Coat: Primer, latex for exterior wood[, **MPI #6**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, flat (MPI Gloss Level 1)[, **MPI #10**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - d. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4)[, **MPI #15**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - e. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5)[, **MPI #11**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - f. Topcoat: Latex, exterior, gloss (MPI Gloss Level 6)[, **MPI #119**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - 2. Latex over Alkyd Primer System[**MPI EXT 6.4G**]:
 - a. Prime Coat: Primer, alkyd for exterior wood[, **MPI #5**].

- 1) <Insert manufacturer's name; product name or designation>.
- b. Intermediate Coat: Latex, exterior, matching topcoat.
- c. Topcoat: Latex, exterior, flat (MPI Gloss Level 1)[, **MPI #10**].
 - 1) <Insert manufacturer's name; product name or designation>.
- d. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4)[, **MPI #15**].
 - 1) <Insert manufacturer's name; product name or designation>.
- e. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5)[, **MPI #11**].
 - 1) <Insert manufacturer's name; product name or designation>.
- f. Topcoat: Latex, exterior, gloss (MPI Gloss Level 6)[, **MPI #119**].
 - 1) <Insert manufacturer's name; product name or designation>.
- 3. Alkyd System [**MPI EXT 6.4B**]:
 - a. Prime Coat: Primer, alkyd for exterior wood[, **MPI #5**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
 - c. Topcoat: Alkyd, exterior, flat (MPI Gloss Level 5)[, **MPI #8**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - d. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5)[, **MPI #94**].
 - 1) <Insert manufacturer's name; product name or designation>.
 - e. Topcoat: Alkyd, exterior, gloss (MPI Gloss Level 6)[, **MPI #9**].
 - 1) <Insert manufacturer's name; product name or designation>.

END OF SECTION 099113

SECTION 099600

HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of high-performance coating systems[.][**on the following substrates:**]
 - 1. Exterior Substrates:
 - a. Concrete, [**vertical**] [**and**] [**horizontal**] surfaces.
 - b. Clay masonry.
 - c. Concrete masonry units (CMUs).
 - d. Steel.
 - e. Galvanized metal.
 - f. Aluminum (not anodized or otherwise coated).
 - g. Wood.

1.2 DEFINITIONS

- A. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- B. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- C. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
- B. Sustainable Design Submittals:
 - 1. <Double click to insert sustainable design text for paints and coatings.>
- C. Samples: For each type of coating system and in each color and gloss of topcoat indicated.

1.4 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each coating system indicated to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each coating system.
 - a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. <Double click here to find, evaluate, and insert list of manufacturers and products.>
- B. Products: Subject to compliance with requirements, **[provide product] [provide one of the products] [available products that may be incorporated into the Work include, but are not limited to products]** listed in the Exterior High-Performance Coating Schedule or Interior High-Performance Coating Schedule for the coating category indicated.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
 - 3. Products shall be of same manufacturer for each coat in a coating system.
- C. <Double click to insert sustainable design text for coatings.>
- D. Colors: **[As selected by Architect from manufacturer's full range] [Match Architect's samples] [As indicated in color schedule] <Insert requirements>.**

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Fiber-Cement Board: 12 percent.
 - 3. Masonry (Clay and CMUs): 12 percent.
 - 4. Wood: 15 percent.
 - 5. Gypsum Board: 12 percent.
 - 6. Plaster: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and coating systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

3.3 APPLICATION

- A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

- B. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Concrete Substrates, Horizontal Surfaces:

- 1. Epoxy Non-Slip Deck Coating System [**MPI EXT 3.2C**]:
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Epoxy deck coating (slip resistant)[, **MPI #82**].
 - 1) **<Insert manufacturer's name; product name or designation>.**

B. CMU Substrates:

- 1. Epoxy System [**MPI EXT 4.2E**]:
 - a. Block Filler: Block filler, epoxy[, **MPI #116**].
 - 1) **<Insert manufacturer's name; product name or designation>.**
 - b. Intermediate Coat: Epoxy, matching topcoat.
 - c. Topcoat: Epoxy, gloss[, **MPI #77**].
 - 1) **<Insert manufacturer's name; product name or designation>.**
- 2. Pigmented Polyurethane over High-Build Epoxy System [**MPI EXT 4.2G**]:
 - a. Block Filler: Block filler, epoxy[, **MPI #116**].
 - 1) **<Insert manufacturer's name; product name or designation>.**
 - b. Intermediate Coat: Epoxy, high build, low gloss[, **MPI #108**].
 - 1) **<Insert manufacturer's name; product name or designation>.**
 - c. Topcoat: Polyurethane, two component, pigmented, gloss (MPI Gloss Level 6)[, **MPI #72**].
 - 1) **<Insert manufacturer's name; product name or designation>.**

C. Galvanized-Metal Substrates:

- 1. Epoxy System [**MPI EXT 5.3C**]:
 - a. Prime Coat: Primer, epoxy, anti-corrosive, for metal[, **MPI #101**].
 - 1) **<Insert manufacturer's name; product name or designation>.**

- b. Intermediate Coat: Epoxy, matching topcoat.
- c. Topcoat: Epoxy, gloss[, **MPI #77**].

1) **<Insert manufacturer's name; product name or designation>.**

2. Pigmented Polyurethane over Epoxy Primer System [**MPI EXT 5.3L**]:

- a. Prime Coat: Primer, epoxy, anti-corrosive, for metal[, **MPI #101**].

1) **<Insert manufacturer's name; product name or designation>.**

- b. Intermediate Coat: Polyurethane, two component, pigmented, gloss matching topcoat.
- c. Topcoat: Polyurethane, two component, pigmented, gloss (MPI Gloss Level 6)[, **MPI #72**].

1) **<Insert manufacturer's name; product name or designation>.**

3. Pigmented Polyurethane over Vinyl Wash Primer and Epoxy Primer System [**MPI EXT 5.3D**]:

- a. Prime Coat: Primer, vinyl wash[, **MPI #80**].

1) **<Insert manufacturer's name; product name or designation>.**

- b. Intermediate Coat: Primer, epoxy, anti-corrosive, for metal[, **MPI #101**].

1) **<Insert manufacturer's name; product name or designation>.**

- c. [**First and Second**] Topcoat: Polyurethane, two component, pigmented, gloss (MPI Gloss Level 6)[, **MPI #72**].

1) **<Insert manufacturer's name; product name or designation>.**

D. Wood Substrates: Exposed framing.

1. Pigmented Polyurethane System [**MPI EXT 6.2J**]:

- a. Prime Coat: Polyurethane, two component, pigmented, gloss, matching topcoat.
- b. Intermediate Coat: Polyurethane, two component, pigmented, gloss, matching topcoat.
- c. Topcoat: Polyurethane, two component, pigmented, gloss (MPI Gloss Level 6)[, **MPI #72**].

1) **<Insert manufacturer's name; product name or designation>.**

E. Wood Substrates: [**Wood trim**] [**Architectural woodwork**] [**Doors**] [**Windows**] [**Wood board siding**] [**and**] [**wood fences**]

1. Pigmented Polyurethane System [**MPI EXT 6.3H**]:

- a. Prime Coat: Polyurethane, two component, pigmented, gloss, matching topcoat.

- b. Intermediate Coat: Polyurethane, two component, pigmented, gloss, matching topcoat.
 - c. Topcoat: Polyurethane, two component, pigmented, gloss (MPI Gloss Level 6)[, **MPI #72**].
- 1) <Insert manufacturer's name; product name or designation>.

END OF SECTION 099600

SECTION 101419
DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cutout dimensional characters.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For dimensional letter signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 3. Show message list, typestyles, graphic elements, and layout for each sign at least [**half size**] <**Insert scale**>.
 - 4. Show locations of electrical service connections.
 - 5. Include diagrams for power, signal, and control wiring.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.
- E. Delegated-Design Submittal: For [**signs indicated in "Performance Requirements" Article**] <**Insert sign designations**>.
 - 1. Include structural analysis calculations for signs indicated to comply with design loads; signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

- A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: [**Five**] **<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DIMENSIONAL LETTER SIGNS, GENERAL

- A. [<Double click to insert sustainable design text for regional materials.>](#)

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design sign structure and anchorage of [**rooftop**] [**dimensional character**] **<Insert description>** sign type(s) **<Insert drawing designation of sign(s)>** to withstand design loads [**as indicated on Drawings**] **<Insert loads>**.
- B. Thermal Movements: For exterior [**fabricated channel dimensional characters**] **<Insert item>**, allow for thermal movements from ambient and surface temperature changes.
1. Temperature Change: [**120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces**] **<Insert temperature change>**.
- C. 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.

2.3 DIMENSIONAL CHARACTERS

- A. Cutout Characters **<Insert drawing designation>**: Characters with uniform faces; square-cut, smooth[, **eased**] edges; precisely formed lines and profiles; and as follows:
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
 2. Character Material: Sheet or plate [**aluminum**] [**brass**] [**bronze**] [**copper**] [**stainless steel**] [**zinc**] [**acrylic**] **<Insert material>**.
 3. Character Height: [**As indicated**] **<Insert dimension>**.
 4. Thickness: [**As indicated**] [**Manufacturer's standard for size of character**] [**0.125 inch (3.18 mm)**] [**0.25 inch (6.35 mm)**] **<Insert dimension>**.
 5. Finishes:
 - a. Integral Metal Finish: [**Mill**] [**Antique oxidized**] [**As indicated by manufacturer's designation**] [**Match Architect's sample**] [**As selected by Architect from full range of industry finishes**] **<Insert finish>**.
 - b. Integral Aluminum Finish: [**Clear anodized**] [**Light bronze anodized**] [**Medium bronze anodized**] [**Match Architect's sample**] [**Anodized color as selected by**

- Architect from full range of industry colors and color densities] <Insert finish>.
 - c. Integral Stainless-Steel Finish: [No. 4] [No. 8] [Match Architect's sample] [As selected by Architect from full range of industry finishes] <Insert description>.
 - d. Integral Acrylic Color: [As indicated by manufacturer's designation] [Match Architect's sample] [As selected by Architect from full range of industry colors] <Insert color>.
 - e. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard, in color [as indicated by manufacturer's designation] [matching Architect's sample] [as selected by Architect from manufacturer's full range] <Insert color>.
 - f. Overcoat: [Manufacturer's standard baked-on clear coating] <Insert requirement>.
6. Mounting: [As indicated] [Concealed studs] [Projecting studs] [Rosette-head through fasteners] [Countersunk flathead through fasteners] [Concealed, painted aluminum back bar or bracket assembly] [Concealed, stainless-steel back bar or bracket assembly] [Adhesive] <Insert requirement>.

2.4 DIMENSIONAL CHARACTER MATERIALS

- A. Brass Castings: [Lead-free alloy] [Alloy UNS No. C85200 (high-copper yellow brass)] <Insert requirement>.
- B. Brass Sheet (Yellow Brass): [Lead-free alloy] [Alloy UNS No. C26000 (yellow brass)] <Insert requirement>.
- C. Bronze Castings: [Lead-free alloy] [Alloy UNS No. C86500 (No. 1 manganese bronze)] <Insert requirement>.
- D. Bronze Plate: [Lead-free alloy] [Alloy UNS No. C22000 (commercial bronze)] <Insert requirement>.
- E. Stainless-Steel Sheet: [Type 304] [Type 316].
- F. Acrylic Sheet: ASTM D 4802, Type UVF (UV filtering).

2.5 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. For exterior exposure, furnish [nonferrous-metal] [stainless-steel] [or] [hot-dip galvanized] <Insert requirement> devices unless otherwise indicated.
 - 3. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.

4. Sign Mounting Fasteners:

- a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
- b. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
- c. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, installed in predrilled holes.

B. Adhesive: As recommended by sign manufacturer.

1. [<Double click to insert sustainable design text for VOC content of adhesive.>](#)
2. [<Double click to insert sustainable design text for low emitting adhesives.>](#)

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.6 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
2. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
4. Internally brace signs for stability and for securing fasteners.
5. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
6. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

B. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted signs to suit sign construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.

1. Aluminum Brackets: Factory finish brackets with baked-enamel or powder-coat finish [**to match sign-background color**] [**to match Architect's sample**] **<Insert requirement>** color unless otherwise indicated.
2. Stainless-Steel Brackets: Factory finish brackets [**to match sign background**] [**to match Architect's sample**] [**with No. 4**] **<Insert finish>** finish unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
 - 3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Mounting Methods:
 - 1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
 - 2. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.
 - 3. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
 - 4. Back Bar and Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position so that signage is correctly located and aligned.
 - 5. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.

- C. Remove temporary protective coverings and strippable films as signs are installed.

END OF SECTION 101419

SECTION 101423

PANEL SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Panel signs.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For panel signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
3. Show message list, typestyles, graphic elements[, **including raised characters and Braille**], and layout for each sign at least [**half size**] <Insert scale>.
4. Show locations of electrical service connections.
5. Include diagrams for power, signal, and control wiring.

C. Samples: For each exposed product and for each color and texture specified.

D. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

E. Delegated-Design Submittal: For [**signs indicated in "Performance Requirements" Article**] <**Insert sign designations**>.

1. Include structural analysis calculations for signs indicated to comply with design loads; signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: **[Five]** **<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design sign structure and anchorage of **[rooftop]** **[illuminated panel]** **<Insert description>** sign type(s) **<Insert drawing designation of sign(s)>** to withstand design loads **[as indicated on Drawings]** **<Insert loads>**.
- B. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.
1. Temperature Change: **[120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces]** **<Insert temperature change>**.
- C. Accessibility Standard: Comply with applicable provisions in **[the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities]** **[and]** **[ICC A117.1]** for signs.
- D. 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.

2.2 SIGNS

- A. **<Double click here to find, evaluate, and insert list of manufacturers and products.>**
- B. Panel Sign **<Insert drawing designation>**: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
1. Basis-of-Design Product: **[Indicated on Drawings]** **<Insert manufacturer's name; product name or designation>**.
 2. Illuminated Panel Sign: Backlighted construction with **[fluorescent tube]** **[fiber-optic]** **[LED]** **[neon tube]** **<Insert requirement>** lighting including transformers, insulators, and other accessories for operability, with provision for servicing and concealing connections to building electrical system. Use tight or sealed joint construction to prevent unintentional light leakage. Space lamps apart from each other and away from sign surfaces as needed to illuminate evenly.
 - a. Power: **[As indicated on electrical Drawings]** **[120 V, 60 Hz, 1 phase, 15 A]** **<Insert requirement>**.

3. Solid-Sheet Sign[**and Returns**][, **Returns, and Back**]: [Aluminum] [Stainless-steel] [Acrylic] [Fiberglass] [PVC] <Insert material> sheet with finish specified in "Surface Finish and Applied Graphics" Subparagraph below and as follows:
 - a. Surface-Applied Graphics: Applied [vinyl film] [baked enamel or powder coat] [paint] [photo image] <Insert requirement>.
 - b. Etched and Filled Graphics: Sign face etched or routed to receive enamel-paint infill.
 - c. Inset, Cutout Characters: Sign face routed to receive push-through acrylic graphics.
4. Laminated Aluminum-Sheet Sign: Aluminum sheet laminated to both sides of [acrylic] [phenolic] <Insert material> core sheet[**with painted edges**].
 - a. Surface-Applied Graphics: Applied [vinyl film] [paint] [photo image] <Insert requirement>.
5. Laminated-Sheet Sign: [Photopolymer] [Sandblasted polymer] <Insert material> face sheet with raised graphics laminated[**over subsurface graphics**] to [acrylic] [phenolic] <Insert material> backing sheet to produce composite sheet.
 - a. Surface-Applied Graphics: Applied [vinyl film] [paint] [photo image] <Insert requirement>.
 - b. Subsurface Graphics: [Reverse halftone or dot-screen image] [Reverse etch image] [Snap-in changeable insert beneath removable face sheet] [Slide-in changeable insert] <Insert requirement>.
6. Laminated Polycarbonate-Sheet Sign: Polycarbonate face sheet laminated to each side of [phenolic] <Insert material> base sheet to produce composite sheet.
 - a. Surface-Applied Graphics: Applied [vinyl film] [paint] [photo image] <Insert requirement>.
 - b. Subsurface Graphics: [Reverse halftone or dot-screen image] [Reverse etch image] <Insert requirement>.
7. Engraved Plastic-Laminate Sign: Plastic-laminate face laminated to contrasting phenolic core to produce composite sheet.
 - a. Engraved Graphics: Characters engraved through plastic-laminate face sheet to expose contrasting phenolic core.
 - b. Plastic-Laminate Color and Pattern: [As indicated by manufacturer's designation] [As selected by Architect from manufacturer's full range] <Insert color and pattern>.
8. Sign-Panel Perimeter: Finish edges smooth.
 - a. Edge Condition[, **Vertical Edges**][, **Horizontal Edges**]: [As indicated] [Square cut] [Beveled] [Bullnosed] <Insert requirement>.
 - b. Corner Condition in Elevation: [As indicated] [Square] [Rounded to radius indicated] <Insert requirement>.

9. Frame: [Entire perimeter] [Horizontal retainers] [Vertical retainers] [to hold changeable sign panel] <Insert description>.
 - a. Material: [Aluminum] [Brass] [Bronze] [Steel] [Stainless steel] [PVC] <Insert material>.
 - b. Profile: [Square] [Beveled] [Rounded] <Insert requirement>.
 - c. Corner Condition in Elevation: [Square] [Mitered] [Rounded to radius indicated] <Insert requirement>.
 - d. Finish and Color: [Mill] [Painted, matte black color] [Match Architect's sample] [As selected by Architect from manufacturer's full range] <Insert requirement>.
10. Mounting: [As indicated] [Manufacturer's standard method for substrates indicated] [Surface mounted to wall] [Projecting from wall] [Suspended] [Aluminum bracket] [Stainless-steel bracket] <Insert requirement> with [concealed anchors] [countersunk flathead through fasteners] [adhesive] [or] [two-face tape].
11. Surface Finish and Applied Graphics:
 - a. Integral Metal Finish: [Mill] [Antique oxidized] [As indicated by manufacturer's designation] [Match Architect's sample] [As selected by Architect from full range of industry finishes] <Insert finish>.
 - b. Integral Aluminum Finish: [Clear anodized] [Light bronze anodized] [Medium bronze anodized] [Match Architect's sample] [Anodized color as selected by Architect from full range of industry colors and color densities] <Insert finish>.
 - c. Integral Stainless-Steel Finish: [No. 4] [No. 8] [Match Architect's sample] [As selected by Architect from full range of industry finishes] <Insert description>.
 - d. Integral [Acrylic] [Fiberglass] [PVC] Sheet Color: [As indicated by manufacturer's designation] [Match Architect's sample] [As selected by Architect from full range of industry colors] <Insert color>.
 - e. Baked-Enamel or Powder-Coat Finish and Graphics: Manufacturer's standard, in color [as indicated by manufacturer's designation] [matching Architect's sample] [as selected by Architect from manufacturer's full range] <Insert color>.
 - f. Painted Finish and Graphics: Manufacturer's standard, factory-applied [exterior-grade sign paint] [acrylic polyurethane] <Insert requirement>, in color [as indicated by manufacturer's designation] [matching Architect's sample] [as selected by Architect from manufacturer's full range] <Insert color>.
 - g. Photo-Image Graphics: Manufacturer's standard [black-and-white] [multicolor], [600-dpi] <Insert value> halftone or dot-screen image.
 - h. Overcoat: [Manufacturer's standard baked-on clear coating] <Insert requirement>.

2.3 PANEL-SIGN MATERIALS

- A. Stainless-Steel Sheet: [Type 304] [Type 316].
- B. Acrylic Sheet: ASTM D 4802, Type UVF (UV filtering).

- C. Polycarbonate Sheet: Coated, mar-resistant, UV-stabilized polycarbonate, with coating on both sides.
- D. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated and suitable for exterior applications.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. For exterior exposure, furnish **[nonferrous-metal] [stainless-steel] [or] [hot-dip galvanized]** <Insert requirement> devices unless otherwise indicated.
 - 3. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
 - 4. Sign Mounting Fasteners:
 - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly, unless otherwise indicated.
 - b. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material or screwed into back of sign assembly, unless otherwise indicated.
 - c. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, installed in predrilled holes.
- B. Adhesive: As recommended by sign manufacturer.
 - 1. <Double click to insert sustainable design text for VOC content of adhesive.>
 - 2. <Double click to insert sustainable design text for low emitting adhesives.>
- C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, **0.045 inch (1.14 mm)** thick, with adhesive on both sides.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 2. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.

3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 4. Internally brace signs for stability and for securing fasteners.
 5. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
- B. Surface-Engraved Graphics: Machine engrave characters and other graphic devices into panel surface indicated to produce precisely formed copy, incised to uniform depth.
1. Engraved Metal: Fill engraved graphics with manufacturer's standard baked enamel.
 2. Engraved Opaque Acrylic Sheet: Fill engraved graphics with manufacturer's standard enamel.
 3. Face-Engraved Clear Acrylic Sheet: Fill engraved copy with manufacturer's standard enamel. Apply manufacturer's standard opaque background color coating to back face of acrylic sheet.
 4. Engraved Plastic Laminate: Engrave through exposed face ply of plastic-laminate sheet to expose contrasting core ply.
- C. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.
- D. Subsurface-Engraved Graphics: Reverse engrave back face of clear face-sheet material. Fill resulting copy with manufacturer's standard enamel. Apply opaque manufacturer's standard background color coating over enamel-filled copy.
- E. Shop- and Subsurface-Applied Vinyl: Align vinyl film in final position and apply to surface. Firmly press film from the middle outward to obtain good bond without blisters or fishmouths.
- F. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted signs to suit sign construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.
1. Aluminum Brackets: Factory finish brackets with baked-enamel or powder-coat finish [**to match sign-background color**] [**to match Architect's sample**] <Insert requirement> color unless otherwise indicated.
 2. Stainless-Steel Brackets: Factory finish brackets [**to match sign background**] [**to match Architect's sample**] [**with No. 4**] <Insert finish> finish unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 2. Install signs so they do not protrude or obstruct according to the accessibility standard.

3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
2. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.
3. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
4. Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position so that signage is correctly located and aligned.
5. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
6. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

C. Remove temporary protective coverings and strippable films as signs are installed.

END OF SECTION 101423

SECTION 102113.15

STAINLESS-STEEL TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes stainless-steel toilet compartments configured as **[toilet enclosures] [entrance screens] [and] [urinal screens]**.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachment details.
- C. Samples for each type of toilet compartment material indicated.

1.3 INFORMATIONAL SUBMITTALS

- A. Product certificates.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. [<Double click to insert sustainable design text for recycled content.>](#)
- B. Regulatory Requirements: Comply with applicable provisions in **[the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities]** **[and]** **[ICC A117.1]** for toilet compartments designated as accessible.

2.2 STAINLESS-STEEL TOILET COMPARTMENTS

- A. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- B. Toilet-Enclosure Style: [**Overhead braced**] [**Floor anchored**] [**Ceiling hung**] [**Floor and ceiling anchored**].
- C. Entrance-Screen Style: [**Overhead braced**] [**Floor anchored**] [**Ceiling hung**] [**Floor and ceiling anchored**].
- D. Urinal-Screen Style: [**Wall hung flat panel**] [**Wall hung with integral flanges**] [**Wall hung, wedge shaped**] [**Floor anchored**] [**Overhead braced**] [**Post to ceiling**].
- E. Door, Panel, and Pilaster Construction: Seamless, metal facing sheets pressure laminated to core material; with continuous, interlocking molding strip or lapped-and-formed edge closures; corners secured by welding or clips and exposed welds ground smooth.[**Provide with no-sightline system.**] Exposed surfaces shall be free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections.
 - 1. Core Material: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of **1 inch (25 mm)** for doors and panels and **1-1/4 inches (32 mm)** for pilasters.
 - 2. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units of size and material adequate for panel to withstand applied downward load on grab bar of at least **250 lbf (1112 N)**, when tested according to ASTM F 446, without deformation of panel.
 - 3. Tapping Reinforcement: Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.
- F. Urinal-Screen Construction:
 - 1. Flat-Panel Urinal Screen: Matching panel construction.
 - 2. Integral-Flange, Wall-Hung Urinal Screen: Similar to panel construction, with integral full-height flanges for wall attachment, and maximum **1-1/4 inches (32 mm)** thick.
 - 3. Wedge-Shaped, Wall-Hung Urinal Screen: Similar to panels, V-shaped, fabricated for concealed wall attachment, and maximum **6 inches (152 mm)** wide at wall and minimum **1 inch (25 mm)** wide at protruding end.
- G. Facing Sheets and Closures: Stainless-steel sheet of nominal thicknesses as follows:
 - 1. Pilasters, Braced at Both Ends: Manufacturer's standard thickness, but not less than **0.038 inch (0.95 mm)**.
 - 2. Pilasters, Unbraced at One End: Manufacturer's standard thickness, but not less than **0.050 inch (1.27 mm)**.
 - 3. Panels: [**Manufacturer's standard thickness, but not less than 0.031 inch (0.79 mm)**] [**0.038 inch (0.95 mm)**].
 - 4. Doors: Manufacturer's standard thickness, but not less than **0.031 inch (0.79 mm)**.
 - 5. Flat-Panel Urinal Screens: Thickness matching the panels.
 - 6. Integral-Flange, Wall-Hung Urinal Screens: Manufacturer's standard thickness, but not less than **0.031 inch (0.79 mm)**.
 - 7. Wedge-Shaped, Wall-Hung Urinal Screens: Manufacturer's standard thickness, but not less than **0.038 inch (0.95 mm)**.
- H. Pilaster [**Shoes**] [**and**] [**Sleeves (Caps)**]: Stainless-steel sheet, not less than **0.031-inch (0.79-mm)** nominal thickness and **3 inches (76 mm)** high, finished to match hardware.

- I. Urinal-Screen Post: Manufacturer's standard post design of **[material matching the thickness and construction of pilasters]** [or] **[1-3/4-inch- (44-mm-) square, aluminum tube with satin finish]** <Insert requirement>; with shoe[**and sleeve (cap)**] matching that on the pilaster.
- J. Brackets (Fittings):
 - 1. Stirrup Type: Ear or U-brackets; **[chrome-plated zamac]** **[clear-anodized aluminum]** **[stainless steel]** **[chrome-plated brass]**.
 - 2. Full-Height (Continuous) Type: Manufacturer's standard design; **[stainless steel]** **[aluminum]**.
- K. Stainless-Steel Finish: **[No. 4 bright, directional polish]** **[Manufacturer's standard textured finish]** <Insert finish> on exposed faces. Protect exposed surfaces from damage by application of strippable, temporary protective covering before shipment.

2.3 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard stainless-steel operating hardware and accessories.
 - 1. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
- B. Hardware and Accessories: Manufacturer's heavy-duty stainless-steel operating hardware and accessories.
 - 1. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
- C. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- D. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel anchors compatible with related materials.

2.4 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories and solid blocking within panel where required for attachment of toilet accessories.
- B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

- C. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- D. Ceiling-Hung Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for connection to structural support above finished ceiling. Provide assemblies that support pilasters from structure without transmitting load to finished ceiling. Provide sleeves (caps) at tops of pilasters to conceal anchorage.
- E. Floor-and-Ceiling-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.
- F. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at **[tops and]** bottoms of posts. Provide shoes **[and sleeves (caps)]** at posts to conceal anchorage.
- G. Door Size and Swings: Unless otherwise indicated, provide **24-inch- (610-mm-)** wide in-swinging doors for standard toilet compartments and **36-inch- (914-mm-)** wide out-swinging doors with a minimum **32-inch- (813-mm-)** wide clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels: **1/2 inch (13 mm)**.
 - b. Panels and Walls: **1 inch (25 mm)**.
 - 2. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than **[two brackets attached] [three brackets attached at midpoint and]** near top and bottom of panel.
 - a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
 - 3. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
 - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.

3.2 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors[**and doors in entrance screens**] to return doors to fully closed position.

END OF SECTION 102113.15

SECTION 102800

TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Public-use shower room accessories.
3. Private-use bathroom accessories.
4. Healthcare accessories.
5. Warm-air dryers.
6. Childcare accessories.
7. Underlavatory guards.
8. Custodial accessories.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: Full size, for each exposed product and for each finish specified.

1.3 INFORMATIONAL SUBMITTALS

- A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: [15] <Insert number> years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE 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.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Toilet Tissue (Roll) Dispenser **<Insert drawing designation>**:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: **[Roll-in-reserve dispenser with hinged front secured with tumbler lockset] [Single-roll dispenser] [Double-roll dispenser] [Double-roll dispenser with shelf] <Insert description>**.
3. Mounting: **[Recessed] [Partition mounted, serving two adjacent toilet compartments] [Surface mounted]**.
4. Operation: **[Noncontrol delivery with standard spindle] [Noncontrol delivery with theft-resistant spindle] [Spindleless with tension-spring controlled delivery] [Spindleless with tension-spring controlled delivery and self-locking device extending through core that prevents core removal until roll is empty] [Eccentric-shaped, molded-plastic spindle revolves one-half revolution per dispensing operation for controlled delivery; core cannot be removed until roll is empty] <Insert description>**.
5. Capacity: Designed for **[4-1/2- or 5-inch- (114- or 127-mm-)] [5-inch- (127-mm-)] <Insert dimension>** diameter tissue rolls.
6. Material and Finish: **[Stainless steel, No. 4 finish (satin)] [Chrome-plated zinc alloy (zamac) or steel] [Satin-finish aluminum bracket with plastic spindle] [ABS plastic, gray] <Insert material and finish>**.

- B. Paper Towel (Folded) Dispenser **<Insert drawing designation>**:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Mounting: **[Recessed] [Semirecessed] [Deck mounted, recessed] [Surface mounted]**.
3. Minimum Capacity: **[400 C-fold or 525 multifold towels] [600 C-fold or 800 multifold towels] [400 single-fold towels] <Insert capacity>**.
4. Material and Finish: **[Stainless steel, No. 4 finish (satin)] [ABS plastic, gray] <Insert material and finish>**.
5. Lockset: Tumbler type.
6. Refill Indicator: Pierced slots at sides or front.

- C. Paper Towel (Roll) Dispenser **<Insert drawing designation>**:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: Lever-actuated mechanism permitting controlled delivery of paper rolls in preset lengths per stroke.
3. Mounting: **[Recessed] [Semirecessed] [Surface mounted]**.
4. Minimum Capacity: **[8-inch- (203-mm-) wide, 800-foot- (244-m-) long roll] <Insert capacity>**.

5. Material and Finish: **[Stainless steel, No. 4 finish (satin)] [ABS plastic, gray]** <Insert material and finish>.
 6. Lockset: Tumbler type.
- D. Automatic Paper Towel (Roll) Dispenser <Insert drawing designation>:
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
 2. Description: Automatic motion sensing mechanism with user-adjustable delay and paper towel length; battery powered.
 3. Mounting: **[Recessed] [Semirecessed] [Surface mounted]**.
 4. Minimum Capacity: **[8-inch- (203-mm-) wide, 800-foot- (244-m-) long roll]** <Insert capacity>.
 5. Material and Finish: **[Stainless steel, No. 4 finish (satin)] [ABS plastic, gray]** <Insert material and finish>.
 6. Lockset: Tumbler type.
- E. Waste Receptacle <Insert drawing designation>:
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
 2. Mounting: **[Open top, recessed] [Self-closing disposal-opening cover, recessed] [Semirecessed] [Surface mounted] [Wall mounted for corner installation] [Freestanding] [Undercounter]** <Insert description>.
 3. Minimum Capacity: <Insert gal. (L)>.
 4. Material and Finish: **[Stainless steel, No. 4 finish (satin)]** <Insert material and finish>.
 5. Liner: **[Reusable vinyl liner]** <Insert liner description>.
 6. Lockset: Tumbler type for waste receptacle.
- F. Combination Towel (Folded) Dispenser/Waste Receptacle <Insert drawing designation>:
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
 2. Description: Combination unit for dispensing C-fold or multifold towels, with removable waste receptacle.
 3. Mounting: **[Surface mounted] [Surface mounted with stainless-steel collar] [Recessed] [Recessed with projecting receptacle] [Semirecessed]**.
 - a. Designed for nominal **[4-inch (100-mm)] [6-inch (150-mm)]** wall depth.
 4. Minimum Towel-Dispenser Capacity: **[600 C-fold or 800 multifold paper towels]** <Insert capacity>.
 5. Minimum Waste-Receptacle Capacity: **[4 gal. (15 L)] [12 gal. (45.4 L)]** <Insert value>.
 6. Material and Finish: **[Stainless steel, No. 4 finish (satin)]** <Insert material and finish>.
 7. Liner: **[Reusable, vinyl waste-receptacle liner]** <Insert liner description>.
 8. Lockset: Tumbler type for towel-dispenser compartment[and waste receptacle].
- G. Combination Towel (Roll) Dispenser/Waste Receptacle <Insert drawing designation>:
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
 2. Description: Combination unit for dispensing preset length of roll paper towels, with removable waste receptacle.
 3. Mounting: **[Recessed] [Semirecessed] [Surface mounted]**.

4. Minimum Towel-Dispenser Capacity: [**8-inch- (203-mm-)** wide, **800-foot- (244-m-)** long roll] <Insert capacity>.
5. Minimum Waste Receptacle Capacity: [**8 gal. (30 L)**] [**12 gal. (45.4 L)**] [**15 gal. (56.8 L)**] <Insert value>.
6. Material and Finish: [**Stainless steel, No. 4 finish (satin)**] <Insert material and finish>.
7. Liner: [**Reusable, vinyl waste-receptacle liner**] <Insert liner description>.
8. Lockset: Tumbler type for towel dispenser compartment[**and waste receptacle**].

H. Liquid-Soap Dispenser <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: Designed for dispensing [**antibacterial**] soap in [**liquid or lotion**] [**lather**] form.
3. Mounting: [**Deck mounted on vanity**] [**Deck mounted on lavatory**] [**Horizontally oriented, recessed**] [**Horizontally oriented, surface mounted**] [**Vertically oriented, surface mounted**].
4. Capacity: <Insert **oz. (mL)**>.
5. Materials: <Insert requirements for valve and reservoir materials and finishes>.
6. Lockset: Tumbler type.
7. Refill Indicator: Window type.

I. Automatic Liquid-Soap Dispenser <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: Automatic dispenser with infrared sensor to detect presence of hands; battery powered; designed for dispensing [**antibacterial**] soap in [**liquid or lotion**] [**lather**] form.
3. Mounting: [**Deck mounted on vanity**] [**Deck mounted on lavatory**].
4. Capacity: <Insert **oz. (mL)**>.
5. Materials: <Insert requirements for valve and reservoir materials and finishes>.
6. Refill Indicator: LED indicator.
7. Low Battery Indicator: LED indicator.

J. Grab Bar <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Mounting: Flanges with [**concealed**] [**exposed**] fasteners.
3. Material: Stainless steel, **0.05 inch (1.3 mm)** thick.
 - a. Finish: Smooth, No. 4 finish (satin)[**on ends and slip-resistant texture in grip area**].
4. Outside Diameter: [**1-1/4 inches (32 mm)**] [**1-1/2 inches (38 mm)**].
5. Configuration and Length: [**As indicated on Drawings**] [**Straight, 36 inches (914 mm) long**] <Insert configuration and length>.

K. Sanitary-Napkin Disposal Unit <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2. Mounting: [**Recessed**] [**Partition mounted, dual access**] [**Surface mounted**].
3. Door or Cover: Self-closing, disposal-opening cover[**and hinged face panel with tumbler lockset**].
4. Receptacle: Removable.
5. Material and Finish: [**Stainless steel, No. 4 finish (satin)**] [**ABS plastic, gray**] <Insert material and finish>.

L. Seat-Cover Dispenser <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Mounting: [**Surface mounted**] [**Recessed**] [**Partition mounted, dual access**].
3. Minimum Capacity: [**250**] [**500**] <Insert number> seat covers.
4. Exposed Material and Finish: [**Stainless steel, No. 4 finish (satin)**] [**ABS plastic, gray**] <Insert material and finish>.
5. Lockset: Tumbler type.

M. Mirror Unit <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Frame: [**Stainless-steel angle, 0.05 inch (1.3 mm) thick**] [**Stainless-steel channel**] [**Stainless steel, fixed tilt**] [**Stainless steel, adjustable tilt**].
 - a. Corners: [**Manufacturer's standard**] [**Mitered and mechanically interlocked**] [**Welded and ground smooth**].
3. Integral Shelf: **5 inches (127 mm)** deep.
4. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
 - a. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
 - b. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
5. Size: [**As indicated on Drawings**] <Insert dimensions>.

N. Coat Hook <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: [**Double**] [**Single**]-prong unit.
3. Material and Finish: [**Solid brass, polished**] [**Polished brass-plated zinc alloy (zamac)**] [**Polished chrome-plated brass**] [**Polished chrome-plated zinc alloy (zamac)**] [**Stainless steel, No. 4 finish (satin)**] [**Stainless steel, No. 7 finish (polished)**] <Insert material and finish>.

2.3 PUBLIC-USE SHOWER ROOM ACCESSORIES

A. Shower Curtain Rod <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: [**1-inch (25.4-mm)** OD; fabricated from nominal **0.0375-inch- (0.95-mm-)** thick stainless steel] [**1-1/4-inch (32-mm)** OD; fabricated from nominal **0.05-inch- (1.3-mm-)** thick stainless steel].
3. Mounting Flanges: [Stainless-steel flanges designed for exposed fasteners] <Insert requirements>.
4. Finish: [Stainless steel, No. 4 finish (satin)] <Insert finish>.

B. Shower Curtain <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Size: Minimum [**6 inches (152 mm)**] [**12 inches (305 mm)**] wider than opening by **72 inches (1828 mm)** high.
3. Material: [Vinyl, minimum **0.006 inch (0.15 mm)** thick, opaque, matte] [Duck, minimum **8 oz. (227 g)**, white, 100 percent cotton] [Nylon-reinforced vinyl, minimum **10 oz. (284 g)** or **0.008-inch- (0.2-mm-)** thick vinyl, with integral antibacterial agent] <Insert material>.
4. Color: [White] [Green] [As selected from manufacturer's full range] <Insert color>.
5. Grommets: Corrosion resistant at minimum **6 inches (152 mm)** o.c. through top hem.
6. Shower Curtain Hooks: Chrome-plated or stainless-steel, spring wire curtain hooks with snap fasteners, sized to accommodate specified curtain rod. Provide one hook per curtain grommet.

C. Folding Shower Seat <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Configuration: [L-shaped seat, designed for wheelchair access] [Rectangular seat] [Triangular, corner-type seat] [Stainless-steel seat designed to fold into recessed-mounted, stainless-steel wall box].
3. Seat: [Phenolic or polymeric composite of slat-type or one-piece construction in color as selected by Architect] [White vinyl padded seat] [Stainless steel, No. 4 finish (satin); **0.05-inch (1.3-mm)** minimum nominal thickness; with single-piece, pan-type construction and edge seams welded and ground smooth] <Insert description>.
4. Mounting Mechanism: [Stainless steel, No. 4 finish (satin)] <Insert description>.
5. Dimensions: <Insert dimensions>.

D. Robe Hook <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: [Double] [Single]-prong unit.
3. Material and Finish: [Solid brass, polished] [Polished brass-plated zinc alloy (zamac)] [Polished chrome-plated brass] [Polished chrome-plated zinc alloy (zamac)] [Stainless steel, No. 4 finish (satin)] [Stainless steel, No. 7 finish (polished)] <Insert material and finish>.

2.4 PRIVATE-USE BATHROOM ACCESSORIES

A. Toilet Tissue Dispenser <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: [Single-roll dispenser] [Double-roll dispenser] [Single-roll dispenser with hood] [Double-roll dispenser with hood] <Insert description>.
3. Mounting: [Recessed] [Surface mounted].
4. Capacity: Designed for 4-1/2- or 5-inch- (114- or 127-mm-) diameter tissue rolls.
5. Material and Finish: [Solid brass, polished] [Polished brass-plated zinc alloy (zamac)] [Polished chrome-plated brass] [Polished chrome-plated zinc alloy (zamac)] [Stainless steel, No. 4 finish (satin)] [Stainless steel, No. 7 finish (polished)] <Insert material and finish>.

B. Shower Curtain Rod <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Outside Diameter: [1 inch (25.4 mm)] [1-1/4 inches (32 mm)].
3. Mounting: Flanges with [exposed] [concealed] fasteners.
4. Rod Material and Finish: [Solid brass, polished] [Polished chrome-plated brass] [Stainless steel, No. 4 finish (satin)] [Stainless steel, No. 7 finish (polished)] <Insert material and finish>.
5. Flange Material and Finish: [Polished brass-plated zinc alloy (zamac)] [Polished chrome-plated brass] [Polished chrome-plated zinc alloy (zamac)] [Stainless steel, No. 4 finish (satin)] [Stainless steel, No. 7 finish (polished)] <Insert material and finish>.
6. Accessories: Integral chrome-plated brass glide hooks.

C. Soap Dish <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: <Insert description>.
3. Mounting: [Recessed] [Surface mounted].
4. Material and Finish: [Solid brass, polished] [Polished brass-plated zinc alloy (zamac)] [Polished chrome-plated brass] [Polished chrome-plated zinc alloy (zamac)] [Stainless steel, No. 4 finish (satin)] [Stainless steel, No. 7 finish (polished)] <Insert material and finish>.

D. Medicine Cabinet <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Mounting: [Recessed, for nominal 4-inch (100-mm) wall depth] [Surface mounted].
3. Size: [18 by 24 inches (460 by 610 mm)] <Insert dimensions>.
4. Door: [Framed mirror door concealing storage cabinet equipped with continuous hinge and spring-buffered, rod-type stop and magnetic door catch] <Insert description>.
5. Shelves: [Three, adjustable] <Insert requirements>.
6. Material and Finish:
 - a. Cabinet: [Stainless steel, No. 4 finish (satin)] [Steel with corrosion-resistant finish].
 - b. Mirror Frame: <Insert material and finish>.
 - c. Door: <Insert material and finish>.
 - d. Hinge: <Insert material and finish>.
 - e. Shelves: <Insert material and finish>.

E. Robe Hook <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: [Double] [Single]-prong unit.
3. Material and Finish: [Solid brass, polished] [Polished brass-plated zinc alloy (zamac)] [Polished chrome-plated brass] [Polished chrome-plated zinc alloy (zamac)] [Stainless steel, No. 4 finish (satin)] [Stainless steel, No. 7 finish (polished)] <Insert material and finish>.

F. Toothbrush and Tumbler Holder <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: <Insert description>.
3. Material and Finish: [Solid brass, polished] [Polished brass-plated zinc alloy (zamac)] [Polished chrome-plated brass] [Polished chrome-plated zinc alloy (zamac)] [Stainless steel, No. 4 finish (satin)] [Stainless steel, No. 7 finish (polished)] <Insert material and finish>.

G. Towel Bar <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: [~~3/4-inch- (19-mm-)~~ square tube with rectangular end brackets] [~~3/4-inch- (19-mm-)~~ round tube with circular end brackets] <Insert description>.
3. Mounting: Flanges with [concealed] [exposed] fasteners.
4. Length: [~~18 inches (457 mm)~~] [~~24 inches (610 mm)~~] [~~30 inches (762 mm)~~] <Insert dimension>.
5. Material and Finish: [Stainless steel, No. 4 finish (satin)] [Stainless steel, No. 7 finish (polished)] [Polished aluminum] <Insert material and finish>.

H. Towel Shelf <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: Surface-mounted, guest-towel shelf with four [~~3/8-inch- (9-mm-)~~ diameter] [~~5/16-inch- (8-mm-)~~ square] stainless-steel tubes mounted in support arms.
 - a. Towel Bar: [~~1/4-inch- (6-mm-)~~ diameter] [~~5/16-inch- (8-mm-)~~ square] stainless-steel towel bar below shelf.
3. Length: [~~18 inches (457 mm)~~] [~~24 inches (610 mm)~~] <Insert dimension>.
4. Material and Finish: [Polished brass-plated, stainless-steel] [Polished chrome-plated, stainless-steel] [Stainless steel, No. 7 finish (polished)] <Insert material and finish>.

I. Towel Rack <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: [Surface-mounted, guest-towel unit with approximately ~~1/4-inch- (6-mm-)~~ diameter wire rings welded to upright wire bracket] <Insert description>.
3. Capacity: [Two] [Three] [Four] <Insert number> sets of bath towels, hand towels, and washcloths.
4. Nominal Height: [~~11 inches (279 mm)~~] [~~17 inches (432 mm)~~] [~~21 inches (533 mm)~~] <Insert dimension>.

5. Material and Finish: **[Polished brass-plated zinc alloy (zamac)] [Polished chrome-plated zinc alloy (zamac)]** <Insert material and finish>.

2.5 HEALTHCARE ACCESSORIES

A. Specimen Pass-Through Cabinet <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: With self-closing doors on both sides, lock that prevents doors from both being opened at same time, and removable stainless-steel tray.
3. Nominal Wall Opening: **[12 by 11-1/4 inches (305 by 285 mm)]** <Insert dimensions>, width by height.
4. Material and Finish: Stainless steel, No. 4 finish (satin).

B. Specimen Pass-Through Box <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: With minimum **[12-inch- (305-mm-)]** <Insert dimension> diameter, turntable removable cylinder that revolves on stainless-steel, self-lubricating, ball-bearing plates, and with mechanism to prevent over rotation of cylinder.
3. Nominal Wall Opening: **[13-1/4 by 14 inches (335 by 355 mm)]** <Insert dimensions>, width by height.
4. Material and Finish: Stainless steel, No. 4 finish (satin).
5. Lockset: Tumbler type.

C. Bedpan and Urinal Cabinet <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: For storing one conventional-size bedpan and one urinal bottle; with door that produces **1/2-inch (13-mm)** opening at top and bottom of cabinet to allow air circulation.
3. Mounting: Recessed.
4. Nominal Wall Opening: **[13-1/2 by 26-1/2 by 5 inches (340 by 670 by 130 mm)]** <Insert dimensions>, width by height by depth.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

D. Bedpan and Urinal Rack <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: For storing one conventional-size bedpan and one urinal bottle.
3. Mounting: Surface mounted.
4. Size: **[12 by 27 inches (300 by 685 mm)]** <Insert dimensions>, width by height.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

2.6 WARM-AIR DRYERS

A. Warm-Air Dryer <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2. Description: Standard-speed, warm-air hand dryer.
3. Mounting: [**Recessed**] [**Semirecessed**] [**Surface mounted**][, with low-profile design].
4. Operation: [**Touch-button**] [**Electronic-sensor**] activated with timed power cut-off switch.
 - a. Operation Time: [**30 to 40**] [**80**] <Insert number(s)> seconds.
5. Cover Material and Finish: [**Steel, with white enamel finish**] [**Cast iron, with enamel finish in color selected by Architect**] [**Chrome-plated steel**] [**Stainless steel, No. 4 finish (satin)**] [**Molded plastic, gray**] [**Molded plastic, white**] <Insert material and finish>.
6. Electrical Requirements: [**115 V, 13 A, 1500 W**] [**115 V, 15 A, 1725 W**] [**115 V, 20 A, 2300 W**] [**208-240 V, 9-10 A, 1900-2300 W**] <Insert electrical requirements>.

B. High-Speed Warm-Air Dryer <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: High-speed, warm-air hand dryer for rapid hand drying.
3. Mounting: [**Recessed**] [**Semirecessed**] [**Surface mounted**][, with low-profile design].
4. Operation: Electronic-sensor activated with operation time of [**10 to 20**] <Insert number(s)> seconds.
5. Cover Material and Finish: [**Steel, with white enamel finish**] [**Cast iron, with enamel finish in color selected by Architect**] [**Chrome-plated steel**] [**Stainless steel, No. 4 finish (satin)**] [**Molded plastic, gray**] [**Molded plastic, white**] <Insert material and finish>.
6. Electrical Requirements: [**115 V, 13 A, 1500 W**] [**115 V, 15 A, 1725 W**] [**115 V, 20 A, 2300 W**] [**208-240 V, 9-10 A, 1900-2300 W**] <Insert electrical requirements>.

C. Multiple Airflow Warm-Air Dryer <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: Multiple airflow warm-air hand dryer, using two or more airstreams for rapid hand drying.
3. Mounting: [**Recessed**] [**Semirecessed**] [**Surface mounted**][, with low-profile design].
4. Operation: Electronic-sensor activated with operation time of [**10 to 20**] <Insert number(s)> seconds.
5. Cover Material and Finish: [**Steel, with white enamel finish**] [**Cast iron, with enamel finish in color selected by Architect**] [**Chrome-plated steel**] [**Stainless steel, No. 4 finish (satin)**] [**Molded plastic, gray**] [**Molded plastic, white**] <Insert material and finish>.
6. Electrical Requirements: [**115 V, 13 A, 1500 W**] [**115 V, 15 A, 1725 W**] [**115 V, 20 A, 2300 W**] [**208-240 V, 9-10 A, 1900-2300 W**] <Insert electrical requirements>.

2.7 CHILDCARE ACCESSORIES

A. Diaper-Changing Station <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: [**Horizontal**] [**Vertical**] unit that opens by folding down from stored position and with child-protection strap.

- a. Engineered to support minimum of **[250-lb (113-kg)]** <Insert value> static load when opened.
3. Mounting: **[Surface mounted, with unit projecting not more than 4 inches (100 mm) from wall when closed]** **[Semirecessed, with unit projecting not more than 1 inch (25 mm) from wall when closed]**.
4. Operation: By pneumatic shock-absorbing mechanism.
5. Material and Finish: **[HDPE in manufacturer's standard color]** **[HDPE with plastic-laminate insert in color selected by Architect]** **[Stainless steel, No. 4 finish (satin), with replaceable insulated polystyrene tray liner and rounded plastic corners]** **[Stainless steel, No. 4 finish (satin), exterior shell with rounded plastic corners; HDPE interior in manufacturer's standard color]** <Insert requirements>.
6. Liner Dispenser: Built in.

2.8 UNDERLAVATORY GUARDS

A. Underlavatory Guard <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.
3. Material and Finish: Antimicrobial, molded plastic, white.

2.9 CUSTODIAL ACCESSORIES

A. Utility Shelf <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: With exposed edges turned down not less than **1/2 inch (13 mm)** and supported by two triangular brackets welded to shelf underside.
3. Size: **[16 inches (406 mm) long by 6 inches (152 mm) deep]** <Insert dimensions>.
4. Material and Finish: Not less than nominal **0.05-inch- (1.3-mm-)** thick stainless steel, No. 4 finish (satin).

B. Mop and Broom Holder <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: **[Unit with shelf, hooks, holders, and rod suspended beneath shelf]** <Insert description>.
3. Length: **[36 inches (914 mm)]** <Insert dimension>.
4. Hooks: **[Four]** <Insert number>.
5. Mop/Broom Holders: **[Three]** <Insert number>, spring-loaded, rubber hat, cam type.
6. Material and Finish: Stainless steel, No. 4 finish (satin).
 - a. Shelf: Not less than nominal **0.05-inch- (1.3-mm-)** thick stainless steel.
 - b. Rod: Approximately **1/4-inch- (6-mm-)** diameter stainless steel.

C. Paper Towel (Folded) Dispenser <Insert drawing designation>:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Mounting: [**Recessed**] [**Semirecessed**] [**Surface mounted**].
3. Minimum Capacity: [**400 C-fold or 525 multifold towels**] [**600 C-fold or 800 multifold towels**] [**400 single-fold towels**] **<Insert capacity>**.
4. Material and Finish: [**Stainless steel, No. 4 finish (satin)**] [**ABS plastic, gray**] **<Insert material and finish>**.
5. Lockset: Tumbler type.
6. Refill Indicator: Pierced slots at sides or front.

D. Paper Towel (Roll) Dispenser **<Insert drawing designation>**:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: Lever-actuated mechanism permits controlled delivery of paper rolls in preset lengths per stroke.
3. Mounting: [**Recessed**] [**Semirecessed**] [**Surface mounted**].
4. Minimum Capacity: [**8-inch- (203-mm-) wide, 800-foot- (244-m-) long roll**] **<Insert capacity>**.
5. Material and Finish: [**Stainless steel, No. 4 finish (satin)**] [**ABS plastic, gray**] **<Insert material and finish>**.
6. Lockset: Tumbler type.

E. Liquid-Soap Dispenser **<Insert drawing designation>**:

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
2. Description: Designed for dispensing soap in [**liquid or lotion**] [**lather**] form.
3. Mounting: [**Deck mounted on vanity**] [**Deck mounted on lavatory**] [**Horizontally oriented, recessed**] [**Horizontally oriented, surface mounted**] [**Vertically oriented, surface mounted**].
4. Capacity: **<Insert oz. (mL)>**.
5. Materials: **<Insert requirements for valve and reservoir materials and finishes>**.
6. Lockset: Tumbler type.
7. Refill Indicator: Window type.

2.10 FABRICATION

- A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of [**six**] **<Insert number>** keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least **250 lbf (1112 N)**, when tested according to ASTM F 446.

END OF SECTION 102800

SECTION 221114

WATER TRANSMISSION LINES AND/OR PRESSURE SEWER LINES

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE:

- A. Trenching, Backfilling and Compacting: Section 312200.
- B. Water Valves: Section 221119.

1.2 SUBMITTALS:

- A. Conform to requirements of Section 013300 - Submittals. Manufacturer's Literature: Manufacturer's descriptive literature and recommended method of installation. Certificates: Manufacturer's certification that products meet specification requirements. Submit shop drawings showing design of pipe and fittings indicating alignment and grade, laying dimensions, fabrication, fitting, flange, and special details. Show station numbers for pipe and fittings corresponding to Drawings. Production of pipe and fittings prior to review by City Engineer is at Contractor's risk.

1.3 PRODUCT DELIVERY, STORAGE, AND HANDLING:

- A. Deliver materials on manufacturer's original skids or in original unopened protective packaging. OWNER reserves the right to reject material left from another job.
- B. Store materials to prevent physical damage.
- C. Protect materials during transportation and installation to avoid physical damage.

1.4 GENERAL DESCRIPTION OF WORK COVERED:

- A. Furnish and install all pipe, fittings, structures and accessories required for water transmission line and/or pressure sewer lines.

1.5 QUALITY ASSURANCE:

- A. Comply with the latest published edition of American Water Works Association (AWWA) Standards:
 - 1. AWWA C110 & C110a - Gray Iron and Ductile-Iron Fittings, 2 inch through 48 inch for water and other liquids.
 - 2. AWWA C111 - Rubber Gasket Joints for Cast Iron Pressure Pipe and Fittings.
 - 3. AWWA C150 - Thickness Design of Ductile-Iron Pipe.

4. AWWA C151 - Ductile-Iron Pipe, centrifugally cast in metal mold or sand lined molds, for water or other liquids.
 5. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe 4 inch through 12 inch for water.
 6. AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe 14 inch through 48 inch for water.
 7. AWWA C301-99 - Prestressed Concrete Pressure Pipe - Steel Cylinder Type, for water and other liquids.
- B. Comply with the latest published editions of the American Society for Testing and Materials (ASTM) Standards:
1. D 2241 - Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR).
 2. D 3139 - Joints for PVC Pressure Pipes using Flexible Elastomeric Seals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS:

- A. Pipe furnished may be either Polyvinyl Chloride (PVC), Steel Cylinder (SCP) or Ductile Iron (DI) as specified herein for water mains unless shown otherwise on the plans or bid documents.
- B. Use PVC pipe for all pressure sewer lines unless shown otherwise on the plans. Pressure sewer lines shall be color coded green.
- C. All pipe shall be marked in accordance with the applicable standard specification under which the pipe is manufactured unless otherwise specified and shall be National Sanitation Foundation (NSF) approved stamped.
- D. Steel cylinder pipe manufactured shall have had a successful experience record in the design and manufacture of steel cylinder pipe with substantial footage in successful operation for at least five years.
- E. The quality of materials, the process of manufacture, and the finished pipe shall be subject to inspection and approval by the Engineer at the pipe manufacturing plant and at the project site prior to and during installation. All water distribution pipe and fittings shall be listed in the Fire Protection Equipment Directory published by the Underwriter's Laboratories, Inc. or shall be Factory Mutual approved for fire service.

2.2 POLYVINYL CHLORIDE PIPE (PVC):

- A. Waterlines 12" and less may be constructed of PVC water pipe, pressure pipe, in accordance with AWWA standard C900 (latest version) for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4-inches through 12-inches, for Water Distribution. All pipe should be designed and installed with a minimum of four foot cover.
- B. Waterlines 14 inches through 48 inches may be constructed of PVC water pipe, pressure pipe, in

accordance with AWWA standard C905 (latest version) for PVC Water Transmission Pipe and Fabricated Fittings. All pipe should be designed and installed with a minimum of four foot cover.

- C. Provide push-on joints with bell integrally cast into pipe or with coupling of same material as pipe.
- D. Use elastomeric gaskets, as provided in AWWA C900 or ASTM D3139.
- E. Provide either cast-iron or PVC 1120 fittings as indicated or required. Use long radius fittings where possible.
- F. Provide fittings with materials and pressure class equal to or greater than that specified for pipe.
- G. Provide sleeve type or anchored coupling where indicated or required to join pipe or provide restraint to offset internal or hydrostatic test pressures.
- H. Provide pipe marked to indicate the following:
 - 1. Nominal Pipe Size.
 - 2. Material Code Designation.
 - 3. Standard Dimension Ratio.
 - 4. Pressure Rating.
 - 5. Manufacturer's name or trademark.
 - 6. National Sanitation Foundation Seal.
 - 7. Appropriate ASTM designation number.

2.3 STEEL CYLINDER PIPE (SCP):

- A. Provide pipe with a minimum working pressure of 200 psi or as shown on the plans or in the specifications.

2.4 DUCTILE IRON PIPE (DIP):

- A. Pipelines ranging in size from 12 inches through 36 inches in diameter shall comply with the latest published edition of AWWA as modified herein:
 - 1. AWWA C104/A21.4-95 - ANSI Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
 - 2. AWWA C105/A21.5-93 - ANSI Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems
 - 3. AWWA C110-98 - ANSI Standard for Ductile-Iron and Gray-Iron Fittings, 3-inches through 48-inches (76 mm through 1,219 mm), for Water and Other Liquids

4. AWWA C111/A21.11-95 - ANSI Standard for Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
 5. AWWA C115/A21.15-94 - ANSI Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
 6. AWWA C150/A21.50-96 - ANSI Standard Thickness Design of Ductile-Iron Pipe
 7. AWWA C151/A.21.51-96 - ANSI Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
 8. ANSI B 16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
 9. ASTM D 1248 - Polyethylene Plastics Molding and Extrusion Materials.
 10. ASTM G 62 - Test Methods for Holiday Detection in Pipeline Coatings.
 11. AWWA C 600 - Standard for Installation of Ductile Iron Water Mains and Their Appurtenances.
 12. SSPC-SP 6 - Steel Structures Painting Council, Commercial Blast Cleaning.
 13. Ductile-iron push-on and mechanical joint pipe shall meet all requirements of standard AWWA C151.
- B. Joint Types include ANSI A21.11 push-on; ANSI A21.11 mechanical joint; or ANSI A21.15 flanged end. Provide push-on joints unless otherwise indicated on the Drawings or required by these specifications. For bolted joints, bolts shall conform to requirements of AWWA C111. Threaded- or grooved-type joints which reduce pipe wall thickness below minimum required are not acceptable.
- C. Provide manufacturer's certifications that all ductile iron pipe and fittings meet provisions of this Section and have been hydrostatically tested at factory and meet requirements of ANSI A21.51.
- D. Provide certifications that all pipe joints have been tested and meet requirements of ANSI A21.11.
- E. Ductile-iron flanged pipe shall meet all requirements of standard AWWA C115. Barrels shall have a nominal thickness required by Table 1 of AWWA C115, which thickness corresponds to Special Class 53 in sizes through 54-inch, and Class 350 in 60 and 64 inch sizes. Flanges shall be ductile-iron (gray-iron is not acceptable) they shall be Class 125 flanges as shown in ANSI/ASME B16.1; and shall conform to dimensions shown in Table 2 and Figure 1 of AWWA C115. Flanges shall be fabricated and attached to the pipe barrels by U.S. fabricators using flanges and pipe barrels of U.S. manufacture. If fabrication is to be by other than the pipe barrel manufacturer, a complete product submittal and approval by the Water and Wastewater Utility will be required. Additionally, such fabricator shall furnish certification that each fabricated joint has been satisfactorily tested hydrostatically at a minimum pressure of 300 psi.
- F. Where ductile iron water main is cathodically protected from corrosion, bond rubber gasketed joints as shown on Drawings to provide electrical continuity along entire pipeline, except where

insulating flanges are required by Drawings. Do not use polyethylene wrap with a cathodic protection system.

G. Where restrained joints for buried service are required by Drawings, provide one of the following, or equal:

1. Super-Lock Joint by Clow Corporation.
2. Flex-Ring or Lok-Ring by American Cast Iron Pipe Company.
3. TR-Flex Joint by U.S. Pipe and Foundry Company.
4. Provide for restrained joints designed to meet test pressures required under Part 3.04 of this section.

H. Linings and Coating: Interior surfaces of all ductile-iron water pipe shall be cement-mortar lined and seal coated as required by AWWA C104. Pipe exteriors shall be coated as required by the applicable pipe specification. The type and brand of interior lining shall be clearly marked on the outside of the pipe and fittings. Except as authorized by the E/A, only one type and brand of pipe lining shall be used on a given project.

I. Exterior: Prime coat and outside asphaltic coating conforming to ANSI A 21.10, ANSI A 21.15, or ANSI A 21.51 for pipe and fittings in open cut excavation and in casings. Pipe to be installed in potentially contaminated areas shall have coatings and linings recommended by the manufacturer as resistant to the contaminants identified.

J. Except as described above for flanged pipe (Thickness Class 53) and where not otherwise indicated, ductile-iron pipe shall be minimum Pressure Class 250 as defined by ANSI/AWWA C150/A21.50-current; all ductile-iron pipe and flanges shall meet the following minimum physical requirements:

Grade 60-42-10:

Minimum tensile strength: 60,000 psi (414 MPa)

Minimum yield strength: 42,000 psi (290 MPa)

Minimum elongation: 10 percent

K. The flanges for AWWA C115 pipe may also be made from:

Grade 70-50-05:

Minimum tensile strength: 70,000 psi (483 MPa)

Minimum yield strength: 50,000 psi (345 MPa)

Minimum elongation: 5 percent

L. Joint Materials:

Gaskets for mechanical joints shall conform to ANSI/AWWA A21.11/C-111.

Furnish, when no contaminant is identified, plain rubber (SBR) gasket material; for flanged joints 1/8-inch-thick gasket in accordance with ANSI A 21.15.

Pipes to be installed in potentially contaminated areas, especially where free product is found near the elevation of the proposed pipeline, shall have the following gasket materials for the noted contaminants:

Contaminant	Gasket Material Required
Petroleum (diesel, gasoline)	Nitrile Rubber
Other contaminants	As recommended by the pipe manufacture

Joining of slip joint iron pipe shall, without exception, be accomplished with the natural or synthetic rubber gaskets of the manufacturer of that particular pipe being used. A joint lubricant shall be used and applicable recommendations of the manufacturer shall be followed.

Gaskets for flanged joints shall be continuous full face gaskets, of 1/8 inch minimum thickness of natural or synthetic rubber, cloth reinforced rubber or neoprene material, preferably of deformed cross section design and shall meet all applicable requirements of ANSI/AWWA A21.11/C-111 for gaskets. They shall be manufactured by, or satisfy all recommendations of, the manufacturer of the pipe/fittings being used and be fabricated for use with Class 125 ANSI B16.1 flanges.

Tee-head bolts, nuts, and washers for mechanical joints shall be high strength, low alloy, corrosion resistant steel stock equal to "COR-TEN A" having UNC Class 2 rolled threads or alloyed ductile-iron conforming to ASTM A 536; either shall be fabricated in accordance with ASTM B18.2 with UNC Class 2 rolled threads.

Hex-head bolts and nuts shall satisfy the chemical and mechanical requirements of ASTM A449

SAE Grade 5 plain, and shall be fabricated in accordance with ASTM B 18.2 with UNC Class 2 rolled threads.

Either Tee-head or Hex-head bolts, nuts, and washers as required, shall be protected with bonded fluoropolymer corrosion resistant coating where specifically required by the E/A.

All threaded fasteners shall be marked with a readily visible symbol cast, forged or stamped on each nut and bolt, which will identify the fastener material and grade. The producer and the supplier shall provide adequate literature to facilitate such identification; painted markings are not acceptable and the number of degrees for bends. Painted markings are not acceptable.

Use fittings of same size as pipe. Reducers are not permitted to facilitate an off-size fitting. Reducing bushings are also prohibited. Make reductions in piping size by reducing fittings. Line

and coat fittings as specified for pipe they serve.

Push-on Fittings: ANSI A 21.10; ductile iron ANSI A 21.11 joints, gaskets, and lubricants; pressure rated at 250 psig.

Flanged Fittings: ANSI A 21.10; ANSI B 16.1 cast or ductile iron. Flanges: ANSI B 16.1, Class 125; pressure rated at 250 psig.

Mechanical Joint Fittings: ANSI A 21.11 (AWWA C110); pressure rated at 250 psi.

2.5 DUCTILE IRON PIPE FITTINGS:

- A. Fittings shall be push-on, flanged, or mechanical joint as indicated or approved, with pressure rating of not less than that specified for adjacent pipe and shall meet all requirements of standards as follows:
 - 1. Sizes 4-inch and larger: AWWA C110
 - 2. Shall be compatible with joint type of adjacent pipe.
 - 3. All specials, taps, plugs, flanges and wall fittings shall be as required.
 - 4. Interior surfaces of all iron water pipe fittings shall be lined with cement-mortar and seal coated as required by AWWA C104. Interior surfaces of all iron wastewater and force main fittings shall be coated with a non-corrosive lining material acceptable to Owner. See Section 02570-3, 2.04.
 - 5. Fitting exteriors shall be coated as required by the applicable pipe specifications.

2.6 VALVES, HYDRANTS, METERS AND APPURTENANCES:

- A. For valve requirements refer to Section 22 11 19 (Water Valves).
- B. Valve Boxes:
 - 1. Provide for all buried valves.
 - 2. Use nominal 6 inch cast-iron sliding type pipe shaft with cover and base casting.
 - 3. Set box top at finished grade.
 - 4. Furnish drop cover appropriately marked "WATER".
- C. Corporation Stops:
 - 1. Conform with AWWA C800.
 - 2. Use 3/4 inch unless indicated otherwise.

D. Hydrants:

1. Design: latest edition of AWWA C502, traffic model with break flange.
2. Mueller Centurion - A423
 - a. American-Darling - B-84-B
 - b. Kennedy Guardian - K-81A
 - c. U.S. Pipe - Metropolitan
 - d. Others as approved by OWNER in writing
3. Provide 6 inch inlet, 2 - 2½ inch hose nozzles, 1 - 4½ inch pumper.
4. Provide compression type main valve, minimum size 5 inches.
5. Pentagon operating nut.
6. Design to open counterclockwise.
7. Provide mechanical joint bell on footpiece.
8. Furnish depth as noted on plans.
9. Furnish National (American) Standard Fire Hose Coupling Screw Thread (NH).

E. Polyethylene Wrapping:

1. Material: AWWA C105.
2. Thickness: 8 mils.

F. Polyethylene Plastic Pipe (PE):

1. Material: ASTM D2737.
2. Fittings: ASTM D2683.
3. Size: ¾ inch unless shown otherwise on plans.

G. Copper Pipe (CU):

1. Material: seamless, Type K, ASTM B88.
2. Fittings: wrought copper solder joint or flared.
3. Size: ¾ inch unless shown otherwise on plans.

PART 3 - EXECUTION

3.1 GENERAL:

- A. Provide all labor, equipment and materials and install all pipe fittings, special and appurtenances as indicated or specified.

3.2 PIPE INSTALLATION:

A. Handling:

1. Handle in a manner to insure installation in sound and undamaged condition.
 - a. Do not drop or bump.
 - b. Use slings, lifting lugs, hooks and other devices designed to protect pipe, joint elements, and coatings.
2. Ship, move and store with provisions to prevent movement or shock contact with adjacent units.
3. Handle with equipment capable of work with adequate factor of safety against overturning or other unsafe procedures.

B. Installation:

1. Utilize equipment, methods, and materials insuring installation to lines and grades as indicated.
 - a. Do not lay on blocks unless pipe is to receive total concrete encasement.

C. Accomplish horizontal and vertical curve alignments of ductile iron pipe with bends, bevels or deflection joints.

1. Limit joint deflection with ductile iron pipe to conform with AWWA C600.
2. Use short specials preceding curves as required.
3. Obtain approval of ENGINEER of method proposed or transfer of line and grade from control to the work.
4. Install pipe of size, material, strength class, and joint type with embedment as shown on plans or specified herein.
5. Clean interior of all pipe, fittings, and joints prior to installation. Exclude entrance of foreign matter during discontinuance of installation.
 - a. Close open ends of pipe with snug fitting closures.

- b. Do not let water fill trench. Include provisions to prevent flotation should water control measures prove inadequate.
 - c. Remove water, sand, mud and other undesirable materials from trench before removal of end cap.
- 6. Pipe shall be inspected prior to installation to determine if any pipe defects are present.
- 7. Brace or anchor as required to prevent displacement after establishing final position.
- 8. Perform only when weather and trench conditions are suitable.
 - a. Do not lay in water.
- 9. Observe extra precaution when hazardous atmospheres might be encountered.
- 10. Sanitary sewer relation to water mains:
 - a. Maintain 9 feet horizontal separation whenever possible.
 - b. When conditions prevent a lateral separation of 9 feet, sewer may be installed closer to a water main if:
 - (1) sewer constructed of PVC pipe meeting AWWA Specifications and having a minimum working pressure rating of 150 psi or greater and equipped with pressure type joints, and
 - (2) the sewer line and water main are separated by a minimum vertical distance of 2 feet and a minimum horizontal distance of 4 feet, measured between the nearest outside diameters of the pipes.
 - c. When a sanitary sewer crosses a water line and that portion of the sewer is constructed as described in 3.02 B.9.b.(1), the sewer may be placed no closer than 6 inches from the water line. The separation distance must be measured between the nearest outside pipe diameters. The sewer line shall be located at a lower elevation than the water line whenever possible and one length of the sewer pipe must be centered on the water line.
- 11. Separation of water mains from sewer manholes:
 - a. No water pipe shall pass through or come in contact with any part of a sewer manhole.
 - b. A minimum horizontal separation of 9 feet shall be maintained.
- 12. Construct service lines where shown on plans in accordance with Standard Detail Drawing. Use pipe material specified on plans or in contract documents.

13. Wrap pipe, fittings and tie rods with polyethylene where shown on plans in accordance with AWWA C105.

D. Jointing:

1. General requirements:

- a. Locate joint to provide for differential movement at changes in type of pipe embedment, at changes from rock to soil trench bottom, and structures.
 - (1) Not more than 18 inches from structure wall, or
 - (2) Support pipe from wall to first joint with concrete cradle structurally continuous with base slab or footing of structure.
- b. Perform in accordance with manufacturer's recommendations.
- c. Clean and lubricate all joint and gasket surfaces with lubricant recommended.
- d. Utilize methods and equipment capable of fully homing or making up joints without damage.
- e. Check joint opening and deflection for specification limits.

2. Special provisions for jointing cast-iron and ductile iron:

- a. Conform to AWWA C600.
- b. Visually examine while suspended and before lowering into trench.
 - (1) Paint bell, spigot, or other suspected portions with turpentine and dust with cement to check for cracks invisible to the eye.
 - (2) Remove turpentine and cement by washing when test is satisfactorily completed.
 - (3) Reject all defective pipe.

3. Special provisions for jointing and laying PVC pipe:

- a. Conform to AWWA C600 and ASTM D2321.
- b. Allow pipe to reach trench soil temperature prior to installation in ditch.

4. Special provisions for jointing steel cylinder pipe:

- a. Before laying each joint, the bell and spigot rings shall be cleaned by wire brush and wiped clean and dry.
- b. Inside cement mortar joint:

- (1) the inside joint recess shall be filled immediately prior to placing the pipe together by buttering the bell end with mortar.
- (2) the joint mortar of pipe 18 inch diameter and smaller shall be smoothed and cleaned with a swab.
- (3) the joint mortar of pipe diameters larger than 18 inches shall be finished off smooth by hand trowel.

c. Outside cement mortar joint:

- (1) encircle joint with wrapper after joint found satisfactory.
- (2) leave enough space between wrapper ends to allow cement mortar to be poured.
- (3) the entire joint shall be poured with cement mortar and consolidated and rodded or agitated to eliminate voids.

E. Cutting:

1. Cut in neat workmanlike manner without damage to pipe.
2. Cut cast-iron with Carborundum saw or other approved method.
 - a. Smooth cut by power grinding to remove burrs and sharp edges.
 - b. Repair lining as required and approved by ENGINEER.

F. Closure Pieces:

1. Connect two segments of pipelines or a pipeline segment and existing structure with short sections of pipe fabricated for the purpose.
2. Observe specifications regarding location of joints, type of joints and pipe materials and strength classifications.
3. May be accomplished with sleeve coupling for water pipe:
 - a. Of length such that gaskets are not less than 3 inches from pipe ends.
 - b. Include spacer ring identical to pipe end such that clear space does not exceed 1/4 inch.

G. Temporary Plugs:

1. Install whenever installed pipe is left unattended.
2. Use water-tight plug.

H. Thrust Blocks:

1. Provide for all horizontal or vertical turns utilizing fittings.
2. Use on all dead-end and tee fittings.
3. Install as indicated on Standard Detail Drawing
4. Construct to undisturbed edge of trench for bearing.
5. Provide minimum bearing area in S.F. as follows based on 150 psi test pressure and 2000 psf soil bearing:

Pipe Size	Tee / Deadends	11<0 Bend	22>0 Bend	45° Bend	90° Bend
4"	1.0	0.5	0.5	0.8	1.3
6"	2.2	0.5	0.9	1.6	3.0
8"	3.8	0.8	1.5	2.9	5.3
10"	6.0	1.2	2.3	4.5	8.4
12"	8.5	1.7	3.3	6.5	12.1
14"	11.6	2.3	4.5	8.9	16.4
16"	15.2	3.0	5.9	11.6	21.4

3.3 VALVE AND APPURTENANCE INSTALLATION:

A. Valves:

1. Install with stems vertical when installation is horizontal.
2. Set valves on concrete thrust block having four (4) square feet of bearing area on undisturbed earth.

B. Valve Boxes:

1. Center on valves.
2. Carefully tamp earth around each valve box to a distance of 4 feet on all sides of box or to undisturbed trench face, if less than 4 feet.

C. Hydrants:

1. Set hydrants where shown on plans in accordance with Standard Detail Drawing.

2. Install gravel, blocks and anchors in accordance with Standard Detail Drawing.
3. Set reference elevation 3 inches above existing grade or to elevation established by ENGINEER (not to exceed 6 inches).
4. Break-a-way flange to be either ground level where applicable or between 3 inches and 6 inches above curb as established by ENGINEER.

3.4 ACCEPTANCE TESTS FOR PRESSURE MAINS:

- A. All testing must meet or exceed Texas Commission on Environmental Quality's current requirements.
- B. Perform hydrostatic pressure and leakage test.
 1. Conform to AWWA C600 procedures.
 - a. As modified herein.
 - b. Shall apply to all pipe materials specified.
 2. Perform after backfilling.
- C. Test separately in segments between sectionalizing valves, between a sectionalizing valve and a test plug, or between test plugs.
 1. CONTRACTOR to furnish and install test plugs, including all anchors, braces and other temporary or permanent devices to withstand hydrostatic pressure on plugs, at no additional cost to the OWNER.
 2. CONTRACTOR responsible for any damage to public or private property caused by failure of plugs.
- D. Limit fill rate of line to available venting capacity. Fill rate shall be regulated to limit velocity in lines when flowing full to not more than 1 fps.
- E. OWNER will make water for testing available to contractor at nearest source. Valves of existing system will at all times be operated by City personnel only.
- F. Pressure test:
 1. Conduct at pressure at least 1.5 times than normal working pressure (not less than 150 psi test pressure).
 2. Maintain pressure for a minimum of two (2) hours.
 3. Test pressure shall not vary by more than +5 psi
- G. Leakage Test:

1. Conduct concurrently with the pressure test.
2. Maintain pressure for a minimum of two (2) hours.
3. Acceptable when leakage does not exceed that determined by the following formula:

$$L = \frac{ND(P)^{1/2}}{7400}$$

L = Maximum permissible leakage in gallons per hour.

N = Number of pipe joints in segment under test.

O = Nominal internal diameter of pipe being tested in inches.

P = Average actual leakage test pressure, psig.

4. Repeat leakage test as necessary.
 - a. After location of leaks and repair or replacement of defective joints, pipe or fittings. Until satisfactory performance of test is at no increase in cost to the OWNER.

H. Refit and replace all pipe not meeting the leakage or pressure requirements. Repair clamp is not permitted.

I. Repair all visible leaks regardless of the amount of leakage.

J. OWNER or ENGINEER will observe all tests.

3.5 DISINFECTION OF PIPELINES FOR CONVEYING POTABLE WATER:

A. CONTRACTOR provide all equipment and materials and perform in accordance with AWWA C601.

1. As modified herein.
2. Include chlorination and final flushing.

B. Add chlorine to attain an initial concentration of 50 mg/l chlorine with 10 mg/l remaining after 24 hours.

C. Flush main until concentration is 2 mg/l or less prior to placing main in service.

D. Obtain approval of materials and methods proposed for use.

E. May be conducted in conjunction with acceptance tests.

F. Dispose of flushing water without damage to public or private property.

G. Repeat disinfection procedure should initial treatment fail to yield satisfactory results.

1. At no additional cost to the OWNER.
 2. OWNER will provide water under terms specified for acceptance tests.
- H. Do not exceed 500 gpm rate in flushing.
- I. Provide safe bacterial sample results before placing main into service.

END OF SECTION 221114

SECTION 221119

WATER VALVES

PART 1 - GENERAL

1.1 GENERAL DESCRIPTION OF WORK

- A. This work shall consist of furnishing and installing valves as indicated on the plans or as directed by the ENGINEER in accordance with these specifications.
- B. Unless otherwise noted, all valves 4 inches and larger shall be AWWA-type valves of suitable design and fully equipped for service buried in the earth, without need for further modification and shall be wrapped with 8 mil polyethylene film with all edges and laps securely taped to provide a continuous wrap.
- C. Valve ends on Valves 4 inches and larger shall be flanged or mechanical joint. All mechanical joints shall conform to AWWA Specification C111. Flanges shall be dimensioned, faced, and drilled to the 125 pound "American Standard".
- D. Valves shall be carefully installed in their respective positions, accessible for operation and repair. Unless shown on the plans otherwise, valves shall be of the same sizes as the pipelines in which they are installed. Stems shall be installed pointing straight upward. The operating nuts of all valves or valve stem extensions shall be no deeper than 18 inches below the top of the valve box cover. Valves shall be left in satisfactory operating condition, free from all distortion and strain.
- E. All valve operators shall turn in a counterclockwise direction to open the valve.

1.2 SUBMITTALS:

- A. Conform to requirements of Section 013300 - Submittals.
- B. Manufacturer's Literature: Manufacturer's descriptive literature and recommended method of installation.
- C. Certificates: Manufacturer's certification that products meet specification requirements.

PART 2 - PRODUCTS

2.1 VALVE TYPES

- A. Gate Valves
 - 1. Gate valves shall only be used for pipe sizes of 12 inches and smaller, unless otherwise noted on the plans.
 - 2. Resilient seat gate valve shall be used and shall conform to AWWA C 509. The gate valve shall be a non-rising stem type with inside screw and "O" ring seals. The valve shall

have a standard hub equipped with a square operating nut. The body-to-bonnet and bonnet-to-bonnet cover shall use 'O' rings as seals.

3. The resilient seat shall be mechanically retained or bonded on the valve gate (\wedge disc).
4. The gate valve shall have protective coating inside and outside of fusion bonded epoxy approved for potable water.
5. The valve stem shall comply with AWWA C 509. The material for the valve stem shall be brass or bronze, and shall have minimum yield strength of 20,000 psi and minimum tensile strength of 60,000 psi. The valve stem shall be compatible and interchangeable with the equivalent sized double disc gate valve models.
6. Gate valves shall have a 2 inch square operating hub nut.
7. The number of turns to open the valve shall be the same or less than the equivalent sized double disc gate valve models. Maximum input torque to open and/or close the valve shall be 200 foot pounds for a 4 inch valve and 300 foot pound for a 6 inch under a working pressure of 200 psi.
8. Before the Work will be accepted, the CONTRACTOR shall provide the ENGINEER with a completed "Water Valve Data Card".
9. Gate valves shall be American Darling, Metroseal by U.S. Pipe, Mueller, or approved equal.

B. Rubber seated Butterfly Valves

1. Butterfly valves will be used in lieu of gate valves for sizes of 14 inches and larger, the butterfly valve shall be of the rubber-seated tight closing type conforming to AWWA C504.
2. The valve body shall be cast iron having integral hubs for the housing shaft bearings and seals. The body ends shall be flanged per AWWA C504 with the flanges designed for installation between Class 125 cast iron flanges or mechanical joint meeting the requirements of AWWA C111.
3. The butterfly valve disc shall be cast iron.
4. The seat shall be resilient new natural or synthetic rubber and shall be mechanically retained on the disc edge by means of 18-8 stainless steel bolts. Seat must also be capable of being replaced in the field without chipping, grinding, or burning out of the old seat or retaining substance. The body seat mating surface shall be 18-8 stainless steel, type 304 mechanically retained.
5. Valve shafts shall be 18-8 stainless steel, type 304 and shall be securely attached to the disc by means of bolts, dowel pins, or taper pins.
6. All butterfly valves shall be side operated. Valve actuator shall be integrally mounted on the valve mounting flange and shall be of the self locking traveling nut type in complete accordance with AWWA C504 requirements. Actuators shall be furnished with a standard 2 inch operating nut and must be designed to permit the adjustment of the valve disc seating without the removal of the housing cover.
7. All butterfly valves shall be tested per AWWA C504
8. Before the work will be accepted, the CONTRACTOR shall provide the ENGINEER with a completed "Water Valve Data Card".

C. Valve Stem Extensions

1. Extension stems shall be provided as necessary to situate the operating nut no greater than 18 inches below the valve cover.
2. Extension stems shall be equipped with stem guides affixed to the valve box at intervals not to exceed ten feet.
3. Stem guides shall be considered a part of the extension. Extension stems and stem guides shall be manufactured items or approved equal.

D. Air and Vacuum Valves

1. Air and vacuum valves shall be of the type that automatically exhaust large quantities of air during the filling of a pipeline and allow air to re-enter enduring draining or when a negative pressure occurs.
2. The inlet and outlet of the valve shall have the same cross-sectional area. The floats shall be guided by a stainless steel guide shaft and seat against a synthetic seat.
3. Valves shall have NPT inlets and outlets.
4. All air and vacuum valves shall be constructed of cast iron with stainless steel trim and buna-n seating. Valves shall be as manufactured by Val-Matic Valve & Mfg. Corp., Series 100.

E. Fire Hydrants

1. Fire hydrants and their extensions shall be in accordance with AWWA C 502, traffic type.
2. Fire hydrants shall have one 5 1/4 inch diameter valve opening; 6 inch mechanical joint of slip on inlet connection; two 2 1/2 inch hose nozzle connections; and one 4 1/2 inch steamer nozzle with National Standard Fire Hose Coupling Screw Threads or as specified by the OWNER.
3. Fire hydrants shall have a bronze or cast iron, pentagon, operating nut, be designed for 150 psi., working pressure service, and have a normal bury of 4 to 4 1/2 feet unless field conditions require a deeper bury, in which case extensions will be used so as to bring the bottom of the break-off flange 2 to 8 inches above the top of finish grade.
4. The pipe fittings and fire hydrants starting at the street main and ending at the fire hydrant itself shall be lying in a line perpendicular to the street's centerline or radially on a curvilinear installation.
5. Fire hydrants shall be installed in as near a vertical position as possible and shall have no more than 1/2 inch variation from a vertical line between the breakaway flange and the top of the fire hydrant.
6. Hydrants shall be dry barrel, post-type with compression main valve closing with pressure. They shall have a field lubrication capability. Hydrants shall have a bronze seat ring threaded into a bronze drain ring or bronze or cast iron bushing.
7. Hydrant interior and exterior below the ground line shall be coated with asphalt varnish, and the exterior painted from the top to a point one foot below the ground level flange, consisting of one coat rust inhibitive primer.
8. The bottom plate of the main valve shall be epoxy coated. The shoe of the fire hydrant shall have a 6 inch mechanical joint connection. The inside shall be epoxy coated to prevent corrosion.
9. The nozzle shall be threaded in place and retained by stainless steel locks.
10. Hydrant body shall be threaded to receive the threaded nozzle. Nozzle shall be secured by a stainless steel locking device.

11. Fire hydrant shall contain two drain outlets. The drain outlets shall be constructed of bronze. Hydrant shall be provided with a pentagon operating nut to open counter clockwise and shall have an anti-friction washer between the hold-down nut and the operating nut.
12. Fire hydrant shall be installed at locations as shown on construction plans and in accordance with Standard Detail Drawings.
13. No project will be accepted by the OWNER until all hydrants are operational, accessible and have been tested by the Harlingen Fire Department.
14. Before the work will be accepted, the CONTRACTOR shall provide the ENGINEER with a completed "Fire Hydrant Data Card".
15. Hydrants shall be limited the following unless prior written approval is provided by the ENGINEER:
 - a. Mueller Centurion A-423
 - b. American Darling B-84-B
 - c. Kennedy Guardian K-81A
 - d. U.S. Pipe Metropolitan

F. Valve Boxes

1. Valve boxes, rings and covers shall be the type, size and materials shown in Standard Detail drawings.
2. No valve box shall be paved over without the permission of the ENGINEER. Paving material shall not remain on valve box covers overnight.
3. Valve boxes shall be fabricated using 6 inch cast-iron sliding type pipe shaft with cover and base casting.
4. Drop covers for valve boxes shall be marked "water" using lettering casted in the cover by the manufacturer.
5. Top of valve box shall be set at finished grade unless otherwise noted.

2.2 WATER VALVE DATA CARD

- A. Water Valve Data Card shall be prepared for all types of valves (Gate Valves, Butterfly Valves, Air Release Valves, etc) according to the following instructions:

1. The Valve Number will be assigned by the OWNER at a later date.
2. Valve Size is the nominal diameter of the valve, i.e., 6 inch, 14 inch, or 48 inch. In the case of compound valves give size of main valve and by-pass valve, i.e., 24 inch and 4 inch, or 36 inch and 6 inch.
3. Valve Type is the general description of the valve, such as: Vertical Gate Valve, Horizontal Gate Valve, Vertical Gate Valve with by-pass, Horizontal Gate Valve with by-pass, Butterfly Valve, Globe Valve, Check Valve, etc.
4. Make and Model refers to the manufacturer, make and model number to identify the valve for replacement parts, such as Mueller No. A-2308-6. This information should be available from the shop drawings.
5. Number of Turns and Direction to Open is the number of revolutions for the operating nut to make the valve travel from fully closed to fully open, and the direction is either clockwise or counter-clockwise, i.e., 54 turns counter-clockwise. All standard valves shall open counter-clockwise. Operation, turn count, and direction to open will be verified by

the ENGINEER prior to installation.

6. Under Project Name is the assigned work order number or name shown on plans.
7. Date Warranty expires is the expiration date, under the contract, for requiring warranty repairs.

END OF SECTION 221119

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SECTION 221300

SANITARY SEWERS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

- A. Trenching, Backfilling and Compacting: Section 312200.
- B. Water Transmission Lines and/or Pressure Sewers: Section 221114.

1.2 SUBMITTAL

- A. Conform to requirements of Section 013300 - Submittals.
- B. Submit manufacturer's certification that products meet specification requirements.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver materials on manufacturer's original skids or in original unopened protective packaging. Owner reserves the right to reject material left from another job.
- B. Store materials to prevent physical damage.
- C. Protect materials during transportation and installation to avoid physical damage.

1.4 GENERAL DESCRIPTION OF WORK COVERED

- A. Furnish and install all sewer pipe, fittings and structures, and accessories required for sanitary sewer construction as indicated.

1.5 QUALITY ASSURANCE

- A. Comply with latest published editions of American Society of Testing and Materials (ASTM) Standards:
 - 1. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
 - 2. ASTM D3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
 - 3. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
 - 4. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
 - 5. ASTM F794 - Poly (Vinyl Chloride) (PVC) Ribbed Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
 - 6. ASTM F679 - Standard Specification for Poly (Vinyl Chloride) (PVC) Large Diameter

- Plastic Gravity Sewer Pipe and Fittings (SDR35).
7. ASTM F949 - Standard Specification for Poly (Vinyl Chloride) (PVC) Ribbed Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
 8. ANSI A21.11 - Rubber Gasket Joints for Cast Iron and Ductile- Iron Pressure Pipe and Fittings.
 9. ASTM D3753 - Standard Specification for Glass Fiber Reinforced Polyester Manholes.
 10. ASTM C-923 - Standard Specification for Resilient Manhole Connectors.
 11. ASTM C-478 - Specification for Pre-cast Reinforced Concrete Manhole Sections.
 12. ASTM C-443 - Specification for Joints for Circular Concrete Sewer and Culvert pipe using Rubber Gaskets.
 13. ASTM C-1244 - Specification for Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test.
 14. AWWA C-151 - Specification for Ductile Iron Pipe and Fittings.
 15. ASTM D-1248 - Standard specification for Polyethylene Plastics Molding and Extrusion Materials.
 16. AWWA C-105 - Polyethylene Encasement for Gray and Ductile Cast -Iron Piping for Water and Other Liquids.
 17. AWWA C-110 - Gray Iron And Ductile Iron Fittings 3-inch through 48-inch, for Water and Other Liquids.
 18. ASTM D-3350 - Specification for Polyethylene Plastic Pipe and Fittings Materials.
 19. ASTM F-714 - Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter (3-inch IPS and larger).
 20. ASTM D-3261 - Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Pipe and Tubing.
 21. ASTM D-1784 - Rigid Poly (Vinyl Chloride) (PVC) Compounds, and Chlorinated Poly (Vinyl Chloride) (CPVC) Compound.
 22. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe 4-inch through 12-inch for water distribution.
 23. AWWA C905 - Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameter 14-inch through 36-inch.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Pipe furnished may be any one of materials specified herein for sanitary sewer construction unless shown otherwise on plans or bid forms.
- B. All pipe shall be marked in accordance with applicable standard specification under which pipe is manufactured unless otherwise specified.

2.2 POLYETHYLENE PIPE AND FITTINGS (PE)

- A. Comply with ASTM D 3350 and ASTM F-714 for polyethylene (PE) solid wall pipe and fittings for use in pressure sanitary sewers. Wall thickness shall be as shown on the plans.
- B. Fittings shall comply with the performance requirements of ASTM D 2683 or ASTM D 3261 for molded or fabricated fittings of the size and pressure class as required.

- C. Provide pipe and fittings with minimum performance requirements of ASTM D 1248, Type III Class C, Category 5, Grade P34 and ASTM D 3350 as indicated in this specification and as shown in the plans and details.

2.3 POLYVINYL CHLORIDE PLASTIC PIPE (PVC)

- A. Comply with ASTM D3033, D3034, ASTM F679, CT-1 walls, or ASTM F-794 for pipe using material conforming to ASTM D1784 for pipe and fittings.
 - 1. Sewers 6-inches to 10-inches shall conform to ASTM D3034.
 - 2. Sewers 12-inches to 30-inches shall conform to ASTM D3034, ASTM F-679 (T-1 wall), or ASTM F-794 for pipe using material conforming to ASTM D1784 for pipe and fitting.
 - 3. Sewers 36-inches and larger shall conform to ASTM F-949, ASTM D3034, ASTM F-679 or ASTM F-794 for pipe using material conforming to ASTM D1784 for pipe and fitting.
- B. Use single elastomeric gasket push-on joints complying with ASTM D3212.
- C. Provide pipe and fittings with minimum performance capabilities of SDR-35 dimension ratio for gravity sewers of less than 10-feet in depth or cover. Where directed by the Engineer and as indicated on the plans, sewers greater than 10-feet in depth shall meet SDR26 or AWWA C900 or C905 requirements.
- D. Lubricant to be in accordance with the requirements of ASTM D3212. Lubricant to be suitable for lubricating the parts of the joints in the assembly. The lubricant to not have any deteriorating effects on the gasket and pipe materials.
- E. Schedule 40 shall be used for service laterals.
- F. Mark all pipe and fittings.

2.4 DUCTILE IRON PIPE AND FITTINGS

- A. Comply with the latest published edition of American Water Works Association (AWWA) Standards:
 - 1. AWWA C110 & C110a - Gray Iron and Ductile-Iron Fittings, 2-inch through 48-inch for water and other liquids.
 - 2. AWWA C111 - Rubber Gasket Joints for Cast Iron Pressure Pipe and Fittings.
 - 3. AWWA C150 - Thickness Design of Ductile-Iron Pipe.
 - 4. AWWA C151 - Ductile-Iron Pipe, centrifugally cast in metal mold or sand lined molds, for water or other liquids.
 - 5. AWWA C153 - Ductile-Iron Compact fittings, 3-inch through 12-inch for water and other liquids.
 - 6. ASSA C900 - Polyvinyl Chloride (PVC) Pressure Pipe 4-inches through 12-inches for water.
 - 7. Polyethylene encasement for the protection of ductile and cast iron pipes, fittings valves, and appurtenances shall be furnished and installed in accordance with the requirements of

AWWA C-105.

8. Lining and Coating- Ductile and cast iron pipes, fittings valves, and appurtenances for sanitary sewer service shall be furnished with corrosion resistant interior lining furnished by the manufacturer:
 1. Polyethylene "polybond"
 2. Polyurethane "Corropipe II TX 5"
 3. Ceramic-Epoxy "Protecto 401"
 4. Engineer Approved Equal
9. Exterior Coating - Ductile and cast iron pipes, fittings valves, and appurtenances for sanitary sewer service shall be furnished with outside surfaces coated with a bituminous coating 1 mil thick in accordance with ANSI A21.6 or ANSI A21.51.

2.5 MANHOLES, STRUCTURES AND PIPE ACCESSORIES

A. Fittings

1. Fittings allowed only on service laterals.
2. Fittings shall equal or exceed quality of pipe. Fittings shall be full-bodied gasket fittings or inserted gasketed compression fittings on line size greater than 15-inches as shown in the plans and details.

B. Cast-in-Place Manholes

1. Concrete and reinforcing steel shall comply with Section 32 30 00.
2. Construction details as indicated (D-2).
3. Minimum wall thickness will be 5-inches.
4. Provide cast-in-place rubber gasket for connection of required sewer line or watertight, size-on-size resilient connectors allowing for differential settlement shall be used to connect pipe to manholes. Pipe to manhole connectors shall conform to ASTM C-923.

C. Fiberglass Manholes

1. Fiberglass manholes shall be in accordance with ASTM D3753 "Glass Fiber Reinforced Polyester Manholes, latest revision. The minimum wall thickness for all manholes up to 20-feet depth shall be .50-inches. The inside diameter of the manhole barrel shall be either 48-inches or 1.5 times the nominal pipe diameter of the largest pipe, which ever is larger, or as indicated on the plan sheets. A concentric reducer over the barrel of the have an inside diameter of 32-inches.
2. Pipe Connectors - Watertight, size-on-size resilient connectors allowing for differential settlement shall be used to connect pipe to manholes. Pipe to manhole connectors shall conform to ASTM C-923 or shall be InsertaTee as shown in the plans and specification details. Joints for sewer pipe for line and drop connections in sizes 4-inches - 15-inches shall be made by means of gasketed inserted watertight compression connection or approved equal as shown in the plans and details. Install in accordance with the manufacturer's written instructions. Connections for pipe larger than 15-inches shall be made using a pre-approved connection. Install in accordance with the manufacturer's written instructions.

E. Manhole Accessories

1. Manhole lid and cover:
 - a. Gray cast iron, with minimum clear opening 30- inches.
 - b. Use Western Iron Works A770R or approved equal with vent holes.
 - c. Provide anchor bolt holes for exposed manhole tops.
2. Manhole Rings:
 - a. Provide minimum of three throat rings between cone and manhole lid and cover, adjustment rings shall be High Density Polyethylene grade rings (LADTECH or approved equal).
3. Coating - Coating and lining of the interior vertical surfaces, if required, shall be as noted in the plans and details. Materials shall be installed and applied in accordance with the written instructions and specifications of the manufacturer at the thickness and quality as noted in the plans and details as approved by Engineer.
4. Manhole Inserts -Provide manhole insert to fit the manhole frame rim upon which the manhole cover rests.
 - a. Insert body shall be made of high density polyethylene copolymer material that meets ASTM D 1248, Class A, Category 5, Type III. Minimum thickness 1/8-inch.
 - b. Gasket shall be of closed cell neoprene and have pressure sensitive adhesive on one side and be placed under the weight-bearing surface of the insert by the manufacturer.
 - c. Lift strap of 1-inch woven polyethylene (seared on all cut ends to prevent unraveling. Strap shall be attached to the rising edge of the bowl off the insert by means of stainless steel rivet and washer.
 - d. Vent shall have 1/8-inch hole located on the side wall of the insert 3/4-inch below the lip.
 - e. Load capacity insert shall have certified test data verifying minimum collapse load of 1500 lbs. minimum applied to a 5.50-inch square area in the center of the insert.

PART 3 - EXECUTION

3.1 GENERAL:

- A. Provide all labor, equipment and materials and install all pipe, fittings, specials and appurtenances as indicated or specified.

3.2 PIPE INSTALLATION

A. Handling

1. Handle in a manner to insure installation in sound and undamaged condition.
 - a. Do not drop or bump.
 - b. Use slings, lifting lugs, hooks and usher devices designed to protect pipe, joint elements, and coatings.
2. Ship, move and store with provisions to prevent movement or shock contact with adjacent units.
3. Handle with equipment capable of work with adequate factor of safety against overturning or other unsafe procedures.

B. Installation

1. Installation, jointing and testing of pipe, fittings, and accessories shall be in accordance with the provisions of the applicable reference standard and in accordance with the requirements of this specification and related specifications referenced or contained in the contract documents for pressure or gravity sewers.
2. Lay pipe to slope gradient noted on the drawings.
3. Utilize equipment, methods, and materials insuring installation to lines and grades as indicated.
 - a. Do not lay on blocks unless pipe is to receive total concrete encasement.
 - b. Use laser or minimum of 3 batter boards for control of line and grade.
 - c. Obtain approval from Engineer for method proposed for transfer of line and grade from control to the work.
4. Install pipe of size, material, strength class, and joint type with embedment shown for plan location.
5. Insofar as possible, commence laying of pipe at downstream end of line, and, install pipe with bell ends in direction of pipe laying. Sewer pipe shall have spigot ends in direction of flow. Obtain approval for deviations there from.
6. Clean interior of all pipe, fittings and joints prior to installation. Exclude entrance of foreign matter during discontinuance of installation.
 - a. Close open ends of pipe with snug fitting closures.
 - b. Do not let water fill trench. Include provisions to prevent flotation should water control measures prove inadequate.
 - c. Remove water, sand, mud and other undesirable materials from trench before removal of end cap.
7. Inspect pipe prior to installation to determine if any pipe defects are present.
8. Brace or anchor as required to prevent displacement after establishing final position.
9. Perform only when weather and trench conditions are suitable.
10. Observe extra precaution when hazardous atmospheres might be encountered.
11. Sanitary sewer relation to water mains:
 - a. Maintain 9-feet horizontal separation whenever possible.
 - b. When conditions prevent a lateral separation of 9- feet, sewer may be installed closer to a water main if:
 - (1) sewer constructed of PVC pipe meeting AWWA Specifications and having a minimum working pressure rating of 150 psi or greater and equipped with pressure type joints, and;
 - (2) the sewer line and water main are separated by a minimum vertical distance of 2-feet and a minimum horizontal distance of 4-feet, measured between the nearest outside diameters of the pipes.
 - c. When a sanitary sewer crosses a water line and that portion of the sewer is constructed as described in 3.02 B.11.b.(1), the sewer may be placed no closer than 6 inches from the water line. The separation distance must be measured between the nearest outside pipe diameters. The sewer line shall be located at a lower elevation than the water line whenever possible and one length of the sewer pipe must be centered on the water line.
12. Auger or jack casing pipe in place where shown on plans.

C. Jointing

1. General requirements:
 - a. Locate joint to provide for differential movement at changes in type of pipe embedment, at changes from rock to soil trench bottom, and structures.
 - (1) Not more than 18 inches from structure wall, or
 - (2) Support pipe from wall to first joint with concrete cradle structurally continuous with base slab or footing of structure.
 - b. Perform in accordance with manufacturer's recommendations.
 - c. Clean and lubricate all joint and gasket surfaces with lubricant recommended.
 - d. Utilize methods and equipment capable of fully homing or making up joints without damage.
 - e. Check joint opening and deflection for specification limits.

D. Closure Pieces

1. Connect two segments of pipelines or a pipeline segment and existing structure with short sections of pipe fabricated for the purpose.
2. Observe specifications regarding location of joints, type of joints and pipe materials and strength classifications.

E. Temporary Plugs

1. Furnish and install temporary plugs at each end of work for removal by others when completed ahead of adjacent contract or where indicated.
2. Remove from pipe laid under adjacent contract in order to complete pipe connection when work by other contractor is finished prior to work at connection point under this contract.
3. Plugs
 - a. Use test plugs as manufactured by pipe supplier, or
 - b. Fabricate by Contractor of substantial construction.
 - c. Must be watertight against heads up to 20 feet of water.
 - d. Secure in place in a manner to facilitate removal when required to connect pipe.

3.3 MANHOLE INSTALLATION

- A. Foundations to be poured in place or to be pre-cast concrete base sections in accordance with the requirements of ASTM C-478. See Standard Details included herein.
- B. Construct manhole foundation and channel inverts integrally for cast in place manhole foundations. See Standard Details included herein.
- C. Pre-cast manhole sections of ruse with cast in place manhole bases may be installed after foundation concrete has attained 75% of design strength.
- D. Forms for cast-in-place manhole may be installed after foundation concrete has attained 75% of design strength.

- E. Manhole foundation and manhole may be installed simultaneously if manhole section is supported on concrete blocks and foundation concrete placed under and around bottom section.
- F. Install manhole sections and joints in accordance with the requirements of the specification.
- G. Heat materials for casting in place in freezing weather and protect work from cold; maintain temperature of work at 40° F. for at least 24 hours after placing.
- H. Invert Channels: Inverts: The bottom of the manhole shall be provided with a "U" shaped channel that is as much as possible a smooth continuation of the inlet and outlet pipes.
 - 1. For manholes connected to pipes less than 15-inches in diameter the channel depth shall be at least half the largest pipe diameter.
 - 2. For manholes connected to pipes 15 to 24-inches in diameter the channel depth shall be at least three fourths the largest pipe diameter.
 - 3. For manholes connected to pipes greater than 24-inches in diameter the channel depth shall be at least equal to the largest pipe diameter.
 - 4. In manholes with pipes of different sizes, the tops of the pipes shall be placed at the same elevation and flow channels in the invert sloped on an even slope from pipe to pipe. The bench provided above the channel shall be sloped at a minimum of 0.5-inch per foot.
 - 5. Where sewer lines enter the manhole higher than 24- inches above the manhole invert, the invert shall be filleted to prevent solids deposition.
 - 6. Drop Manholes: A drop manhole as shown in the details shall be provided for a sewer entering a manhole more than 30-inches above the insert. A drop pipe of the same pipe material and size shall be provided for a sewer pipe entering a manhole more than 24-inches above the invert. The drop pipe shall be constructed on the outside of the manhole utilizing Wyes and Ells to provide a smooth drop and a clean out leg as shown on the details. The drop pipe shall be encased with concrete unless otherwise directed by the Engineer. Concrete shall extend from the bottom of the manhole base up to the bottom of the incoming sewer pipe, concrete shall also extend from the outside wall of the manhole out past the Wye on the Wye branch with a minimum of six inches (6") on each side.
- I. Pipe Connection
 - 1. Make watertight.
 - 2. Use rubber gasket or size on size resilient connectors allowing for differential settlement conforming to ASTM C-9232.
 - 3. All connections shall be at flowline of manhole.
- J. Exterior Pipe Support (Rigid Pipe)
 - 1. Support vitrified clay pipe on concrete cradle from manhole connection to first joint on each side of manhole as indicated.
 - 2. Provide pipe joint within 18 inches of manhole wall.
- K. Castings, frames, and fittings

1. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place and position before the concrete or mortar is placed.
 2. The unit shall be protected until mortar or concrete is set.
- L. Coatings if required in the specifications and details shall be applied after Engineer's approval of structure.

3.4 ACCEPTANCE TESTS FOR SEWER PIPELINES

A. Infiltration Testing

1. General
 - a. All testing must meet or exceed the Texas Commission on Environmental Quality current requirements.
 - b. Maximum infiltration for each section of sewer pipe shall not exceed 50 gal/mile/day/inch of pipe diameter.
 - c. Infiltration, exfiltration or air test may be used to prove compliance with infiltration requirement.
 - d. Acceptance of air test or exfiltration results will not preclude rejection of work if infiltration is measured and exceeds limitation.
 - e. After backfilling and removing debris from each section of sewer line, conduct a line acceptance test under observation of the Engineer. Copies of all test results shall be made available to the Engineer upon request. Test the sanitary sewer lines in strict accordance with the following leakage test using low pressure air. If the test results indicate an unacceptable installation, locate the source of leakage, correct the defect, and retest until the installation is proven satisfactory.
 - f. Tests should conform to the following requirements:
 - (1) Infiltration or Exfiltration Tests. The total exfiltration as determined by a hydrostatic head test shall not exceed 50 gallons per inch diameter, per mile of pipe per 24 hours at a minimum test head of two feet above the crown of the pipe at the upstream manhole.
 - (2) When pipes are installed below the groundwater level an infiltration test shall be used in lieu of the exfiltration test. The total infiltration, as determined by a hydrostatic head test, shall not exceed 50 gallons per inch diameter per mile of pipe per 24 hours at a minimum test head of two feet above the crown of the pipe at the upstream manhole, or at least two feet above existing groundwater level, whichever is greater.
 - (3) For construction within the 25 year flood plan, the infiltration or exfiltration shall not exceed 10 gallons per inch diameter per mile of pipe per 24 hours at the same minimum test head.
 - (4) If the quantity of infiltration or exfiltration exceeds the maximum quantity specified, remedial action shall be undertaken in order to reduce the infiltration or exfiltration to an amount within the limits specified.
2. Air Test
 - a. Furnish all facilities required including: (1) Necessary piping connections. (2) Test pumping equipment. (3) Pressure gauges or manometers. (4) Bulkheads. (5) All

- miscellaneous items required.
- b. Obtain approval from Engineer of equipment and methods proposed for use.
- c. Test pipe in sections determined by Contractor and approved by Engineer.
- d. Plug ends of line and cap or plug all connections to with-stand internal test pressures.
- e. Introduce low pressure air until internal air pressure is 4.0 psi greater than the average back pressure of ground water above the pipe. (Add 0.43 psi for each vertical foot of ground water over the top of pipe.)
- f. Allow two minutes for air pressure to stabilize.
- g. Time required for pressure to decrease from 3.5 to 2.5 psi greater than average back pressure of any ground water above pipe shall not be less than time in following table for given diameters.

AIR TESTING TIMING

<u>Pipe Diameter</u> <u>(Inches)</u>	<u>Minutes</u>
6	3.0
8	4.0
10	5.0
12	5.5
15	7.0
18	8.5
21	10.0
24	11.5
27	12.75
30	14.0
36	17.0

- h. Repeat test as necessary after all leaks and defects have been repaired.

C. Deflection Testing

1. Perform on flexible pipe.
2. Use a mandrel to test for a maximum 5 percent deflection unless otherwise specified in the contract document.
3. The mandrel shall be sized and constructed as required by the Texas Commission on Environmental Quality.
4. Conduct no sooner than thirty (30) days after final backfill.
5. Use no mechanical pulling devices.
6. Uncover all irregularity or pipe deformation exceeding 5%. Replace all damaged pipe reround non-damaged pipe and tamp the embedment and initial backfill.
7. Any pipe removed shall be replaced by use of gasketed repair couplings.
8. Conduct deflection test in the presence of the Owner's or Engineer's representative.
9. Manhole Testing: Successful passage of a vacuum or hydrostatic test shall be required for acceptance of all sanitary sewer manholes and sanitary sewer structures. If a manhole fails a leakage test the manhole must be made watertight and retested. Hydrostatic testing shall be conducted by plugging with Engineer approved plugs all influent and effluent pipes in the manhole and filling the manhole with water to the top of the manhole cone with water.

Additional water may be added over a twenty-four (24) hour period to compensate for absorption and evaporate losses. At the conclusion of the twenty-four (24) hour saturation period the manhole shall be filled to the top of the manhole cone and observed. The maximum leakage for hydrostatic testing shall be 0.025 gallons per foot diameter per foot of manhole depth per hour. Any loss within a thirty (30) minute period shall be considered an unsuccessful test. Vacuum testing shall be performed in accordance with the requirements of ASTM C-1244, Specification for Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test.

3.5 SERVICE CONNECTIONS:

- A. Install service connections at each dwelling or business place, or as directed by Engineer.
- B. Services wyes: install wyes, 4-inch branch diameter unless shown otherwise on plans. See standard detail.
- C. Risers: use in lieu of wyes for service connections where invert of sewer is 15 feet or more below ground surface or where shown on plans. See standard detail.
- D. Place suitable stopper in end of connection, cement stopper in place with cold bituminous joint compound.
- E. Backfill trench only after recording exact location of service connection. Place engineer approved marker tape above service piping in excavation within 3-feet of the surface.
- F. Make no connections to house sewers or extend service connections beyond this contract without written permission of Engineer.
- G. Backfill trench only after entire service line and Wye connection has been inspected and approved by Engineer. Compact as specified in Section 02221, "Trenching, Backfilling and Compacting".
- H. Street crossings shall have a minimum of 3 feet of cover to sub-grade unless approved by Engineer.
- I. No payment for service lines will be made until all specified requirements have been met.

3.6 CONNECTIONS TO EXISTING DRAINS AND SEWER SYSTEM

- A. Connect existing sanitary service drains which cross new sewer line through equal sized Wye.
- B. Connect no storm drains to new sewers.
- C. Connections to existing manholes:
 - 1. Cut hole in existing manhole at required elevation.
 - 2. Insert new sewer pipe flush with inside of manhole.
 - 3. Grout new pipe in place.

4. Reconstruct manhole bottom to suit new connection.

D. Connections to existing sewer:

1. Build new manhole around existing sewer.
2. Break out existing sewer inside of manhole and construct bottom to suit new connection.

END OF SECTION 221300

SECTION 221353

SEPTIC TANK SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes:
 - 1. Septic tanks.
 - 2. Sewage pump.
 - 3. Distribution piping.
 - 4. Dosing chamber (ETA).
 - 5. Pressure Pipe (ETA).
 - 6. Leaching piping (ETA).
 - 7. Seepage bed materials (ETA).
 - 8. Evapotranspiration fill materials (ETA).
- B. Alternative Sanitary Disposal Methods maybe developed based on detail design which may included buy not limited to Wisconsin (Sand) Mound system and Incinerator Toilet/Graywater Septic system.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Precast Concrete Septic Tanks:
 - 1. Description: Double-chamber precast, reinforced-concrete tank with internal baffles and covers; designed for structural loading according to ASTM C 890 and made according to ASTM C 1227.
 - a. Coating: Coal-tar epoxy coating, 15-mil minimum thickness covering internal areas above the water line and extending at least 4 inches below that point.
 - b. Inlet and Outlet Access: 12 inches in diameter, reinforced concrete access lids with steel lift rings. Include access centered over inlet and outlet.
 - c. Manhole: 48 inches in diameter, reinforced-concrete access lid with steel lift rings. Include manhole in center of each septic tank compartment top. Include coal-tar epoxy coating, 15-mil minimum thickness over entire surface of access lid.
- B. Distribution Piping:
 - 1. PVC Sewer Pipe and Fittings: ASTM D 3034, SDR 35, nonperforated, for solvent-cement or elastomeric gasket joints.
 - a. Solvent Cement: ASTM D 2564.
 - b. Gaskets: ASTM F 477, elastomeric seal.
- C. Dosing Chamber: Standard straight manhole ASTM C-478.
- D. Evapotranspiration Absorption System to be installed.

E. Evapotranspiration Absorption Fill Materials

1. Aggregate Filtering Material:

- a. Course Aggregate for Concrete, per State's Department of Transportation Standard Specifications:

Sieve	% Passing
1-1/2"	100
1"	95-100
3/8"	15-55

- b. R/R Ballast:

Sieve	% Passing
1-1/2"	100
1"	90-100
3/4"	40-75
1/2"	15-35
3/8"	0-15
#4	0-5

- c. Round River Rock, 3/4" - 1-1/2".

- d. 3/8-inch Pea Rock, per State's Department of Transportation Standard Specifications.

2. Cap/Topsoil: Sandy loam material.

3. Vegetation Cover: Grass compatible with adjacent ground cover. No shrubs or trees.

4. Filter Mat: Approved Geotextile filter fabric (surrounds entire drain field – top, sides, and bottom).

	<u>Product</u>	<u>Manufacturer</u>
a.	ProPex 4550	Amoco
b.	GEOTEX 451	Synthetic Industries
c.	Typar 3401 GTF140EX	Linq Industrial Fabrics
d.	Mirafi 140NC Mirafi Filterweave 402	Mirafi, Inc.
e.	TerraTex SD	Webtec, Inc.

5. Runoff berm: Topsoil

6. Leaching Chamber: 24" Corrugated Polyethylene (perforated). Eight 3/4" diameter holes, symmetrical around pipe at 2 Ft. longitudinal intervals along pipe.

- a. Approved Suppliers

- 1) Advanced Drainage Systems Inc. (ADS).
- 2) Hancor.
- 3) Prinsco.
- 4) Quality Culvert Inc.

7. Standpipe: 6" diameter minimum 1/8-inch slotted PVC pipe. Glued cap at base and threaded cap above grade. Slots extend below filter fabric to base.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Survey the area for septic tank system installation. Locate and mark existing utilities, underground structures, and aboveground obstructions before beginning and avoid disruption of and damage to services.
- B. Examine soil structure, materials, and conditions.
- C. Install precast concrete septic tanks level according to ASTM C 891.
- D. Excavate trenches 30 inches in width and 24 inches in depth, minimum, for a single pipe.
- E. Use pipes, fittings, and joining methods, for all piping sizes, according to the following applications:
 - 1. Install solid piping to connect septic tank, dosing tank, distribution box, and header for the absorption field or the piping to seepage beds with closed joints.
 - 2. Install perforated pipe for absorption and seepage beds. Install perforated pipe with perforations at bottom, sides and top.
- F. Join and install solvent-cement type PVC pipe and fittings according to ASTM D 2855 and ASTM F 402.
- G. Evapotranspiration Absorption Bed Installation:
 - 1. Numerous construction methods must be followed per State/Local Health Department Administrative Code for Private Sewage Disposal Systems.

END OF SECTION 221353

SECTION 31 05 13
SOILS FOR EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Subsoil materials.
 - 2. Topsoil materials.
- B. Related Sections:
 - 1. Section 310513 - Aggregates for Earthwork.
 - 2. Section 320516 - Aggregates for Exterior Improvements.
 - 3. Section 312213 - Rough Grading.
 - 4. Section 312323 - Backfill.
 - 5. Section 312317 - Trenching.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. ASTM International:
 - 1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - 2. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft³ (2,700 kN-m/m³)).
 - 3. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

PART 2 PRODUCTS

2.1 SOURCE QUALITY CONTROL

- A. Section 014000 - Quality Requirements: Testing and Inspection Services Testing and analysis of soil material.
- B. Testing and Analysis of Subsoil Material: Perform in accordance with ASTM D698.
- C. Testing and Analysis of Topsoil Material: Perform in accordance with ASTM D698.
- D. When tests indicate materials do not meet specified requirements, change material and retest.

- E. Furnish materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1 EXCAVATION

- A. Excavate subsoil and topsoil from areas designated. Strip topsoil to full depth of topsoil in designated areas.
- B. Stockpile excavated material meeting requirements for subsoil materials and topsoil materials.
- C. Remove excess excavated materials subsoil and topsoil not intended for reuse, from site.
- D. Remove excavated materials not meeting requirements for subsoil materials and topsoil materials from site.

3.2 STOCKPILING

- A. Stockpile materials on site at locations designated by Architect/Engineer.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
- C. Separate differing materials with dividers or stockpile apart to prevent mixing.
- D. Prevent intermixing of soil types or contamination.
- E. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.3 STOCKPILE CLEANUP

- A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION 310513

SECTION 31 10 00

SITE CLEARING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Removing surface debris.
 - 2. Removing designated trees, shrubs, and other plant life.
 - 3. Removing abandoned utilities.
 - 4. Excavating topsoil.
- B. Related Sections:
 - 1. Section 312213 - Rough Grading.
 - 2. Section 312318 - Rock Removal.

PART 2 EXECUTION

2.1 EXAMINATION

- A. Section 013000 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify existing plant life designated to remain is tagged or identified.
- C. Identify waste area for placing removed materials.

2.2 PREPARATION

- A. Call Local Utility Line Information not less than three working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.

2.3 PROTECTION

- A. Locate, identify, and protect utilities indicated to remain, from damage.
- B. Protect trees, plant growth, and features designated to remain, as final landscaping
- C. Protect bench marks, survey control points, and existing structures from damage or displacement.

2.4 CLEARING

- A. Clear areas required for access to site and execution of Work.
- B. Remove trees and shrubs within marked areas. Remove stumps.
- C. Clear undergrowth and deadwood, without disturbing subsoil.
- D. Apply herbicide to remaining stumps to inhibit growth.

2.5 REMOVAL

- A. Remove debris, rock, and extracted plant life from site.
- B. Remove abandoned utilities. Indicated removal termination point for underground utilities on Record Documents.
- C. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.
- D. Do not burn or bury materials on site. Leave site in clean condition.

2.6 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, relandscaped, or regraded, without mixing with foreign materials for use in finish grading.
- B. Do not excavate wet topsoil.
- C. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion.
- D. Remove excess topsoil not intended for reuse, from site.

END OF SECTION 311000

SECTION 311100

CLEARING AND GRUBBING

PART 1 – GENERAL

1.1 GENERAL DESCRIPTION OF WORK

- A. Cleaning and grubbing on project site of trees, stumps, brush, roots, vegetation, logs rubbish and other objectionable matter within limits described in specifications or as shown on plans.
- B. Cleaning and grubbing shall be in advance of grading operation except that in cuts over 3 feet in depth, grubbing may be done simultaneously with excavation, provided objectionable matter is removed as specified.
- C. Dispose of all debris resulting from clearing and grubbing work.

1.2 PROTECTION OF ADJACENT WORK:

- A. Protect all areas outside indicated construction areas.
- B. Protect existing improvements, adjacent property, utilities and other facilities, and trees and plants not to be removed from injury or damage.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Provide materials required to perform work as specified.

PART 3 - EXECUTION

3.1 CLEARING:

- A. Clear all areas covered by dikes, roads, structures and embankments within project limits unless otherwise shown in plans.
- B. Remove all saplings, brush, down-timber and debris unless shown or directed otherwise.
- C. Use tree wound paint to treat scars, gashes or limbs stubs on trees not removed.

3.2 GRUBBING:

- A. Trees, stumps, root systems, rocks and other obstructions shall be removed to the depths shown when they fall within the construction templates for the following items:
 - 1. Footings 18-inches below bottom of footing.
 - 2. Sidewalks (or other types of walks) 12-inches below bottom of walk.
 - 3. Roadways or Streets 18-inches below bottom of subgrade
 - 4. Parking Areas 18-inches below bottom of subgrade
 - 5. Grassed Areas 18-inches below top soil
 - 6. Fills 24-inches below bottom of fill

B. Blasting not permitted.

3.3 REMOVAL OF DEBRIS AND CLEANUP

A. Burning is not permitted.

B. Dispose of all waste materials not burned by removal from site.

C. Materials cleared and grubbed shall be the property of the Contractor and shall be his responsibility for disposal.

END OF SECTION 311100

SECTION 312100

EXCAVATION, BACKFILL AND GRADING FOR SITE WORK OUTSIDE OF BUILDING

PART 1 - GENERAL

1.1 SECTION INCLUDES:

- A. Grading and earthwork which occurs in areas other than under structures, under paving, or trenching for utilities.
- B. Earthwork consists of operations required for the excavation of materials on site; excavation of borrow material from designated areas; compaction of natural or improved sub-grades; finish grading; disposal of excess or unsuitable materials; and other required operations. Earthwork shall conform with dimensions and typical sections shown, and within lines and grades established on Drawings.

1.2 RELATED SECTIONS:

- A. Trench Excavation, Backfill and Compaction- Section 312200.

1.3 REFERENCES:

- A. ASTM D698 - Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 lbf/ft³).
- B. ASTM D4972 - pH of Soil.
- C. ASTM G57 - Field Measurement of Soil Resistivity Using the Wenner Four Electrode Method.
- D. ASTM D4318 - Liquid Limit, Plastic Limit and Plasticity Index of Soils.

1.4 EXISTING UTILITIES:

- A. Where pipes, ducts and structures are encountered in the excavation but are not shown on the Drawings, immediately notify the ENGINEER.

1.5 DEFINITIONS:

- A. Classification: Earthwork materials are classified in accordance with definitions in this Article.
- B. Topsoil: Top 8 inches of natural surface soil possessing the characteristics of representative soils on the site that produce growths of grass or other vegetation. Topsoil includes roots and other vegetation.

- C. General Site Fill: Suitable, clean material excavated on-site or off-site may be used as fill material. Suitable material shall consist of clay soils classified as CH according to the unified soil classification system. Clay soil used as fill shall have a liquid limit of less than 55 and a Plasticity Index comparable with on-site soils.
- D. Select Fill: Select fill material, as required for construction, defined in the Geotechnical Report, shall consist of inorganic silty or sandy clay.
- E. Subgrade: Consists of that portion of the surface on which a compacted fill, backfill or topsoil is placed.
- F. Borrow: Material taken from on-site designated areas or approved off-site sources to make up any deficit of excavated material. Obtain from area that is normally dry and well drained. Borrow does not include top soil.
- G. Finish Grading: Operations required for smoothing disturbed areas that are not overlaid with pavement.
- H. Excavation: Excavation of every description and of whatever substances encountered within the limits of the project to the lines and grades indicated on the Drawings.
- I. Compaction: Compaction of soil materials shall be measured as a percent of Standard Proctor density as determined by the ASTM D698.

PART 2 - PRODUCTS

2.1 SELECT FILL:

- A. Source: Obtain select fill material from required excavation, or if excavated material is not adequate, from borrow areas approved by the Geotechnical ENGINEER. Material from source shall be tested for compliance with project requirements and approved by the Owner and Testing Laboratory.
- B. Suitability: Use the best material available from excavation or borrow, suitability of select fill is subject to the ENGINEER'S approval.
- C. Quality: Select fill material must be free of rock and clay lumps or excessive silts. Do not use soil containing brush, roots, sod or similar organic materials.
- D. Characteristics: Select fill material shall consist of inorganic silty or sandy clay. Additional select fill requirements are described in Geotechnical Report.

2.2 FILL AND BACKFILL UNDER TOPSOIL:

- A. Source: Obtain site fill from required excavation or, if excavated material is not sufficient, from borrow areas approved by the ENGINEER.
- B. Suitability: Use the best material available from excavation or borrow. Suitability of fill material is subject to the Testing Laboratory\Engineer's approval.
- C. Quality: Fill material shall be free of excessive silts. Do not use soil containing brush, roots, sod or similar organic materials.
- D. Characteristics: Fill material shall have a plasticity index between 6 and 25, inclusive, and shall generally be of similar character to that of existing soil at the site.

PART 3 – EXECUTION

3.1 STRIP AND STOCKPILE:

- A. Remove topsoil at all non-paved areas where excavation of topsoil is required or where fill material will be added for site grading. Remove top 6 inches of topsoil where necessary and stockpile on the property as directed by the Owner. Protect stockpiled topsoil from other excavated materials, dumping of unwanted material, dumping by the public, and erosion. Upon completion of rough grading, replace topsoil in 4-inch minimum layer to finish grade elevations as shown on the grading plan.

3.2 EXCAVATION:

- A. Objective: As shown on the Drawings, excavate to lines, grades and elevations required for subsequent construction. All excavation shall be made in such manner as to permit all surfaces to be brought to final line and grade within plus or minus 0.1 foot. Over excavation shall be restored by the Contractor at his own expense. Finished grades consistently high or low will not be acceptable and shall be corrected by the Contractor at his expense and no additional cost to the Owner.
- B. Drainage: During excavation, maintain grades as required to provide positive drainage away from structures; or, as directed by the Engineer, install temporary drains or drainage ditches to intercept or divert surface water and prevent interference or delay of the work.
- C. Stockpiling: If at time of excavation it is not possible to place material in the proper section of permanent construction, stockpile the material in Owner or Architect approved areas for later use.
- D. Stone or Rock: Stone or rock fragments greater than 6" will not be allowed in fills or embankments. Stones or rock fragments larger than 2 inches in their greatest dimension will not be permitted in top 6 inches of subgrade.

- E. Dressing: Uniformly dress cut and fill slopes to slope, cross section and alignment, as shown.

3.3 TREATMENT OF SUBGRADES:

- A. All topsoil and vegetation shall be stripped from the ground surface and stockpiled, exposing sound undisturbed subgrade soils.
- B. After stripping the topsoil in areas to receive fill or cut areas, the exposed ground surface shall be scarified to a depth of 6 inches, the moisture adjusted, and then recompact to a density of 95 to MIN. percent of the maximum density as obtained in the Standard Proctor Compaction Test (ASTM D698), at a moisture content between minus 1 to plus 3 percent of optimum. Any soft or compressible areas detected during the recompaction process shall be undercut such that sound subgrade soils are exposed and recompacted. Site excavated or select fill shall then be used to bring all areas to grade. Allow for placement of minimum 4-inch layer of top soil in areas not covered by building or pavement.
- C. Finished subgrade shall be inspected by Testing Laboratory for determination that subgrade meets requirements of Contract Documents.

3.4 PLACING FILL AND BACKFILL:

- A. Examination of Subgrade: Do not place fill on any part of the subgrade until the subgrade preparation has been accepted by the Engineer.
- B. Removing Debris: During the dumping and spreading process, remove all roots, stones and debris that are uncovered in the fill material.
- C. Spreading Fill and Backfill: After dumping, spread the material in horizontal layers over the entire fill area. The thickness of each layer before compaction shall not exceed 8 inches unless otherwise directed by the Engineer. Maintain positive drainage throughout construction. The combined excavation and fill placing operation shall be such that the material when compacted in the fill will be blended sufficiently to secure the best practicable degree of compaction. The suitability of the materials shall be subject to testing by the Testing Laboratory and approval of the Engineer. After each layer of fill has been spread to the proper depth, it shall be thoroughly manipulated with a disc plow or other suitable and approved equipment until the material is uniformly mixed, pulverized and brought to a uniform approved moisture content.
- D. Attaining Proper Bond: If, in the opinion of the Testing Laboratory, the compacted surface of a layer is too smooth to bond with succeeding layers, loosen the surface by harrowing or other approved method before continuing the work.
- E. Place materials to proper elevation allowing for depth of topsoil furnished under this Contract.

3.5 MOISTURE CONTROL:

- A. Intent: Developing the maximum density obtainable with the natural moisture of the material is preferred. However, the moisture content shall not vary from the optimum, as determined by ASTM D698, by more than minus 1 to plus 3 percent of optimum.
- B. Adjustment: If the moisture content is too high, adjust to within the specified limits by spreading the material and permitting it to dry. Assist the drying process by discing or harrowing if necessary. When the material is too dry, sprinkle each layer with water. Work the moisture into the soil by harrowing or other Engineer approved method.

3.6 COMPACTION:

- A. Rough Grade: Compact each layer of fill material with suitable equipment as necessary to secure 95% to 98% Standard Proctor Density (ASTM D698) within the specified range of the moisture content.
- B. Finish Grade: Place and lightly compact topsoil to achieve finish grades.

3.7 DISTRIBUTION OF TOPSOIL:

- A. Perform rough grading and topsoil/finish grading work.
- B. Preparation:
 - 1. Prior to placing topsoil, scarify the subgrade to a depth of 2 inches to provide effective bonding of the topsoil with the subgrade.
 - 2. Shape all areas designated for grading, including cut and fill areas, to receive a minimum of 4 inches of topsoil
- C. Placement:
 - 1. Do not haul or place wet topsoil. Also prohibited is placement of topsoil on a subgrade that is excessively wet, extremely dry, or in a condition otherwise detrimental to proper grading or proposed planting.
 - 2. Distribute topsoil uniformly and spread evenly. Correct irregularities in the surface to prevent formation of depressions where water could stand.
 - 3. Perform the spreading operation so that planting can proceed with little additional tillage or soil preparation. Leave the area smooth and suitable for lawn planting.
 - 4. Lightly compact topsoil to obtain proper bond with previously placed or prepared material.
- D. Maintenance: Where any portion of the surface becomes eroded or otherwise damaged, repair the affected area to establish the condition and grade prior to topsoil placement; then replace topsoil.

3.8 MATERIAL DISPOSAL:

- A. Excess Excavation Material (soil material free of trees, stumps, logs, brush, roots, rubbish and other objectionable matter which has been accepted by the Geotechnical Engineer): Remove excess excavated material from the construction site or place on the property as directed by the ENGINEER.
- B. Waste Material (soil material including trees, stumps, logs, brush, roots, rubbish and other objectionable matter which has not been accepted by the Geotechnical Engineer): Remove waste material from the project site before Final Inspection. Legally dispose of material at a licensed site or with written and notarized permission from the property owner for a private disposal site. All costs associated with waste material removal and disposal shall be paid for by the Contractor.

PART 4 - TESTING

4.1 PROCEDURE

- A. The testing laboratory will make tests of in-place density in accordance with ASTM Standards. Backfill operations will be monitored continuously by the testing laboratory at structures. It will be the responsibility of the CONTRACTOR to notify the testing laboratory before backfill operations begin.

END OF SECTION 312100

SECTION 312200

TRENCH EXCAVATION, BACKFILL AND COMPACTION

PART 1 - GENERAL

1.1 GENERAL DESCRIPTION OF WORK

- A. Excavation, shoring, dewatering, pipe bleeding, trench backfill, compaction, grading and cleanup of all pipeline trenching for the project.
- B. All work must be done in accordance with these specifications and the safety requirements of the State and OSHA Standards.

1.2 JOB CONDITIONS

- A. Site Acceptance
 - 1. Accept site in condition existing during Contract time frame.
 - 2. Ground water/surface water found during construction are conditions of the contract and responsibility of Contractor.
- B. Adverse Weather
 - 1. Place no backfill that is excessively wet or frozen.
 - 2. Place no backfill in excessively wet or frozen trenches.

PART 2 – PRODUCT

2.1 MATERIAL CLASSIFICATIONS

- A. Materials for backfill shall be classified for the purpose of quality control in accordance with the Unified Soil Classification Symbols as defined in ASTM D 2487. Material use and application is defined in utility installation specifications and Drawings either by class, as described in Paragraph 2.10B, or by product descriptions, as given in Paragraph 2.02.
Class Designations Based on Laboratory Testing:
 - 1. Class I: Well-graded sands and gravels, gravel-sand mixtures, crushed well-graded rock, little or no fines (GW,SW)
 - 2. Plasticity Index: Non-plastic
 - 3. Gradation: D60/D10 – greater than 4 percent. Amount passing No. 200 $\leq$ 5%.
 - 4. Class II: Poorly-graded gravels and sands, silty sands and gravels, little to moderate fines (GM, GP, SP, and SM)
 - 5. Plasticity Index: Non-plastic to 4
 - 6. Gradation (GP, SP): Amount passing No. 200 Sieve – less than 5%.
 - 7. Gradation (GM, SM): Amount passing No. 200 Sieve – 12% to 50%
 - 8. Class III: Clayey gravels and sands, poorly graded mixtures of sand, gravel, and clay (GC, SC)
 - a. Plasticity Index

2.2 PIPE BEDDING AND BACKFILL

- A. The type of bedding shall be stated on the Plans or in the Specification. Determination of source of materials for bedding and backfill to meet the stated conditions shall be responsibility of Contractor, but use of such materials shall be subject to approval of Engineer.
- B. Excavated Material Backfill
 - 1. Excavated material may be used in the trench backfill, provided that all hard rock and stones having any dimensions greater than 6" and frozen earth debris and roots larger than 2" are removed for the initial backfill. Plasticity Index shall be less than 30. Excavated backfill material must be approved by Engineer for bedding material.
- C. Select Backfill
 - 1. Select Backfill shall be gravel, fine rock cuttings, sand, sandy loam or loam free from excessive clay. Rock cuttings shall have no dimensions greater than 2 inches. Plasticity Index shall be between 7 and 22. Select backfill must be approved by Engineer.
- D. Sand Backfill
 - 1. Sand backfill shall be clean, hard, durable, uncoated grains, free from lumps and organic material. All materials must pass a No. 8 Sieve.
- E. Granular Backfill
 - 1. Granular backfill shall be free flowing, such as sand or hydraulically grade stone fines, or mixed sand and gravel, or sandy loam. The material shall be free from lumps, stones over 2 inches in diameter, clay and organic matter.
- F. Controlled Density Fill
 - 1. Use high slump mixture of portland cement, fly ash and fine aggregate formulated, licensed and marketed as K-Krete or equal. Provide mixture with minimum 28-day compressive strength of 70 psi with no measurable shrinkage or surface settlement.

2.3 CRADLING ROCK

- A. Use crushed rock or stone with 70-100% passing 1" sieve and no more than 50% passing 1/2 inch sieve.

2.4 SHEETING, SHORING AND BRACING

- A. Use sound timber or structural steel.
- B. Use shapes and sizes as required.

PART 3 - EXECUTION

3.1 GENERAL

A. Dewatering

1. Execute work "dry". No pipe or conduits shall be laid or concrete poured on excessively wet soil.
2. Prevent surface water from flowing into excavation.
3. Provide equipment for handling water encountered as required. Obtain approval of proposed method of dewatering.
4. No Sanitary sewer shall be used for disposal of trench water.

B. Protection of Existing Utilities:

1. Notify all utilities of location and schedule of work.
2. Locations and elevations of utilities shown on plans are to be considered approximate only. Notify utility and Engineer of conflicts between existing and proposed facilities.
3. Repair, relay or replace existing utilities damaged, destroyed or disrupted during work. Unless specified otherwise, replacement will be at the Contractors expense.

C. Sheet piling, Shoring and Bracing

1. Provide as necessary, to hold walls of excavation, prevent damage to adjacent structures, and to protect workmen and property.
2. Leave Sheet piling and shoring in place where removal might cause damage to work or otherwise indicated on drawings.
3. When movable trench shield is used below spring line of pipe, it shall be lifted prior to any forward movement to avoid pipe displacement.

D. Changes in Grade

1. Grades may be adjusted 1.5 feet (plus or minus) from plan grades to suit unforeseen construction conflicts or conditions with approval of Engineer.
2. No additional compensation will be made for such changes.

3.2 EXCAVATION AND TRENCHING

A. General

1. Method of excavation at Contractor's option.
2. Excavate by hand under tree roots 3 inches and larger, and under and around structures and utilities.
3. Stockpile and replace topsoil to a minimum of 4-inches for surface restoration in grassed or agricultural areas.

B. Trench Characteristics

1. Depth
 - a. As indicated for pipe installation to lines and grades required with proper allowance for thickness of pipe and type of bedding specified or indicated.
2. Width
 - a. Keep width of trench as narrow as possible and yet provide adequate room for backfilling and jointing.
 - b. Maximum width as follows:

Pipe Size <u>Inches</u>	Maximum Trench <u>Width</u>
4	2-feet 0-inches
6	2-feet 0-inches
8	2-feet 4-inches
10	2-feet 4-inches
12	2-feet 6-inches
15	2-feet 9-inches
18	3-feet 0-inches
Over 18	Pipe O.D. + 12-inches

3. Trench walls must be vertical below top of pipe and may be vertical or sloped above pipe to conform to excavating codes.
4. Provide bell holes for each pipe joint where pipe bears on undisturbed earth.
5. Trench bottom shall be free of large stones and other foreign material.

3.3 SOFT, SPONGY OR UNSTABLE MATERIALS

- A. Stop work and notify Engineer.
- B. Perform remedial work as directed.
- C. If material is judged unsuitable and removal is authorized, remove and replace with trench stabilizing material as directed by Engineer.

3.4 ROCK EXCAVATION

- A. Excavate any rock to maintain minimum 6-inch clearance around pipe.
- B. Dispose of rock material not suitable for backfill as directed by Engineer.
- C. Use of explosives not permitted without prior written authorization from owner and Engineer.
- D. Provide Special Hazard Insurance covering liability for blasting operations.

3.5 BEDDING

- A. Place after bottom of trench has been excavated to proper depth and grade.

- B. Place, compact and shape bedding material to conform to barrel of pipe to insure continuous firm bedding for full length of pipe.
- C. Provide bedding as described in following table unless indicated otherwise on Plans or in Special Conditions.

<u>Pipe Material</u>	<u>Minimum Bedding Class</u>
1. Vitrified Clay Pipe	Class C*
2. Non-reinforced Concrete Pipe	Class C*
3. Reinforced Concrete Pipe	Class D*
4. Ductile Iron Pipe	Class D*
5. Steel Cylinder	Class C*
6. Flexible or Composite Pipe (PVC)	Class 1**

*Refers to standard detail, "Pipe Envelope Requirements"

**Refers to standard detail, "Bedding Detail"

3.6 TRENCH BACKFILL

- A. Use excavated material for backfill unless otherwise specified.
- B. Use Sand Backfill for all trenches within 5 feet of buildings and beneath walks, parking areas, paved streets or existing exposed utilities, unless otherwise specified in the plans.
- C. Initial Backfill
 - 1. Place after pipe has been bedded and checked for alignment, grade and internal obstructions.
 - 2. Carry out in an orderly fashion after authorization to cover pipe has been given.
 - 3. Allow no more than 300 feet of trench to be open at one time.
 - 4. Do not backfill until concrete or mortar has sufficiently cured.
 - 5. Record location of connections and appurtenances before backfilling.
 - 6. Place by hand and hand tamp to not less than 12-inches above top of pipe, in approximately 4-inch layers.
 - 7. Backfill simultaneously on both sides of pipe to prevent displacement.
 - 8. Place cushion of 4-foot backfill above pipe envelope before using heavy compacting equipment.
- D. Subsequent Backfill
 - 1. Place backfill into trench at an angle so that impact on installed pipe is minimized.
 - 2. Compaction of all backfill material shall be performed in a manner that shall not crack, crush, and/or cause the installed pipe to be moved from the established grade and/or alignment.
 - 3. Area under or within 5-feet of pavement; and under or within 2-feet of utilities, buildings, or walks shall be mechanically compacted to the top of the subgrade in 6-inch lifts to a minimum of 95% Standard Proctor Density.
 - 4. Areas not subject to vehicular traffic shall be backfilled in layers not more than 12-inches in depth.

5. Compaction method is at discretion of Contractor with following exceptions:
 - a. If in Owner's opinion compaction method presents potential damage to pipe, it will not be allowed.
 - b. Compaction of any backfill material by flooding or jetting is not allowed.
6. Mound excavated materials no greater than 6-inches in open areas only.
7. Fill upper portion of trench with topsoil as specified hereinbefore.

E. Controlled Density Fill

1. Use where shown on plans.
2. Provide suitable forms to limit volume of control density fill material.
3. Prevent flow of material into existing drain lines.
4. Protect exposed utility lines during placement.
5. Place material in accordance with suppliers' written recommendations unless directed otherwise by Engineer

3.7 EXCESS MATERIAL

- A. Waste of excess excavated material shall be the responsibility of the Contractor.

3.8 TESTING

- A. Unless specified elsewhere, testing will be responsibility of Owner.

B. Standard Proctor Density

1. ASTM D698.
2. One (1) required for each type of material encountered.

C. In Place Density

1. ASTM D1556 (Sand Cone)
2. ASTM D2167 (Balloon)
3. ASTM D3017 (Nuclear)

- D. One (1) test per each 400 cubic yards of backfill placed.

END OF SECTION 312200

SECTION 31 22 13

ROUGH GRADING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Excavating topsoil.
 - 2. Excavating subsoil.
 - 3. Cutting, grading, filling, compacting site for site structures, building pads.
- B. Related Sections:
 - 1. Section 310513 - Soils for Earthwork: Soils for fill.
 - 2. Section 310516 - Aggregates for Earthwork: Aggregates for fill.
 - 3. Section 311000 - Site Clearing: Excavating topsoil.
 - 4. Section 312316 - Excavation and Fill: Building excavation.
 - 5. Section 312318 - Rock Removal.
 - 6. Section 312323 - Backfill: General building area backfilling.
 - 7. Section 312317 - Trenching: Trenching and backfilling for utilities.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. ASTM International:
 - 1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - 2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - 3. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
 - 4. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft³ (2,700 kN-m/m³)).
 - 5. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
 - 6. ASTM D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
 - 7. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head).
 - 8. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - 9. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

PART 2 EXECUTION

2.1 PREPARATION

- A. Call Local Utility Line Information service not less than three working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.
- B. Identify required lines, levels, contours, and datum.
- C. Protect utilities indicated to remain from damage.
- D. Protect bench marks, survey control point, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

2.2 FILLING

- A. Fill areas to contours and elevations with unfrozen materials.
- B. Place fill material in continuous layers and compact as required.
- C. Maintain optimum moisture content of fill materials to attain required compaction density.
- D. Slope grade away from building minimum 2 percent slope for minimum distance of 10 ft, unless noted otherwise.
- E. Make grade changes gradual. Blend slope into level areas.

2.3 FIELD QUALITY CONTROL

- A. Perform in place compaction tests in accordance with the following:
 - 1. As required by geotechnical engineer.

END OF SECTION 312213

SECTION 31 23 16
EXCAVATION AND FILL

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Soil densification.
 - 2. Excavating for building foundations.
 - 3. Excavating for slabs-on-grade.
 - 4. Excavating for site structures.
- B. Related Sections:
 - 1. Section 310513 - Soils for Earthwork: Stockpiling excavated materials.
 - 2. Section 310516 - Aggregates for Earthwork: Stockpiling excavated materials.
 - 3. Section 312213 - Rough Grading: Topsoil and subsoil removal from site surface.
 - 4. Section 312318- Rock Removal: Removal of rock during excavating.
 - 5. Section 312323- Backfill.
 - 6. Section 312317 - Trenching: Excavating for utility trenches.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - 2. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
 - 3. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
 - 4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- B. Local utility standards when working within 24 inches of utility lines.

PART 2 EXECUTION

2.1 EXCAVATION

- A. Underpin adjacent structures which may be damaged by excavation work.
- B. Excavate subsoil to accommodate building foundations, slabs-on-grade.
- C. Excavate to working elevation for piling work.

- D. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity; perform compaction in accordance with Section 02320 and Section 02324.
- E. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- F. Trim excavation. Remove loose matter.
- G. Notify Architect/Engineer of unexpected subsurface conditions.
- H. Correct areas over excavated with structural fill.
- I. Remove excess and unsuitable material from site.
- J. Repair or replace items indicated to remain damaged by excavation.

2.2 PROTECTION

- A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- C. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

END OF SECTION 312316

SECTION 312350

GROUND WATER HANDLING

PART 1-GENERAL

1.1 SECTION INCLUDES

- A. Dewatering, depressurizing, draining, and maintaining trenches, shaft excavations, structural excavations, and foundation beds in a stable condition, and controlling ground water conditions for tunnel excavations.
- B. Protecting work against surface runoff and rising flood waters.
- C. Disposing of removed water.

1.2 REFERENCES

- A. Federal Regulations, 29 CFR Part 1926, Standards-Excavation, Occupational Safety and Health Administration (OSHA).
- B. Federal Register 40 CFR (Vol. 53. No. 222) Part 122, EPA Administrator permit Programs (NPDES), Para 122.26 (b)(14) Storm Water Discharge.

1.3 DEFINITIONS

- A. Ground water control includes both dewatering and depressurization of water-bearing soil layers using well points, for either vacuum or educator systems, or deep wells. Use of sump pumps does not constitute ground water control.
 - 1. Dewatering is lowering the water table and intercepting seepage which would otherwise emerge from slopes or bottoms of excavations or into tunnels and shafts, and disposing of removed water.
 - 2. Depressurization is reduction of piezometric pressure within a soil strata not controlled by dewatering alone.
- B. Control of excavation drainage by sump pumping includes operating the sump pump and drainage facilities installed to collect water in the sump.
- C. Control of surface drainage is diversion of surface water away from excavations.

1.4 PERFORMANCE REQUIREMENTS

- A. Conduct subsurface investigations as needed to identify ground water conditions and to provide parameters for installation and operation of ground water control systems. Perform pump tests, if necessary, to determine drawdown characteristics of water bearing layers.
- B. Develop a ground water control system, compatible with requirements of Federal Regulations 29 CFR Part 1926, to produce the following results:
 - 1. Reduce hydrostatic pressure affecting excavations to the following levels as determined by

piezometer observations.

- a. For structural excavations, reduce the piezometric level to at least 3 feet below the excavation bottom elevation or within 2 feet above the top of clay layers.
 - b. Where hydrostatic pressure in a confined water-bearing layer exist below the excavation, depressurize this zone to eliminate risk of uplift or other instability of the excavation or installed works.
 2. Develop stable subgrade for subsequent construction operations.
 3. Reduce hydrostatic pressure for tunnel excavations as necessary to maintain face stability, grade control, and to control seepage into tunnel.
- C. Provide drainage of seepage water and surface water, as well as water from any other source entering the excavation. Excavation drainage may include placement of drainage materials such as crushed stone and filter fabric, together with sump pumping.
- D. Locate ground water control and drainage systems so as not to interfere with utilities, construction operations, adjacent properties, or adjacent water wells.
- E. Modify ground water control systems or operations if they cause or threaten to cause damage to new construction, existing site improvements, adjacent property, or adjacent water wells, if they affect potentially contaminated areas.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Comply with the Texas Natural Resource Conservation Commission regulations and Texas Water Well Driller Association for development, drilling, and abandonment of wells used in dewatering system.
- B. Where potentially contaminated areas are indicated on the Drawings, monitor ground water discharge for contamination in accordance with the Project Engineer's instructions.

PART 2-PRODUCTS

2.1 EQUIPMENT AND MATERIALS

- A. Equipment and materials are at the option of Contractor as necessary to achieve desired results for ground water control. Ground water control systems may include single-stage or multiple-stage well point systems, educator and ejector-type systems, deep wells, or combinations of these equipment types. Excavation drainage and surface drainage may also include sump pumping subsidiary to bid item.
- B. Maintain equipment in good repair and operating order.
- C. Arrange for standby equipment and materials where required.

PART 3-EXECUTION

3.1 GROUND WATER CONTROL

- A. Install, operate and maintain the ground water control system in a manner compatible with construction methods and site conditions. Notify Project Engineer in writing of any changes made to accommodate field conditions and changes to the Work.

- B. For above ground piping in ground water control system, include a length of clear transparent piping between every well point and discharge header so that discharge from each installation can be visually monitored.
- C. Replace installations that produce noticeable amounts of sediments after development.
- D. Provide additional ground water control installations, or change the methods, if the installation do not achieve satisfactory results.
- E. Do not allow piezometric pressure levels to rise until foundation concrete has achieved design strength.
- F. During backfilling, dewatering may be reduced to maintain water level a minimum of 5 feet below prevailing level of backfill. However, do not allow that water level to result in uplift pressures in excess of 80 percent of downward pressure produced by weight of structure or backfill in place.
- G. Remove ground water control installations.
 - 1. Remove pumping system components and piping when ground water control is no longer required.
 - 2. Remove monitoring wells when directed by the Project Engineer.
 - 4. Grout abandoned well. Fill piping that is not removed with cement-bentonite grout or cement-sand grout.

3.2 MAINTENANCE AND OBSERVATION

- A. Conduct daily maintenance and observation of the ground water control systems.
- B. Replace inoperable or damaged system components as necessary to maintain operation.
- C. Keep monitoring system piping accessible for observation,

3.3 MONITORING AND RECORDING

- A. Observe and record elevation of water level daily as long as ground water control system is in operation. Observe levels weekly thereafter until the Work is completed or piezometers or wells are removed. Initiate more frequent observation when the Project Engineer determines that more frequent monitoring and recording are required.

3.4 SURFACE WATER CONTROL

- A. Intercept surface water and divert it away from excavations. This includes temporary works required to protect adjoining properties from surface drainage caused by construction operations.
- B. Drive surface water and seepage water into sumps and pump it into drainage channels, setting basins, or storm drains.

END OF SECTION 312350

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SECTION 312500

EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION

PART 1-GENERAL

1.1 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to provide erosion and sediment control for the duration of the construction period including furnishing, installing and maintaining erosion and sediment control structures and procedures and the proper removal when no longer required.
- B. The intent of this specification is to provide guidelines for the Contractor to adhere to all State, Federal, and Local environmental regulations. It is also the intent to provide preventive measures to keep sediment from entering any storm water system, including open channels. It is the Contractor's responsibility to adhere to all State, Federal and Local requirements. While the Owner may require the Contractor to install erosion control devices during construction, this will in no way relieve the Contractor of his responsibility.

1.2 QUALITY ASSURANCE

- A. Comply with applicable requirements of all governing authorities having jurisdiction. The Specifications and the Plans are not represented as being comprehensive, but rather to convey the intent to provide complete slope protection and erosion control for both the Owner's and adjacent property.
- B. Erosion control measures shall be established at the beginning of construction and maintained during the entire length of construction. On-site areas which are subject to severe erosion and off-site areas which are especially vulnerable to damage from erosion and/or sedimentation are to be identified and receive additional erosion control measures as directed by the Owner or the Engineer.
- C. All land-disturbing activities shall be planned and conducted to minimize the size of the area to be exposed at any one time and to minimize the time of exposure.
- D. Surface water runoff originating upgrade of exposed area shall be controlled to reduce erosion and sediment loss during the period of exposure.
- E. When the increase in the peak rates and velocity of storm water runoff resulting from a land-disturbing activity is sufficient to cause accelerated erosion of the receiving ditch or stream, the Contractor shall install measures to control both the velocity and rate of release so as to minimize accelerated erosion and increased sedimentation of the stream as directed by the Owner or the Engineer.
- F. All land-disturbing activities shall be planned and conducted so as to minimize off-site sedimentation damage.

- G. The Contractor shall be responsible for periodically cleaning out and disposing of all sediment once the storage capacity of the drainage feature or structure receiving the sediment is reduced by one-half. The Contractor shall also be responsible for cleaning out and disposing of all sediment at the time of completion of the Work.

1.3 SUBMITTALS

- A. Submittals shall be in accordance with Section 013300, SUBMITTALS, and shall include:
 - 1. Manufacturer's Literature: Descriptive data of installation methods and procedures.
 - 2. Certificates: Manufacturer's certification that materials meet specification requirements.

1.4 JOB CONDITIONS; CODES AND ORDINANCES

- A. Comply with the local codes and ordinances. If local codes and ordinances require more stringent or additional erosion and sediment control measures during construction, Contractor shall provide such measures.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. **STRAW BALES:** Straw bales shall weigh a minimum of fifty (50) pounds and shall be at least 30" in length. Bales shall be composed entirely of vegetable matter and be free of seeds. Binding shall be either wire or nylon string, jute or cotton binding is unacceptable. Bales shall be used for not more than three months before being replaced. However, if weather conditions cause biological degradation of the straw bales, they shall be replaced sooner than the three month time period to prevent a loss of structural integrity of the dike.
- B. **SILT FENCE:** Silt fence fabric shall be a nylon reinforced polypropylene fabric which has a built-in cord running the entire length of the top edge of the fabric. The fabric must meet the following minimum criteria:

Tensile Strength, ASTM D4632	90 lbs.,
Puncture Rating, ASTM D4833	60 lbs.,
Mullen Burst Rating, ASTM D3786	200 psi,
Apparent Opening Size, U.S. Sieve No.	40

Silt fence shall be "Enviro Fence" preassembled silt fence, AMXCO Silt Stop prefabricated silt fence, AMOCO Style 2155 preassembled silt fence or approved equal.

- C. **SILT FENCE POSTS:** A minimum 2" x 2" (nominal) x 54" pressure treated wood posts of Number 2 Grade southern yellow pine or approved equal.
- D. **SAND BAG:** Sand bag material shall be polypropylene, polyethylene, polyamide or cotton burlap woven fabric, minimum unit weight four (4) ounces per square yard, mullen burst strength exceeding 300 psi and ultraviolet stability exceeding 70%. Length shall be 24 to 30 inches, width shall be 16 to 18 inches and thickness shall be six (6) to eight (8) inches and

having an approximate weight of 40 pounds. Sand bags shall be filled with coarse grade sand, free from deleterious material. All sand shall pass through a No. 10 sieve.

- E. P.V.C. PIPE: Pipe shall be SDR-35 polyvinyl chloride having a minimum nominal internal diameter of 4". Pipes shall be sized for anticipated flows.
- F. SOIL RETENTION BLANKET: Soil retention blankets shall consist of a geocomposite of excelsior or fiber blanket with an extruded plastic net attached to the tope side. The plastic net shall be photodegradable and the excelsior or fiber blanket shall be made smolder resistant without the use of chemicals. Soil retention blankets shall be high velocity type to resist severe runoff. The soil retention blanket shall be one (1) of the following classes and types:
 - 1. Class 1. "Slope Protection"
 - (a) Type A. Slopes of 3:1 or flatter - Clay soils
 - (b) Type B. Slopes of 3:1 or flatter - Sandy soils
 - (c) Type C. Slopes steeper than 3:1 - Clay soils
 - (d) Type D. Slopes steeper than 3:1 - Sandy soils
 - 2. Class 2. "Flexible Channel Liner"
 - (a) Type E. Short-term duration (Up to 2 Years)
Shear Stress (t_D) < 1.0 lb./sq. ft.
 - (b) Type F. Short-term duration (Up to 2 Years)
Shear Stress (t_d) 1.0 to 2.0 lb./sq. ft.
 - (c) Type G. Long-term duration (Longer than 2 Years)
Shear Stress (t_d) > 2.0 to < 5.0 lb./sq. ft.
 - (d) Type H. Long-term duration (Longer than 2 Years)
Shear Stress (t_d) greater than 0 Equal to 5.0 lb./sq. ft.

The Contractor has the option of selecting an approved soil retention blanket provided that selection conforms to the following list of approved soil retention blankets for slope protection applications:

CLASS I. SLOPE PROTECTION

TYPE A: Slopes of 3:1 or Flatter-Clay Soils

Airtrol® ANTI-WASH®/GEOJUTE® (Regular)
Contech Standards®
Contech Standards Plus®
Green Triangle Regular®
Green Triangle Superior®
GREENSTREAK® PEC MAT
Curlex®
North American Green® S150
North American Green® S75
North American Green® SC150
POLYJUTE® 407/GT
SOIL SAVER®
TerraJute®

Verdyol® ERO-MAT®
Xcel Regular®
Xcel Superior®

TYPE B: Slopes of 3:1 or Flatter-Sandy Soils

Contech Standards®
Contech Standards Plus®
GEOCOIR®/DEKOWE® 700
Green Triangle Superior®
Green Triangle Regular®
North American Green® S75
North American Green® SC150
North American Green® S150
POLYJUTEÔ 407/GT
TerraJute®
Verdyol® ERO-MAT®
Xcel Superior®
Xcel Regular®

TYPE C: Slopes Steeper than 3:1-Clay Soils

Airtrol®
ANTI-WASH®/GEOJUTE® (Regular)
Contech Standards Plus®
Curlex®
Green Triangle Superior®
GREENSTREAK® PEC-MAT
North American Green® SC150
North American Green® S150
POLYJUTEÔ 407/GT
SOIL SAVER®
TerraJute®
Xcel Superior®

TYPE D: Slopes Steeper than 3:1-Sandy Soils

Contech Standards Plus®
GEOCOIR®/DEKOWE® 700
Green Triangle Superior®
North American Green® S150
North American Green® SC150
POLYJUTEÔ 407GT
TerraJute®
Xcel Superior®

CLASS II: FLEXIBLE CHANNEL LINER PROTECTION

PART 3 - EXECUTION

3.1 INSTALLATION

A. TEMPORARY STRAW BALE DIKE

1. Straw bales shall be embedded a minimum of 4" and securely anchored using 2" x 2" wood stakes driven through the bales into the ground a minimum of 6". Straw bales are to be placed directly adjacent to one another leaving no gap between them.
2. Bales shall be placed in a single row, lengthwise on proposed line, with ends of adjacent bales tightly abutting one another. In swales and ditches, the barrier shall extend to such a length that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale. Additional bales shall be placed behind the first row where the bales abut each other. The additional bale is used to prevent unfiltered runoff from escaping between the bales.
3. The excavated soil shall be backfilled against the barrier. Backfill shall conform to ground level on the downhill side and shall be built up to 4" above ground level on the uphill side. Loose straw shall be scattered over the area immediately uphill from a straw barrier.

B. SILT FENCE

The purpose of a silt fence is to intercept and detain water-borne sediment from unprotected areas to a limited extent. The Contractor shall excavate a 6" by 6" trench for site fence bedding along the lower perimeters of the site where necessary to prevent sediment from entering any drainage system. The Contractor shall install the silt fence in accordance with the manufacturer's recommendations and instructions. Silt fence is used during the period of construction near the perimeter of a disturbed area to intercept sediment while allowing water to percolate through. This fence shall remain in place until the disturbed area is permanently stabilized. Silt fence should not be used where there is a concentration of water in a channel or drainage way or where soil conditions prevent a minimum toe-in depth of 6" or installation of support post to depth of 12". Fabric shall overlap at abutting ends a minimum of 3' and shall be jointed such that no leakage or bypass occurs. If concentrated flow occurs after installation, corrective action must be taken such as placing rock berm in the areas of concentrated flow.

C. SAND BAG BERM

1. The purpose of a sandbag berm is to intercept sediment-laden water from disturbed areas such as construction in stream beds, create a retention pond, detain sediment and release water in sheet flow.
2. A temporary sand bag berm shall be installed across a channel or right of way in a developing or disturbed area and should be used when the contributing drainage area is greater than 5 acres. The berm shall be a minimum height of 18", measured from the top of the existing ground at the upslope toe to the top of the berm. The berm shall be sized to have a minimum width of 48" measured at the bottom of the berm and 18" measured at the top of the berm.
3. The sand bag berm shall be inspected after each rain. The sand bags shall be reshaped or replaced as needed during inspection. Additional inspections shall be made daily by the responsible party and when the silt reaches 6", the accumulated silt shall be removed and disposed of at an approved site in a manner that will not contribute to additional siltation. The

sand bag berm shall be left in place until all upstream areas are stabilized and accumulated silt removed; removal must be done by hand.

D. SOIL RETENTION BLANKETS

1. A soil retention blanket (SRB) is a geotextile or biodegradable fabric placed over disturbed areas to limit the effects of erosion due to rainfall impact and runoff across barren soil. Soil retention blankets are manufactured by a wide variety of vendors addressing a wide variety of conditions such as vegetation establishment and high velocity flow. Blankets are used in areas which are difficult to stabilize such as steep slopes, drainage swales or high pedestrian traffic areas.
2. The soil retention blanket, whether installed as slope protection or as flexible channel liner, shall be placed within 24 hours after seeding or sodding operations have been completed, or as approved by the Engineer. Prior to placing the blanket, the area to be covered shall be relatively free of all rocks or clods over 1-1/2" in maximum dimension and all sticks or other foreign material which will prevent the close contact of the blanket with the soil. The area shall be smooth and free of ruts and other depressions. If as a result of rain, the prepared bed becomes crusted or eroded or if any eroded places, ruts or depressions exist for any reason, the Contractor shall be required to rework the soil until it is smooth and to reseed or resod the area at the Contractor's expense.
Installation and anchorage of the soil retention blanket shall be in accordance with the manufacturer's recommendations.

E. PROTECTION OF BARE AREAS

1. Apply seeding and soil retention blanket to bare areas including new embankment areas, fills, stripped areas, graded areas or otherwise disturbed areas, which have a grade greater than 5% or which will be exposed for more than 30 days.
2. Bare working areas on which it is not practical or desirable to install seeding and soil retention blankets, as determined by the Engineer, such as areas under proposed building slabs, shall be temporarily sloped to drain at a minimum of 0.2% and a maximum of 5% grade. These areas shall then be "trackwalked" with a crawler dozer traveling up and down the slope to form the effect of small "terraces" with the tracks of the dozer. Apply a minimum of three (3) coverages to each area with the dozer tracks.
3. Route runoff from the areas through the appropriate silt fence system.
4. Protect earth spoil areas by "trackwalking" and silt fences.

F. INTERCEPTOR SWALE

1. Interceptor swales may have a v-shape or be trapezoidal with a flat bottom and side slopes of 3:1 or flatter. These are used to shorten the length of exposed slope by intercepting runoff and can also serve as perimeter swales preventing off-site runoff from entering the disturbed area or prevent sediment-laden runoff from leaving the construction site or disturbed area. The outflow from a swale must be directed to a stabilized outlet or sediment trapping device. The swales should remain in place until the disturbed area is permanently stabilized.
2. Stone Stabilization shall be used when grades exceed 2% or velocities exceed 6' per second and shall consist of a layer of crushed stone 3" thick, or flexible channel liner soil retention blankets. Stabilization shall extend across the bottom of the swale and up both sides of the

channel to minimum height of 3" above the design water surface elevation based on a two year storm.

3. Interceptor swale shall be installed across exposed slopes during construction and should intercept no more than five (5) acres of runoff. Swales shall have a minimum bottom width of 2'-0" and a maximum depth of 1'-6" with side slopes of 3:1 or flatter. Swale must have positive drainage for its entire length to an outlet. When the slope exceeds 3%, or velocities exceed 4' per second (regardless of slope), stone stabilization is required. Check dams are also recommended to reduce velocities in the swales possibly reducing the amount of stabilization necessary. Swales should be inspected on a weekly basis during wet weather and repairs should be made promptly to maintain a consistent cross section.
4. All trees, brush, stumps, obstructions and other material shall be removed and disposed of so as not to interfere with the proper functioning of the swale.
5. The swale shall be excavated or shaped to line, grade, and cross-section as required to meet criteria specified herein and be free of bank projections or other irregularities which will impede normal flow.
6. All earth removed and not needed in construction shall be disposed of in an approved spoils site so that it will be conveyed to a sediment trapping device.
7. Diverted runoff from a disturbed or exposed upland area shall be conveyed to a sediment trapping device.
8. The on-site location may need to be adjusted to meet field conditions in order to utilized the most suitable outlet.
9. Minimum compaction for the swale shall be 90% standard proctor.

G. LOCATION OF EROSION AND SEDIMENT CONTROL STRUCTURES

1. Locate erosion and sediment control structures as required to prevent erosion and removal of sediment from the project site. Silt fences shall be required for disturbed areas and soil stockpiles/spoil areas. Each silt fence installation shall have a minimum net length (exclusive of embedments into diversion dikes or other ineffective areas) of 25'. The runoff from a maximum of one (1) acre of disturbed area or soil stockpile/ spoil area shall be routed through any individual silt fence installation.
2. Install diversion dikes to divert runoff to the silt fence installation.
3. Install silt traps at the inlet (upstream) end of the drainage structures, including open channels, through which runoff from disturbed areas or soil stockpiles/spoil areas may drain.
4. Provide an overall erosion and sediment control system which protects disturbed areas and soil stockpiles/spoil areas. The system shall be modified by the Contractor from time to time to effectively control erosion and sediment during construction.

3.2 MAINTENANCE

- A. Maintain erosion and sediment control structures and procedures in full working order at all times during construction. This shall include any necessary repair or replacement of items which have become damaged or ineffective. Remove sediment on a regular basis which accumulates in sediment control devices and place the material in approved earth spoil areas or return the material to the area from which it eroded.
- B. Upon completion of construction, properly remove the temporary erosion and sediment control structures and complete the area as indicated.

- C. Soil retention blankets will not require removal if installed on a finished graded area specified to receive seeding.

3.3 FIELD QUALITY CONTROL

- A. In the event of conflict between the requirements and storm water pollution control laws, rules or regulations or other Federal, State or Local agencies, the more restrictive laws, rules or regulations shall apply.

END OF SECTION 312500

SECTION 313116
TERMITE CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Soil treatment.
2. Bait-station system.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]** <Insert location>.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include the EPA-Registered Label for termiticide products.

1.4 INFORMATIONAL SUBMITTALS

- A. Product certificates.

- B. Soil Treatment Application Report: Include the following:

1. Date and time of application.
2. Moisture content of soil before application.
3. Termiticide brand name and manufacturer.
4. Quantity of undiluted termiticide used.
5. Dilutions, methods, volumes used, and rates of application.
6. Areas of application.
7. Water source for application.

- C. Bait-Station System Installation Report: Include the following:

1. Location of areas and sites conducive to termite feeding and activity.
2. Plan drawing showing number and locations of bait stations.
3. Dated report for each monitoring and inspection occurrence, indicating level of termite activity, procedure, and treatment applied before time of Substantial Completion.
4. Termiticide brand name and manufacturer.
5. Quantities of **[termiticide]** **[and]** **[nontoxic termite bait]** used.
6. Schedule of inspections for one year from date of Substantial Completion.

- D. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located and who employs workers trained and approved by manufacturer to install manufacturer's products.

1.6 WARRANTY

- A. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work consisting of applied soil termiticide treatment will prevent infestation of subterranean termites[, **including Formosan termites (*Coptotermes formosanus*)**] **<Insert requirement>**. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
 - 1. Warranty Period: [**Three**] [**Five**] **<Insert number>** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT

- A. Termiticide: EPA-Registered termiticide acceptable to authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
 - 2. Service Life of Treatment: Soil treatment termiticide that is effective for not less than [**three**] [**five**] **<Insert number>** years against infestation of subterranean termites.

2.2 BAIT-STATION SYSTEM

- A. Description: EPA-Registered system acceptable to authorities having jurisdiction. Provide bait stations based on the dimensions of building perimeter indicated on Drawings, according to product's EPA-Registered Label and manufacturer's written instructions.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Remove extraneous sources of wood cellulose and other edible materials, such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.
- B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated.

3.2 APPLYING SOIL TREATMENT

- A. Application: Mix soil treatment termiticide solution to a uniform consistency. Distribute treatment uniformly. Apply treatment at the product's EPA-Registered Label volume and rate for maximum specified concentration of termiticide to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction.
 - 1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
 - 2. Foundations: Soil adjacent to and along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing.
 - 3. Crawlspace: Soil under and adjacent to foundations. Treat adjacent areas, including around entrance platform, porches, and equipment bases. Apply overall treatment only where attached concrete platform and porches are on fill or ground.
 - 4. Masonry: Treat voids.
 - 5. Penetrations: At expansion joints, control joints, and areas where slabs and below-grade walls will be penetrated.
- B. Post warning signs in areas of application.
- C. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

3.3 INSTALLING BAIT-STATION SYSTEM

- A. Bait-Station System: Install [**during construction to determine areas of termite activity**] [**and**] [**after construction, including landscaping, is completed**].
- B. Place bait stations according to product's EPA-Registered Label and manufacturer's written instructions, in the following locations:
 - 1. Conducive sites and locations indicated on Drawings.
 - 2. In and around infested trees and stumps.

3. In mulch beds.
4. Where wood directly contacts soil.
5. Areas of high soil moisture.
6. Near irrigation sprinkler heads.
7. Each area where roof drainage system, including downspouts and scuppers, drains to soil.
8. Along driplines of roof overhangs without gutters.
9. Where condensate lines from mechanical equipment drip or drain to soil.
10. At plumbing penetrations through ground-supported slabs.
11. Other sites and locations as determined by licensed Installer.

END OF SECTION 313116

SECTION 31 31 16
TERMITE CONTROL

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Soil treatment for termite control.
- B. Related Sections:
 - 1. Section 310513 - Soils for Earthwork: Backfill materials.
 - 2. Section 312316 - Excavation and Fill: Subgrade preparation.
 - 3. Section 033000 - Cast-In-Place Concrete: Slabs on grade and foundations placed over treated soil.

1.2 REFERENCES

- A. Environmental Protection Agency:
 - 1. EPA FIFRA - Federal Insecticide, Fungicide and Rodenticide Act.
- B. National Pest Management Association:
 - 1. NPMA WDO - Wood Destroying Organism Library.

1.3 SUBMITTALS

- A. Product Data: Submit toxicants to be used, composition by percentage, dilution schedule, intended application rate. Include product label information.
- B. Test Reports: Indicate regulatory agency approval reports.
- C. Manufacturer's Application Instructions: Indicate caution requirements and in accordance with current product label of chosen pesticide.
- D. Certify applications followed NPMA WDO for termite control or other regional location guidance.

1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record moisture content of soil before application, date and rate of application, areas of application, diary of toxicity meter readings and corresponding soil coverage.
- B. Operation and Maintenance Data: Indicate re-treatment schedule.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.
- B. Applicator: Company specializing in performing the Work of this section and licensed in State of Texas.

1.6 SEQUENCING

- A. Section 011000 - Summary: Work sequence.
- B. Apply toxicant immediately prior to installation of vapor barrier under slabs-on-grade in accordance with product label supplemented by the NPCA's ARP for termiticiding or local requirements.

1.7 WARRANTY

- A. Warranty: Include coverage for damage and repairs to building and building contents caused by termites. Repair damage. Re-treat where required.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Toxicant Chemical: EPA FIFRA approved; synthetically color dyed to permit visual identification of treated soil.
- B. Diluent: Recommended by toxicant manufacturer.

2.2 MIXES

- A. Mix toxicant to manufacturer's instructions.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 013000 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.
- C. Verify final grading and excavation are complete.

3.2 APPLICATION

- A. Apply toxicant at locations indicated in Schedule at end of section.
- B. Apply extra treatment to structure penetration surfaces including pipe or ducts, and soil penetrations including grounding rods or posts.
- C. Re-treat disturbed treated soil with same toxicant as original treatment.
- D. When inspection or testing identifies presence of termites, re-treat soil and re-test.

3.3 PROTECTION OF FINISHED WORK

- A. Section 017000 - Execution Requirements: Protecting finished Work.
- B. Do not permit soil grading over treated work.

END OF SECTION 313116

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SECTION 315100

TRENCH PROTECTION SYSTEM

PART 1 - GENERAL

- 1.0 THE GENERAL CONDITIONS, SPECIAL PROVISIONS and applicable requirements of DIVISION 1 - GENERAL REQUIREMENTS are hereby made a part of this section.
- 1.1 SCOPE: This section covers excavation and supporting systems for trenches necessary to protect the safety of workers. This specification shall govern for construction of all types of trenches except where the requirements of this section are explicitly revised or superseded by another section. Additional requirements as set forth by federal, state, and local government regulations will be applicable and must be followed. The contractor shall be responsible for the design, placement, and inspection of all trench safety systems in conformance with the Occupational Safety and Health Administration (OSHA) standards as contained in Subpart P, Part 1926, Title 29 of the Code of Federal Regulations (29 CFR 1926). Other OSHA construction standards shall also apply.
- 1.2 No boring logs are provided in these documents for subsurface conditions at the site. It is the Contractor's responsibility to determine and evaluate soil conditions at the site and design adequate trench safety systems. The Contractor will be responsible for detecting varying soil conditions which may be hazardous and take appropriate action. The contractor, at his expense, shall be responsible for obtaining any geological data required for his design of the trench safety system.
- 1.3 APPLICABILITY: These specifications apply to any trench excavation which is over five (5) feet in depth from the ground surface, or trench excavations that are less than five (5) feet in depth located in areas where unstable soil conditions are present (Ref. OSHA Safety and Health Regulations, Part 1926, Subpart P, Paragraph 29 CFR 1926.652, Subparagraph (a)).
- 1.4 LIABILITY: It is the Contractor's responsibility that all excavation work and site conditions are within the regulations as established by OSHA. Any property damage or bodily injury (including death) that arises from use of the trench safety systems, from the Contractor's negligence in performance of the contract work, shall remain the sole responsibility and liability of the Contractor.
- 1.5 EXISTING UNDERGROUND INSTALLATIONS: Underground installations are shown in approximate locations on the Drawings. It is the Contractors responsibility to verify the size, locations and elevations of all existing utilities in the construction area prior to commencement of excavation operations.
- 1.6 SURCHARGE LOADS: The Contractor's trench safety system shall be designed to take into account all surcharge loads including, but not limited to adjacent structures, contractor's equipment and heavily loaded truck traffic which will be routed near the work site.

PART 2 - MEASUREMENT & PAYMENT

- 2.1 MEASUREMENT: Trench Excavation Protection shall be measured by the lump sum for the trenching and excavations shown or implied in the plans.
- 2.2 PAYMENT: Payment for Trench Excavation Protection, measured as prescribed above, shall be

made at the unit price bid for "Trench Excavation Protection".

- A. Payment shall include all components for design and construction of the Trench Protection System which can include, but not be limited to sloping, sheeting, trench boxes or trench shields, sheet piling, cribbing, bracing, shoring, dewatering or diversion of water to provide adequate drainage. Payment shall also include the additional excavation and backfill required, any jacking, jack removal, and removal of the trench supports after completion.
- B. Payment of all work prescribed under this item shall be full compensation for all additional excavation and backfill; for furnishing, placing and removing all shoring, sheeting, or bracing; for dewatering or diversion of water; for all jacking and jack removal; and for all other labor, materials, tools, equipment and incidentals necessary to complete the work.

END OF SECTION 315100

SECTION 321216

DENSE-GRADED HOT-MIX ASPHALT (METHOD)

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. Construct a pavement layer composed of a compacted, dense-graded mixture of aggregate and asphalt binder mixed hot in a mixing plant.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Furnish uncontaminated materials of uniform quality that meet the requirements of the plans and specifications. Notify the Engineer of all material sources. Notify the Engineer before changing any material source or formulation. When the Contractor makes a source or formulation change, the Engineer will verify that the requirements of this Item are met and may require a new laboratory mixture design, trial batch, or both. The Engineer may sample and test project materials at any time during the project to verify compliance.
- B. Aggregate. Furnish aggregates from sources that conform to the requirements shown in Table 1, and as specified in this Section, unless otherwise shown on the plans. Provide aggregate stockpiles that meet the definition in this Section for either coarse aggregate or fine aggregate. When reclaimed asphalt pavement (RAP) is allowed by plan note, provide RAP stockpiles in accordance with this Section. Aggregate from RAP is not required to meet Table 1 requirements unless otherwise shown on the plans. Supply mechanically crushed gravel or stone aggregates that meet the definitions in Tex-100-E. The Engineer will designate the plant or the quarry as the sampling location. Samples must be from materials produced for the project. The Engineer will establish the surface aggregate classification (SAC) and perform Los Angeles abrasion, magnesium sulfate soundness, and Micro-Deval tests. Perform all other aggregate quality tests listed in Table 1. Document all test results on the mixture design report. The Engineer may perform tests on independent or split samples to verify Contractor test results. Stockpile aggregates for each source and type separately. Determine aggregate gradations for mixture design and production testing based on the washed sieve analysis given in Tex-200-F, Part II. Do not add material to an approved stockpile from sources that do not meet the aggregate quality requirements of the Department's *Bituminous Rated Source Quality Catalog* (BRSQC) unless otherwise approved.
 1. Coarse Aggregate. Coarse aggregate stockpiles must have no more than 20% material passing the No. 8 sieve. Provide aggregates from sources listed in the BRSQC. Provide aggregate from nonlisted sources only when tested by the Engineer and approved before use. Allow 30 calendar days for the Engineer to sample, test, and report results for nonlisted sources.
Provide coarse aggregate with at least the minimum SAC shown on the plans. SAC requirements apply only to aggregates used on the surface of travel lanes, unless otherwise shown on the plans. The SAC for sources on the Department's AQMP is listed in the BRSQC.

Class B aggregate meeting all other requirements in Table 1 may be blended with a Class A aggregate in order to meet requirements for Class A materials. When blending Class A and B aggregates to meet a Class A requirement, ensure that at least 50% by weight of the material retained on the No. 4 sieve comes from the Class A aggregate source. Blend by volume if the bulk specific gravities of the Class A and B aggregates differ by more than 0.300. When blending, do not use Class C or D aggregates. For blending purposes, coarse aggregate from RAP will be considered as Class B aggregate.

2. RAP. RAP is salvaged, milled, pulverized, broken, or crushed asphalt pavement. Crush or break RAP so that 100% of the particles pass the 2-in. sieve.
RAP from either Contractor- or Department-owned sources, including RAP generated during the project, is permitted only when shown on the plans. Department-owned RAP, if allowed for use, will be available at the location shown on the plans. When RAP is used, determine asphalt content and gradation for mixture design purposes. Perform other tests on RAP when shown on the plans.

When RAP is allowed by plan note, use no more than 30% RAP in Type A or B mixtures unless otherwise shown on the plans. For all other mixtures, use no more than 20% RAP unless otherwise shown on the plans.

Do not use RAP contaminated with dirt or other objectionable materials. Do not use the RAP if the decantation value exceeds 5% and the plasticity index is greater than 8. Test the stockpiled RAP for decantation in accordance with the laboratory method given in Tex-406-A, Part I. Determine the plasticity index using Tex-106-E if the decantation value exceeds 5%. The decantation and plasticity index requirements do not apply to RAP samples with asphalt removed by extraction.

Do not intermingle Contractor-owned RAP stockpiles with Department-owned RAP stockpiles. Remove unused Contractor-owned RAP material from the project site upon completion of the project. Return unused Department-owned RAP to the designated stockpile location.

3. Fine Aggregate. Fine aggregates consist of manufactured sands, screenings, and field sands. Fine aggregate stockpiles must meet the gradation requirements in Table 2. Supply fine aggregates that are free from organic impurities. The Engineer may test the fine aggregate in accordance with Tex-408-A to verify the material is free from organic impurities. At most 15% of the total aggregate may be field sand or other uncrushed fine aggregate. With the exception of field sand, use fine aggregate from coarse aggregate sources that meet the requirements shown in Table 1, unless otherwise approved. If 10% or more of the stockpile is retained on the No. 4 sieve, test the stockpile and verify that it meets the requirements in Table 1 for coarse aggregate angularity (Tex-460-A) and flat and elongated particles (Tex-280-F).

Table 1
Aggregate Quality Requirements

Property	Test Method	Requirement
Coarse Aggregate		
SAC	AQMP	As shown on plans
Deleterious material, %, max	Tex-217-F, Part I	1.5
Decantation, %, max	Tex-217-F, Part II	1.5
Micro-Deval abrasion, %, max	Tex-461-A	Note 1
Los Angeles abrasion, %, max	Tex-410-A	40
Magnesium sulfate soundness, 5 cycles, %, max	Tex-411-A	30 ²
Coarse aggregate angularity, 2 crushed faces, %, min	Tex 460-A, Part I	85 ³
Flat and elongated particles @ 5:1, %, max	Tex-280-F	10
Fine Aggregate		
Linear shrinkage, %, max	Tex-107-E	3
Combined Aggregate⁴		
Sand equivalent, %, min	Tex-203-F	45

1. Not used for acceptance purposes. Used by the Engineer as an indicator of the need for further investigation.
2. Unless otherwise shown on the plans.
3. Unless otherwise shown on the plans. Only applies to crushed gravel.
4. Aggregates, without mineral filler, RAP, or additives, combined as used in the job-mix formula (JMF).

Table 2
Gradation Requirements for Fine Aggregate

Sieve Size	% Passing by Weight or Volume
3/8"	100
#8	70–100
#200	0–30

- C. Mineral Filler. Mineral filler consists of finely divided mineral matter such as agricultural lime, crusher fines, hydrated lime, cement, or fly ash. Mineral filler is allowed unless otherwise shown on the plans. Do not use more than 2% hydrated lime or cement, unless otherwise shown on the plans. The plans may require or disallow specific mineral fillers. When used, provide mineral filler that:
- is sufficiently dry, free-flowing, and free from clumps and foreign matter;
 - does not exceed 3% linear shrinkage when tested in accordance with Tex-107-E; and
 - meets the gradation requirements in Table 3:

Table 3
Gradation Requirements for Mineral Filler

Sieve Size	% Passing by Weight or Volume
#8	100
#200	55–100

- D. Baghouse Fines. Fines collected by the baghouse or other dust-collecting equipment may be reintroduced into the mixing drum.
- E. Asphalt Binder. Furnish the type and grade of performance-graded (PG) asphalt binder specified on the plans in accordance with Section 300.2.J, “Performance-Graded Binders.”
- F. Tack Coat. Unless otherwise shown on the plans or approved, furnish CSS-1H, SS-1H, or a PG binder with a minimum high-temperature grade of PG 58 for tack coat binder in accordance with Item 300, “Asphalts, Oils, and Emulsions.” Do not dilute emulsified asphalts at the terminal, in the field, or at any other location before use. If required, verify that emulsified asphalt proposed for use meets the minimum residual asphalt percentage specified in Item 300, “Asphalts, Oils, and Emulsions.” The Engineer will obtain at least 1 sample of the tack coat binder per project and test it to verify compliance with Item 300. The Engineer will obtain the sample from the asphalt distributor immediately before use.
- G. Additives. When shown on the plans, use the type and rate of additive specified. Other additives that facilitate mixing or improve the quality of the mixture may be allowed when approved. If lime or a liquid antistripping agent is used, add in accordance with Item 301, “Asphalt Antistripping Agents.” Do not add lime directly into the mixing drum of any plant where lime is removed through the exhaust stream unless the plant has a baghouse or dust collection system that reintroduces the lime back into the drum.

2.2 EQUIPMENT

- A. Provide required or necessary equipment in accordance with Item 320, “Equipment for Asphalt Concrete Pavement.”

PART 3 - EXECUTION

3.1 CONSTRUCTION

- A. Design, produce, store, transport, place, and compact the specified paving mixture in accordance with the requirements of this Item. Unless otherwise shown on the plans, provide the mix design. The Department will perform quality assurance (QA) testing. Provide quality control (QC) testing as needed to meet the requirements of this Item.
- B. Mixture Design:
 - 1. Design Requirements. Use a Level II specialist certified by a Department-approved hot-mix asphalt certification program to develop the mixture design. Have the Level II specialist sign the design documents. Unless otherwise shown on the plans, use the typical weight design example given in Tex-204-F, Part I, to design a mixture meeting the requirements listed in Tables 1 through 6. Use an approved laboratory to perform the Hamburg Wheel test and provide results with the mixture design, or provide the laboratory mixture and

request that the Department perform the Hamburg Wheel test. The Construction Division maintains a list of approved laboratories. Furnish the Engineer with representative samples of all materials used in the mixture design. The Engineer will verify the mixture design. If the design cannot be verified by the Engineer, furnish another mixture design. The Contractor may submit a new mixture design at any time during the project. The Engineer will approve all mixture designs before the Contractor can begin production. Provide the Engineer with a mixture design report using Department-provided software. Include the following items in the report:

- the combined aggregate gradation, source, specific gravity, and percent of each material used;
- results of all applicable tests;
- the mixing and molding temperatures;
- the signature of the Level II person or persons who performed the design;
- the date the mixture design was performed; and
- a unique identification number for the mixture design.

Table 4
Master Gradation Bands (% Passing by Weight or Volume)
and Volumetric Properties

Sieve Size	A Coarse Base	B Fine Base	C Coarse Surface	D Fine Surface	F Fine Mixture
1-1/2"	98.0–100.0	–	–	–	–
1"	78.0–94.0	98.0–100.0	–	–	–
3/4"	64.0–85.0	84.0–98.0	95.0–100.0	–	–
1/2"	50.0–70.0	–	–	98.0–100.0	–
3/8"	–	60.0–80.0	70.0–85.0	85.0–100.0	98.0–100.0
#4	30.0–50.0	40.0–60.0	43.0–63.0	50.0–70.0	80.0–86.0
#8	22.0–36.0	29.0–43.0	32.0–44.0	35.0–46.0	38.0–48.0
#30	8.0–23.0	13.0–28.0	14.0–28.0	15.0–29.0	12.0–27.0
#50	3.0–19.0	6.0–20.0	7.0–21.0	7.0–20.0	6.0–19.0
#200	2.0–7.0	2.0–7.0	2.0–7.0	2.0–7.0	2.0–7.0
Design VMA¹, % Minimum					
–	12.0	13.0	14.0	15.0	16.0
Plant-Produced VMA, % Minimum					
–	11.0	12.0	13.0	14.0	15.0

1. Voids in Mineral Aggregates.

Table 5
Laboratory Mixture Design Properties

Property	Test Method	Requirement
Target laboratory-molded density, %	Tex-207-F	96.0 ¹
Tensile strength (dry), psi (molded to 93% ±1% density)	Tex-226-F	85–200 ²
Boil test ³	Tex-530-C	–

1. Unless otherwise shown on the plans.
2. May exceed 200 psi when approved and may be waived when approved.
3. Used to establish baseline for comparison to production results. May be waived when approved.

Table 6
Hamburg Wheel Test Requirements¹

High-Temperature Binder Grade	Minimum # of Passes² @ 0.5" Rut Depth, Tested @ 122°F
PG 64 or lower	10,000
PG 70	15,000
PG 76 or higher	20,000

1. Tested in accordance with Tex-242-F.
2. May be decreased or waived when shown on the plans.

- C. **Job-Mix Formula Approval.** The job-mix formula (JMF) is the combined aggregate gradation and target asphalt percentage used to establish target values for mixture production. JMF is the original laboratory mixture design used to produce the trial batch. The Engineer and the Contractor will verify JMF based on plant-produced mixture from the trial batch unless otherwise approved. The Engineer may accept an existing mixture design previously used on a Department project and may waive the trial batch to verify JMF. If the JMF is not verified by the Engineer from the trial batch, adjust the JMF or redesign the mix and produce as many trial batches as necessary to verify the JMF.

Provide the Engineer with split samples of the mixtures and blank samples used to determine the ignition oven correction factors. The Engineer will determine the aggregate and asphalt correction factors from the ignition oven using Tex-236-F.

The Engineer will use a Texas gyratory compactor calibrated in accordance with Tex-914-F in molding production samples.

The Engineer will perform Tex-530-C and retain the tested sample for comparison purposes during production. The Engineer may waive the requirement for the boil test.

- D. **JMF Field Adjustments.** Produce a mixture of uniform composition closely conforming to the approved JMF.

If, during initial days of production, the Contractor or Engineer determines that adjustments to the JMF are necessary to achieve the specified requirements, or to more nearly match the

aggregate production, the Engineer may allow adjustment of the JMF within the tolerances of Table 7 without a laboratory redesign of the mixture.

The Engineer will adjust the asphalt content to maintain desirable laboratory density near the optimum value while achieving other mix requirements.

Table 7
Operational Tolerances

Description	Test Method	Allowable Difference from JMF Target
Individual % retained for #8 sieve and larger	Tex-200-F or Tex-236-F	±5.0 ¹
Individual % retained for sieves smaller than #8 and larger than #200		±3.0 ¹
% passing the #200 sieve		±2.0 ¹
Asphalt content, %	Tex-236-F	±0.3 ¹
Laboratory-molded density, %	Tex-207-F	±1.0
VMA, %, min		Note 2

1. When within these tolerances, mixture production gradations may fall outside the master grading limits; however, the percent passing the #200 sieve will be considered out of tolerance when outside the master grading limits.

2. Test and verify that Table 4 requirements are met.

- E. Production Operations. Perform a new trial batch when the plant or plant location is changed. The Engineer may suspend production for noncompliance with this Item. Take corrective action and obtain approval to proceed after any production suspension for noncompliance.

1. Operational Tolerances. During production, do not exceed the operational tolerances in Table 7. Stop production if testing indicates tolerances are exceeded on:

- 3 consecutive tests on any individual sieve,
- 4 consecutive tests on any of the sieves, or
- 2 consecutive tests on asphalt content.

Begin production only when test results or other information indicate, to the satisfaction of the Engineer, that the next mixture produced will be within Table 7 tolerances.

2. Storage and Heating of Materials. Do not heat the asphalt binder above the temperatures specified in Item 300, “Asphalts, Oils, and Emulsions” or outside the manufacturer’s recommended values. On a daily basis, provide the Engineer with the records of asphalt binder and hot-mix asphalt discharge temperatures in accordance with Item 320, “Equipment for Asphalt Concrete Pavement.” Unless otherwise approved, do not store mixture for a period long enough to affect the quality of the mixture, nor in any case longer than 12 hr.

3. Mixing and Discharge of Materials. Notify the Engineer of the target discharge temperature and produce the mixture within 25°F of the target. Monitor the temperature of the material in the truck before shipping to ensure that it does not exceed 350°F. The Department will not pay for or allow placement of any mixture produced at more than 350°F. Control the

mixing time and temperature so that substantially all moisture is removed from the mixture before discharging from the plant.

F. Hauling Operations. Before use, clean all truck beds to ensure mixture is not contaminated.

When a release agent is necessary to coat truck beds, use a release agent on the approved list maintained by the Construction Division.

G. Placement Operations. Prepare the surface by removing raised pavement markers and objectionable material such as moisture, dirt, sand, leaves, and other loose impediments from the surface before placing mixture. Remove vegetation from pavement edges. Place the mixture to meet the typical section requirements and produce a smooth, finished surface with a uniform appearance and texture. Offset longitudinal joints of successive courses of hot mix by at least 6 in. Place mixture so longitudinal joints on the surface course coincide with lane lines, or as directed. Ensure that all finished surfaces will drain properly. Place mixture within the compacted lift thickness shown in Table 8, unless otherwise shown on the plans or allowed.

Table 8
Compacted Lift Thickness and Required Core Height

Mixture Type	Compacted Lift Thickness	
	Minimum (in.)	Maximum (in.)
A	3.00	6.00
B	2.50	5.00
C	2.00	4.00
D	1.50	3.00
F	1.25	2.50

1. Weather Conditions. Place mixture when the roadway surface temperature is 60°F or higher unless otherwise approved. Measure the roadway surface temperature with a handheld infrared thermometer. Unless otherwise shown on the plans, place mixtures only when weather conditions and moisture conditions of the roadway surface are suitable in the opinion of the Engineer.

2. Tack Coat. Clean the surface before placing the tack coat. Unless otherwise approved, apply tack coat uniformly at the rate directed by the Engineer. The Engineer will set the rate between 0.04 and 0.10 gal. of residual asphalt per square yard of surface area. Apply a thin, uniform tack coat to all contact surfaces of curbs, structures, and all joints. Prevent splattering of tack coat when placed adjacent to curb, gutter, and structures. Roll the tack coat with a pneumatic-tire roller when directed. The Engineer may use Tex-243-F to verify that the tack coat has adequate adhesive properties. The Engineer may suspend paving operations until there is adequate adhesion.

H. Lay-Down Operations.

1. Minimum Mixture Placement Temperatures. Use Table 9 for suggested minimum mixture placement temperatures.

2. Windrow Operations. When hot mix is placed in windrows, operate windrow pickup equipment so that substantially all the mixture deposited on the roadbed is picked up and loaded into the paver.

Table 9
Suggested Minimum Mixture Placement Temperature

High-Temperature Binder Grade	Minimum Placement Temperature (Before Entering Paver)
PG 64 or lower	260°F
PG 70	270°F
PG 76	280°F
PG 82 or higher	290°F

- I. Compaction. Use air void control unless ordinary compaction control is specified on the plans. Avoid displacement of the mixture. If displacement occurs, correct to the satisfaction of the Engineer. Ensure pavement is fully compacted before allowing rollers to stand on the pavement. Unless otherwise directed, use only water or an approved release agent on rollers, tamps, and other compaction equipment. Keep diesel, gasoline, oil, grease, and other foreign matter off the mixture. Unless otherwise directed, operate vibratory rollers in static mode when not compacting, when changing directions, or when the plan depth of the pavement mat is less than 1-1/2 in.

Use tamps to thoroughly compact the edges of the pavement along curbs, headers, and similar structures and in locations that will not allow thorough compaction with the rollers. The Engineer may require rolling with a trench roller on widened areas, in trenches, and in other limited areas.

Allow the compacted pavement to cool to 160°F or lower before opening to traffic unless otherwise directed. When directed, sprinkle the finished mat with water or limewater to expedite opening the roadway to traffic.

1. Air Void Control. Compact dense-graded hot-mix asphalt to contain from 5% to 9% in-place air voids. Do not increase the asphalt content of the mixture to reduce pavement air voids.
 - a. Rollers. Furnish the type, size, and number of rollers required for compaction, as approved. Use a pneumatic-tire roller to seal the surface, unless otherwise shown on the plans. Use additional rollers as required to remove any roller marks.
 - b. Air Void Determination. Unless otherwise shown on the plans, obtain 2 roadway specimens at each location selected by the Engineer for in-place air void determination. The Engineer will measure air voids in accordance with Tex-207-F and Tex-227-F. Before drying to a constant weight, cores may be predried using a Corelok or similar vacuum device to remove excess moisture. The Engineer will use the average air void content of the 2 cores to calculate the in-place air voids at the selected location.
 - c. Air Voids Out of Range. If the in-place air void content in the compacted mixture is below 5% or greater than 9%, change the production and placement operations to bring the in-place air void content within requirements. The Engineer may suspend production until the in-place air void content is brought to the required level, and may require a test section as described in Section 340.4.H.1.d, "Test Section."
 - d. Test Section. Construct a test section of 1 lane-width and at most 0.2 mi. in length to demonstrate that compaction to between 5% and 9% in-place air voids can be obtained. Continue this procedure until a test section with 5% to 9% in-place air voids can be produced. The Engineer will allow only 2 test sections per day. When a test section producing satisfactory in-place air void content is placed, resume full production.

2. Ordinary Compaction Control. Furnish the type, size, and number of rollers required for compaction, as approved. Furnish at least 1 medium pneumatic-tire roller (minimum 12-ton weight). Use the control strip method given in Tex-207-F, Part IV, to establish rolling patterns that achieve maximum compaction. Follow the selected rolling pattern unless changes that affect compaction occur in the mixture or placement conditions. When such changes occur, establish a new rolling pattern. Compact the pavement to meet the requirements of the plans and specifications.

When rolling with the 3-wheel, tandem or vibratory rollers, start by first rolling the joint with the adjacent pavement and then continue by rolling longitudinally at the sides.

Proceed toward the center of the pavement, overlapping on successive trips by at least 1 ft., unless otherwise directed. Make alternate trips of the roller slightly different in length. On superelevated curves, begin rolling at the low side and progress toward the high side unless otherwise directed.

- J. Irregularities. Immediately take corrective action if surface irregularities, including but not limited to segregation, rutting, raveling, flushing, fat spots, mat slippage, color, texture, roller marks, tears, gouges, streaks, or uncoated aggregate particles, are detected. The Engineer may suspend production or placement operations until the problem is corrected.

At the expense of the Contractor and to the satisfaction of the Engineer, remove and replace any mixture that does not bond to the existing pavement or that has other surface irregularities identified above.

- K. Ride Quality. Use Surface Test Type A to evaluate ride quality in accordance with Item 585, "Ride Quality for Pavement Surfaces," unless otherwise shown on the plans.

END OF SECTION 321216

SECTION 321220

PAVING, REPAIR, AND RESURFACING

PART - GENERAL

1.1 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to repair and resurface pavement. This section shall govern for the repair or replacement of pavement or other improved surfaces damaged or destroyed in performing the construction of water and sewer lines. Construction of such projects below pavement subgrade is covered by Section 312200 TRENCH, EXCAVATION, BACKFILL, AND COMPACTION.

1.2 SUBMITTALS

- A. Submittals shall be in accordance with Section 01330, SUBMITTALS and shall include:
 - 1. Proposed material list and sources
 - 2. Experience record of proposed paving subcontractor

1.3 STANDARDS

- A. The applicable provisions of the following standards shall apply as if written here in their entirety:
 - 1. Texas Department of Transportation (TxDOT), Standard Specifications for Construction of Highways, Streets, and Bridges, latest edition.

1.4 JOB CONDITIONS

- A. Do not place materials when, in the opinion of the Engineer, weather conditions are unsuitable. Do not place concrete when the temperature is 40 degrees F and falling. Concrete may be placed when temperature is above 35 degrees F and rising. Do not place asphalt or asphaltic concrete when the temperature is below 50 degrees F and falling. Asphalt or asphaltic concrete may be placed when temperature is above 40 degrees F and rising.

PART 2 - PRODUCTS

2.1 MATERIALS

A. CONCRETE PAVEMENT

- 1. CONCRETE: 3,500 psi.
- 2. REINFORCING STEEL: Of the same size and spacing as in the existing concrete pavement unless otherwise indicated. New billet steel, deformed bars, conforming to ASTM A615, Grade 60.

B. ASPHALT PAVEMENT

1. HOT MIX ASPHALTIC CONCRETE
 - a. HMAC Surface Course: Conforming to TxDOT Standard Specifications, Item 340, Type D.
 - b. Asphaltic Materials Used in the Mix: Conforming to TxDOT Standard Specifications, Item 300. The grade of asphalt shall be AC-20. Other grades of asphalt will be considered if weather conditions or mix design appear to warrant a change.
 - c. AGGREGATE: Conforming to TxDOT Standard Specification, Item 340.2.
 - d. PRIME COAT: Conforming to TxDOT Standard Specifications, Item 300, Grade MC-30, or an appropriate asphalt emulsion.
 - e. TACK COAT: Cut-back asphalt RC-2 or MC-2 conforming to ASTM D598, unless otherwise approved by the Engineer.
2. TWO-COURSE SURFACE TREATMENT: Conforming to TxDOT Standard Specifications, Item 316. Asphaltic materials shall conform to TxDOT Standard Specifications, Item 300, AC-10 for hot weather and AC-5 for cooler weather. Aggregates shall conform to TxDOT Standard Specifications, Item 302. First course shall be Grade 1 and second course shall be Grade 2.
3. FLEXIBLE BASE: Of the depth and to the extent shown on the plans. Unless otherwise shown on plans, flexible base shall be one (1) or more of the following listed options:
 - a. Flexible Base Material: Conforming to TxDOT Standard Specifications, Item 247, Type A, B, C, or D, Grade 1 or Grade 2.
 - b. Full Depth Asphaltic Concrete: Conforming to TxDOT Standard Specifications, Item 340, Type A, B, or C.

PART 3 - EXECUTION

3.1 PREPARATION

A. CONCRETE PAVEMENT

Cut pavement in parallel straight lines a minimum of 1' outside trench walls on each side to permit pavement removal before trench excavation. Make cuts by sawing partial pavement depth to avoid cutting reinforcing steel. After concrete pavement is broken up and removed, cut off existing reinforcing steel to provide a minimum of 30 bar diameters lap with new reinforcing steel on each side and bent back to clear the trench for excavation and pipe laying.

B. ASPHALT PAVEMENT

Cut paved surface in parallel straight lines outside trench walls prior to trench excavation. Before pavement replacement has begun, make additional straight line cuts and remove pavement a minimum of 1' outside trench walls.

C. SUBGRADE

The subgrade, including granular trench backfill, shall be approved by the Engineer before any base or pavement surface is replaced. Moisten, reshape, and re-compact subgrade as necessary to receive the base material.

3.2 INSTALLATION

A. CONCRETE PAVEMENT REPLACEMENT

1. Install reinforcing steel on the approved subgrade and securely tie in place. Bend down existing reinforcing into proper position and securely tie each bar to new reinforcing bars. Support and tie reinforcing to steel bar chairs or other suitable supporting devices. New reinforcement shall be of equal size and spacing to existing steel, unless otherwise indicated. Install substantial forms to proper grade at pavement edges.
2. Rapidly deposit concrete on the subgrade in successive batches and distribute to the required depth and for the entire width of the pavement by shoveling or other approved methods. Do not use rakes in handling concrete. The placing operation shall be continuous. Level the concrete, as soon as placed, and then struck off and screed to such elevation above grade that when consolidated and finished the surface of the pavement shall be at the proper elevation. Tamp the entire surface and consolidate the concrete so as to insure maximum compaction and a minimum of voids.
3. After final floating and while the concrete is still workable, finish the surface to provide a uniform surface of gritty texture by brooming, use of belting, burlap drags or other approved methods.
4. Cure the concrete with an approved curing compound or other approved means. Concrete pavement shall not be opened to traffic until it has gained sufficient strength to withstand traffic without damage unless approved protective devices are provided. Concrete pavement at an age of seven (7) days or a strength of 2,000 psi may be opened to traffic.

B. FLEXIBLE BASE

1. Where the base course exceeds 6" in thickness, construct the flexible base in two (2) or more courses of equal thickness. Wet, manipulate, and compact material to 95% maximum density as determined by ASTM D698. Where deemed necessary by the Engineer, apply a uniform application of prime coat asphaltic material to the surface of the prepared subgrade, applied at a rate of not less than 0.30 gallon per square yard of surface.
2. Where plant mix asphalt material is used for base, construction shall be in accordance with TxDOT Standard Specifications, Item 351, as applicable to small areas.

C. ASPHALT PAVEMENT REPLACEMENT

1. **HOT MIX ASPHALTIC CONCRETE:** Apply prime coat to base or tack coat base as indicated. Coat contact surfaces of pavement edges and structures with asphalt before any pavement is placed. Do not place pavement until the Engineer has approved the base. Hauling or transporting of the material to the project site, placing, compaction, and shaping shall be in accordance with TxDOT Standard Specification Item 340.6 as applicable for small areas. After final compaction of the pavement, no vehicular traffic of any kind shall be permitted until the pavement has cooled and hardened for at least six (6) hours. Smooth the finished surface course, upon completion of final rolling true to grade and cross section. Immediately correct low or defective areas by cutting out the faulty areas and replacing with fresh, hot mixture. Compact the area to conform to the remainder of the pavement.
2. **TWO-COURSE ASPHALT SURFACE TREATMENT:** On the approved surface of the finished base, asphalt at the rate of 0.20 to 0.30 gallons per square yard shall be applied by an approved distributor so operated to result in a uniform, proper distribution at the correct temperature. Immediately cover the surface with No. 1 aggregate, distribute at a rate of one

cubic yard per 80 square yards, broom as necessary for uniform distribution, and roll with a flat wheel roller of ample weight. Make a second application of asphalt in the manner specified for the first application, at a rate of 0.30 to 0.40 gallon per square yard. Make the second application with No. 2 aggregate at a rate of one cubic yard per 110 square yards and process as specified for the first application. After the work has been completed, there should be a slight excess of aggregate on the surface.

D. OTHER IMPROVED SURFACES

Where water, storm drains, or sewer lines to be constructed traverse or cross through gravel surfaced public roads or shoulders, or private dirt or gravel driveways or parking areas, replace the surface with a quality material, workmanship and at a thickness at least equal to the existing surfaces.

END OF SECTION 321220

SECTION 321260

ASPHALTS, OILS, AND EMULSIONS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide asphalt cements, cutback and emulsified asphalts, performance-graded asphalt binders, and other miscellaneous asphalt materials as specified on the plans.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Provide asphalt materials that meet the stated requirements when tested in accordance with the referenced Department, AASHTO, and ASTM test methods. Refer to the Material Inspection Guide (maintained by the Construction Division), Section 11. "Asphalt Inspection, Quality Control and Quality Assurance," for sampling and testing requirements. Acronyms used in this Item are defined in Table 1.

Table 1
Acronyms

Acronym	Definition
Test Procedure Designations	
Tex T or R D	Department AASHTO ASTM
Polymer Modifier Designations	
P SBR or L SBS TR	polymer-modified styrene-butadiene rubber (latex) styrene-butadiene-styrene block co-polymer tire rubber (from ambient temperature grinding of truck and passenger tires)
AC	asphalt cement
AE	asphalt emulsion
AE-P	asphalt emulsion prime
A-R	asphalt-rubber
C	cationic
EAP&T	emulsified asphalt prime and tack
H-suffix	harder residue (lower penetration)
HF	high float
MC	medium-curing

Table 1 (continued)
Acronyms

Acronym	Definition
MS	medium-setting
PCE	prime, cure, and erosion control
PG	performance grade
RC	rapid-curing
RS	rapid-setting
S-suffix	stockpile usage
SCM	special cutback material
SS	slow-setting

- A. Asphalt Cement. Asphalt cement must be homogeneous, water-free, and nonfoaming when heated to 347°F, and must meet Table 2 requirements.

Table 2
Asphalt Cement

Property	Test Procedure	Viscosity Grade									
		AC-0.6		AC-1.5		AC-3		AC-5		AC-10	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Viscosity 140°F, poise 275°F, poise	T 202	40 0.4	80 –	100 0.7	200 –	250 1.1	350 –	400 1.4	600 –	800 1.9	1,200 –
Penetration, 77°F, 100g, 5 sec.	T 49	350	–	250	–	210	–	135	–	85	–
Flash point, C.O.C., °F	T 48	425	–	425	–	425	–	425	–	450	–
Solubility in trichloroethylene, %	T 44	99.0	–	99.0	–	99.0	–	99.0	–	99.0	–
Spot test	Tex-509-C	Neg.		Neg.		Neg.		Neg.		Neg.	
Tests on residue from Thin-Film Oven Test:	T 179										
Viscosity, 140°F, poise	T 202	–	180	–	450	–	900	–	1,500	–	3,000
Ductility ¹ , 77°F 5 cm/min., cm	T 51	100	–	100	–	100	–	100	–	100	–

1. If AC-0.6 or AC-1.5 ductility at 77°F is less than 100 cm, material is acceptable if ductility at 60°F is more than 100 cm.

- A. Polymer-Modified Asphalt Cement. Polymer-modified asphalt cement must be smooth and homogeneous, and comply with the requirements of Table 3. If requested, supply samples of the base asphalt cement and polymer additives.

Table 3
Polymer-Modified Asphalt Cement

Property	Test Procedure	Polymer-Modified Viscosity Grade							
		AC-5 w/2% SBR		AC-10 w/2% SBR		AC-15P		AC-20-5T R	
		Min	Max	Min	Max	Min	Max	Min	Max
Polymer		SBR		SBR		SBS		TR	
Polymer content, % (solids basis)	Tex-533-C	2.0	–	2.0	–	3.0	–	5.0	–
Dynamic shear, G*/sin δ, 64°C, 10 rad/s, kPa	T 315	–	–	–	–	–	–	1.0	–
Viscosity 140°F, poise	T 202	700	–	1,300	–	1,500	–	2,000	–
275°F, poise	T 202	–	7.0	–	8.0	–	8.0	–	10.0
Penetration, 77°F, 100 g, 5 sec.	T 49	120	–	80	–	100	150	75	115
Ductility, 5cm/min., 39.2°F, cm	T 51	70	–	60	–	–	–	–	–
Elastic recovery, 50°F, %	Tex-539-C	–	–	–	–	55	–	55	–
Softening point, °F	T 53	–	–	–	–	–	–	120	–
Polymer separation, 48 hr.	Tex-540-C	None		None		None		None	
Flash point, C.O.C., °F	T 48	425	–	425	–	425	–	425	–
Tests on residue from Thin-Film Oven Test: Retained penetration ratio, 77°F	T 179 T 49	–	–	–	–	0.60	1.00	0.60	1.00
Tests on residue from RTFOT aging and pressure aging: Creep stiffness S, -18°C, MPa m-value, -18°C	Tex-541-C and R 28 T 313	–	–	–	–	–	–	–	300
		–	–	–	–	–	–	0.300	–

- C. Cutback Asphalt. Cutback asphalt must meet the requirements of Tables 4, 5, and 6 for the specified type and grade. If requested, supply samples of the base asphalt cement and polymer additives.

Table 4
Rapid-Curing Cutback Asphalt

Property	Test Procedure	Type-Grade					
		RC-250		RC-800		RC-3000	
		Min	Max	Min	Max	Min	Max
Kinematic viscosity, 140°F, cSt	T 201	250	400	800	1,600	3,000	6,000
Water, %	T 55	—	0.2	—	0.2	—	0.2
Flash point, T.O.C., °F	T 79	80	—	80	—	80	—
Distillation test:	T 78						
Distillate, percentage by volume of total distillate to 680°F							
to 437°F		40	75	35	70	20	55
to 500°F		65	90	55	85	45	75
to 600°F		85	—	80	—	70	—
Residue from distillation, volume %		70	—	75	—	82	—
Tests on distillation residue:							
Penetration, 100 g, 5 sec., 77°F	T 49	80	120	80	120	80	120
Ductility, 5 cm/min., 77°F, cm	T 51	100	—	100	—	100	—
Solubility in trichloroethylene, %	T 44	99.0	—	99.0	—	99.0	—
Spot test	Tex-509-C	Neg.		Neg.		Neg.	

Table 5
Medium-Curing Cutback Asphalt

Property	Test Procedure	Type-Grade							
		MC-30		MC-250		MC-800		MC-3000	
		Min	Max	Min	Max	Min	Max	Min	Max
Kinematic viscosity, 140°F, cSt	T 201	30	60	250	500	800	1,600	3,000	6,000
Water, %	T 55	—	0.2	—	0.2	—	0.2	—	0.2
Flash point, T.O.C., °F	T 79	100	—	150	—	150	—	150	—
Distillation test:	T 78								
Distillate, percentage by volume of total distillate to 680°F									
to 437°F		—	25	—	10	—	—	—	—
to 500°F		40	70	15	55	—	35	—	15
to 600°F		75	93	60	87	45	80	15	75
Residue from distillation, volume %		50	—	67	—	75	—	80	—
Tests on distillation residue:									
Penetration, 100 g, 5 sec., 77°F	T 49	120	250	120	250	120	250	120	250
Ductility, 5 cm/min., 77°F, cm ¹	T 51	100	—	100	—	100	—	100	—
Solubility in trichloroethylene, %	T 44	99.0	—	99.0	—	99.0	—	99.0	—
Spot test	Tex-509-C	Neg.		Neg.		Neg.		Neg.	

Table 6
Special-Use Cutback Asphalt

Property	Test Procedure	Type-Grade					
		MC-2400L		SCM I		SCM II	
		Min	Max	Min	Max	Min	Max
Kinematic viscosity, 140°F, cSt	T 201	2,400	4,800	500	1,000	1,000	2,000
Water, %	T 55	—	0.2	—	0.2	—	0.2
Flash point, T.O.C., °F	T 79	150	—	175	—	175	—
Distillation test:	T 78						
Distillate, percentage by volume of total distillate to 680°F							
to 437°F		—	—	—	—	—	—
to 500°F		—	35	—	0.5	—	0.5
to 600°F		35	80	20	60	15	50
Residue from distillation, volume %		78	—	76	—	82	—
Tests on distillation residue:							
Polymer		SBR		—		—	
Polymer content, % (solids basis)	Tex-533-C	2.0	—	—	—	—	—
Penetration, 100 g, 5 sec., 77°F	T 49	150	300	180	—	180	—
Ductility, 5 cm/min., 39.2°F, cm	T 51	50	—	—	—	—	—
Solubility in trichloroethylene, %	T 44	99.0	—	99.0	—	99.0	—

D. Emulsified Asphalt. Emulsified asphalt must be homogeneous, not separate after thorough mixing, and meet the requirements for the specified type and grade in Tables 7, 8, 9, and 10.

Table 7
Emulsified Asphalt

Property	Test Procedure	Type-Grade									
		Rapid-Setting		Medium-Setting		AES-300		Slow-Setting		Slow-Setting	
		HFRS-2		MS-2		AES-300		SS-1		SS-1H	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol	T 72										
77°F, sec.		–	–	–	–	75	400	20	100	20	100
122°F, sec.		150	400	100	300	–	–	–	–	–	–
Sieve test, %	T 59	–	0.1	–	0.1	–	0.1	–	0.1	–	0.1
Miscibility	T 59	–		–		–		Pass		Pass	
Cement mixing, %	T 59	–	–	–	–	–	–	–	2.0	–	2.0
Coating ability and water resistance:	T 59										
dry aggregate/after spray		–		–		Good/Fair		–		–	
wet aggregate/after spray		–		–		Fair/Fair		–		–	
Demulsibility, 35 ml of 0.02 N CaCl ₂ , %	T 59	50	–	–	30	–	–	–	–	–	–
Storage stability, 1 day, %	T 59	–	1	–	1	–	1	–	1	–	1
Freezing test, 3 cycles ¹	T 59	–		Pass		–		Pass		Pass	
Distillation test:	T 59										
Residue by distillation, % by wt.		65	–	65	–	65	–	60	–	60	–
Oil distillate, % by volume of emulsion		–	0.5	–	0.5	–	5	–	0.5	–	0.5
Tests on residue from distillation:											
Penetration, 77°F, 100 g, 5 sec.	T 49	100	140	120	160	300	–	120	160	70	100
Solubility in trichloroethylene, %	T 44	97.5	–	97.5	–	97.5	–	97.5	–	97.5	–
Ductility, 77°F, 5 cm/min., cm	T 51	100	–	100	–	–	–	100	–	80	–
Float test, 140°F, sec.	T 50	1,200	–	–	–	1,200	–	–	–	–	–

1. Applies only when the Engineer designates material for winter use.

Table 8
Cationic Emulsified Asphalt

Property	Test Procedure	Type-Grade											
		Rapid-Setting				Medium-Setting				Slow-Setting			
		CRS-2		CRS-2H		CMS-2		CMS-2S		CSS-1		CSS-1H	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol 77°F, sec. 122°F, sec.	T 72	— 150	— 400	— 150	— 400	— 100	— 300	— 100	— 300	20 —	100 —	20 —	100 —
Sieve test, %	T 59	—	0.1	—	0.1	—	0.1	—	0.1	—	0.1	—	0.1
Cement mixing, %	T 59	—	—	—	—	—	—	—	—	—	2.0	—	2.0
Coating ability and water resistance: dry aggregate/after spray wet aggregate/after spray	T 59	—		—		Good/Fair		Good/Fair		—		—	
		—		—		Fair/Fair		Fair/Fair		—		—	
Demulsibility, 35 ml of 0.8% sodium dioctyl sulfosuccinate, %	T 59	70	—	70	—	—	—	—	—	—	—	—	—
Storage stability, 1 day, %	T 59	—	1	—	1	—	1	—	1	—	1	—	1
Particle charge	T 59	Positive		Positive		Positive		Positive		Positive		Positive	
Distillation test: Residue by distillation, % by wt. Oil distillate, % by volume of emulsion	T 59	65	—	65	—	65	—	65	—	60	—	60	—
		—	0.5	—	0.5	—	7	—	5	—	0.5	—	0.5
Tests on residue from distillation: Penetration, 77°F, 100 g, 5 sec. Solubility in trichloroethylene, % Ductility, 77°F, 5 cm/min., cm	T 49	120	160	70	110	120	200	300	—	120	160	70	110
	T 44	97.5	—	97.5	—	97.5	—	97.5	—	97.5	—	97.5	—
	T 51	100	—	80	—	100	—	—	—	100	—	80	—

Table 9
Polymer-Modified Emulsified Asphalt

Property	Test Procedure	Type-Grade											
		Rapid-Setting				Medium-Setting				Slow-Setting			
		RS-1P		HFRS-2P		AES-150P		AES-300P		AES-300S		SS-1P	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol 77°F, sec. 122°F, sec.	T 72	—	—	—	—	75	400	75	400	75	400	30	100
		50	200	150	400	—	—	—	—	—	—	—	—
Sieve test, %	T 59	—	0.1	—	0.1	—	0.1	—	0.1	—	0.1	—	0.1
Miscibility	T 59	—		—		—		—		—		Pass	
Coating ability and water resistance: dry aggregate/after spray	T 59	—		—		Good/Fair		Good/Fair		Good/Fair		—	
wet aggregate/after spray		—		—		Fair/Fair		Fair/Fair		Fair/Fair		—	
Demulsibility, 35 ml of 0.02 N CaCl ₂ , %	T 59	60	—	50	—	—	—	—	—	—	—	—	—
Storage stability, 1 day, %	T 59	—	1	—	1	—	1	—	1	—	1	—	1
Breaking index, g	Tex-542-C	—	80	—	—	—	—	—	—	—	—	—	—
Distillation test: ¹ Residue by distillation, % by wt.	T 59	65	—	65	—	65	—	65	—	65	—	60	—
Oil distillate, % by volume of emulsion		—	3	—	0.5	—	3	—	5	—	7	—	0.5
Tests on residue from distillation: Polymer content, wt. % (solids basis)	Tex-533-C	—	—	3.0	—	—	—	—	—	—	—	3.0	—
Penetration, 77°F, 100 g, 5 sec.	T 49	225	300	90	140	150	300	300	—	300	—	100	140
Solubility in trichloroethylene, %	T 44	97.0	—	97.0	—	97.0	—	97.0	—	97.0	—	97.0	—
Viscosity, 140°F, poise	T 202	—	—	1,500	—	—	—	—	—	—	—	1,300	—
Float test, 140°F, sec.	T 50	—	—	1,200	—	1,200	—	1,200	—	1,200	—	—	—
Ductility ² , 39.2°F, 5 cm/min., cm	T 51	—	—	50	—	—	—	—	—	—	—	50	—
Elastic recovery ² , 50°F, %	Tex-539-C	55	—	55	—	—	—	—	—	—	—	—	—
Tests on RTFO curing of distillation residue	Tex-541-C												

Property	Test	Type-Grade											
		—	—	—	—	50	—	50	—	30	—	—	—

1. Exception to T 59: Bring the temperature on the lower thermometer slowly to 350°F ±10°F. Maintain at this temperature for 20 min. Complete total distillation in 60 ±5 min. from the first application of heat.
2. HFRS-2P must meet one of either the ductility or elastic recovery requirements.

Table 10
Polymer-Modified Cationic Emulsified Asphalt

Property	Test Procedure	Type-Grade					
		Rapid-Setting				Slow-Setting	
		CRS-1P		CRS-2P		CSS-1P	
		Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol 77°F, sec. 122°F, sec.	T 72	— 50	— 150	— 150	— 400	20 —	100 —
Sieve test, %	T 59	—	0.1	—	0.1	—	0.1
Demulsibility, 35 ml of 0.8% sodium dioctyl sulfosuccinate, %	T 59	60	—	70	—	—	—
Storage stability, 1 day, %	T 59	—	1	—	1	—	1
Breaking index, g	Tex-542-C	—	80	—	—	—	—
Particle charge	T 59	Positive		Positive		Positive	
Distillation test: ¹ Residue by distillation, % by weight Oil distillate, % by volume of emulsion	T 59	65 —	— 3	65 —	— 0.5	62 —	— 0.5
Tests on residue from distillation:							
Polymer content, wt. % (solids basis)	Tex-533-C	—	—	3.0	—	3.0	—
Penetration, 77°F, 100 g, 5 sec.	T 49	225	300	90	150	55	90
Viscosity, 140°F, poise	T 202	—	—	1,300	—	—	—
Solubility in trichloroethylene, %	T 44	97.0	—	97.0	—	97.0	—
Softening point, °F	T 53	—	—	—	—	135	—
Ductility, 77°F, 5 cm/min., cm	T 51	—	—	—	—	70	—
Ductility ² , 39.2°F, 5 cm/min., cm	T 51	—	—	50	—	—	—
Elastic recovery ² , 50°F, %	Tex-539-C	45	—	55	—	—	—

1. Exception to T 59: Bring the temperature on the lower thermometer slowly to 350°F ±0°F. Maintain at this temperature for 20 min. Complete total distillation in 60 ±5 min. from the first application of heat.
2. CRS-2P must meet one of either the ductility or elastic recovery requirements.

E. Specialty Emulsions. Specialty emulsions may be either asphalt-based or resin-based and must meet the requirements of Table 11

Table 11

Specialty Emulsions

Property	Test Procedure	Type-Grade					
		Medium-Setting				Slow-Setting	
		AE-P		EAP&T		PCE ¹	
		Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol 77°F, sec. 122°F, sec.	T 72	— 15	— 150	— —	— —	10 —	100 —
Sieve test, %	T 59	—	0.1	—	0.1	—	0.1
Miscibility ²	T 59	—		Pass		Pass	
Demulsibility, 35 ml of 0.10 N CaCl ₂ , %	T 59	—	70	—	—	—	—
Storage stability, 1 day, %	T 59	—	1	—	1	—	—
Particle size ⁵ , % by volume < 2.5 μ m	Tex-238-F ³	—	—	90	—	90	—
Asphalt emulsion distillation to 500°F followed by Cutback asphalt distillation of residue to 680°F: Residue after both distillations, % by wt. Total oil distillate from both distillations, % by volume of emulsion	T 59 & T 78	40 25	— 40	— —	— —	— —	— —
Residue by distillation, % by wt.	T 59	—	—	60	—	—	—
Residue by evaporation ⁴ , % by wt.	T 59	—	—	—	—	60	—
Tests on residue after all distillation(s): Viscosity, 140°F, poise Kinematic viscosity ⁵ , 140°F, cSt Flash point C.O.C., °F Solubility in trichloroethylene, % Float test, 122°F, sec.	T 202 T 201 T 48 T 44 T 50	— — — 97.5 50	— — — — 200	800 — — — —	— — — — —	— 100 400 — —	— 350 — — —

1. Supply with each shipment of PCE:

- a) a copy of a lab report from an approved analytical lab, signed by a lab official, indicating the PCE formulation does not meet any characteristics of a Resource Conservation Recovery Act (RCRA) hazardous waste;
 - b) a certification from the producer that the formulation supplied does not differ from the one tested and that no listed RCRA hazardous wastes or PCBs have been mixed with the product; and
 - c) a Material Safety Data Sheet.
2. Exception to T 59: In dilution, use 350 ml of distilled or deionized water and a 1,000-ml beaker.
 3. Use Tex-238-F, beginning at “Particle Size Analysis by Laser Diffraction,” with distilled or deionized water as a medium and no dispersant, or use another approved method.
 4. Exception to T 59: Leave sample in the oven until foaming ceases, then cool and weigh.
 5. PCE must meet either the kinematic viscosity requirement or the particle size requirement.

F. Recycling Agent. Recycling agent and emulsified recycling agent must meet the requirements in Table 12. Additionally, recycling agent and residue from emulsified recycling agent, when added in the specified proportions to the recycled asphalt, must meet the properties specified on the plans.

Table 12
Recycling Agent and Emulsified Recycling Agent

Property	Test Procedure	Recycling Agent		Emulsified Recycling Agent	
		Min	Max	Min	Max
Viscosity, Saybolt Furol, 77°F, sec.	T 72	–	–	15	100
Sieve test, %	T 59	–	–	–	0.1
Miscibility ¹	T 59	–		No coagulation	
Residue by evaporation ² , % by wt.	T 59	–	–	60	–
Tests on recycling agent or residue from evaporation:					
Flash point, C.O.C., °F	T 48	400	–	400	–
Kinematic viscosity,	T 201				
140°F, cSt		75	200	75	200
275°F, cSt		–	10.0	–	10.0

1. Exception to T 59: Use 0.02 N CaCl₂ solution in place of water.
2. Exception to T 59: Maintain sample at 300°F until foaming ceases, then cool and weigh.

G. Crumb Rubber Modifier. Crumb rubber modifier (CRM) consists of automobile and truck tires processed by ambient temperature grinding.

CRM must be:

- free from contaminants including fabric, metal, and mineral and other nonrubber substances;
- free-flowing; and
- nonfoaming when added to hot asphalt binder.

When tested in accordance with Tex-200-F, Part I, using a 50-g sample, the rubber gradation must meet the requirements of the grades in Table 13.

Table 13
CRM Gradations

Sieve Size (% Passing)	Grade A		Grade B		Grade C		Grade D	Grade E
	Min	Max	Min	Max	Min	Max		
#8	100	–	–	–	–	–	As shown on the plans	As approved
#10	95	100	100	–	–	–		
#16	–	–	70	100	100	–		
#30	–	–	25	60	90	100		
#40	–	–	–	–	45	100		
#50	0	10	–	–	–	–		
#200	–	–	0	5	–	–		

H. Crack Sealer. Polymer modified asphalt-emulsion crack sealer must meet the requirements of Table 14. Rubber-asphalt crack sealer must meet the requirements of Table 15.

Table 14
Polymer-Modified Asphalt Emulsion Crack Sealer

Property	Test Procedure	Min	Max
Rotational viscosity, 77°F, cP	D 2196, Method A	10,000	25,000
Sieve test, %	T 59	–	0.1
Storage stability, 1 day, %	T 59	–	1
Evaporation Residue by evaporation, % by wt.	Tex-543-C	65	–
Tests on residue from evaporation:			
Penetration, 77°F, 100 g, 5 sec.	T 49	35	75
Softening point, °F	T 53	140	–
Ductility, 39.2°F, 5 cm/min., cm	T 51	100	–

Table 15
Rubber-Asphalt Crack Sealer

Property	Test Procedure	Class A		Class B	
		Min	Max	Min	Max
CRM content, Grade A or B, % by wt.	Tex-544-C	22	26	–	–
CRM content, Grade B, % by wt.	Tex-544-C	–	–	13	17
Virgin rubber content ¹ , % by wt.		–	–	2	–
Flash point ² , COC, °F	T 48	400	–	400	–
Penetration ³ , 77°F, 150 g, 5 sec.	T 49	30	50	30	50
Penetration ³ , 32°F, 200 g, 60 sec.	T 49	12	–	12	–
Softening point, °F	T 53	–	–	170	–
Bond ⁴	D5329	–		Pass	

1. Provide certification that the min. % virgin rubber was added.
2. Before passing the test flame over the cup, agitate the sealing compound with a 3/8- to 1/2-in. (9.5- to 12.7-mm) wide, square-end metal spatula in a manner so as to bring the material on the bottom of the cup to the surface, i.e., turn the material over. Start at one side of the thermometer, move around to the other, and then return to the starting point using 8 to 10 rapid circular strokes. Accomplish agitation in 3 to 4 sec. Pass the test flame over the cup immediately after stirring is completed.
3. Exception to T 49: Substitute the cone specified in ASTM D 217 for the penetration needle.
4. No crack in the crack sealing materials or break in the bond between the sealer and the mortar blocks over 1/4 in. deep for any specimen after completion of the test.

- I. Asphalt-Rubber Binders. Asphalt-rubber (A-R) binders are mixtures of asphalt binder and CRM, which have been reacted at elevated temperatures. The A-R binders meet D 6114 and contain a minimum of 15% CRM by weight. Types I or II, containing CRM Grade C, are used for hot mixed aggregate mixtures. Types II or III, containing CRM Grade B, are used for surface treatment binder. Table 16 describes required binder properties.

Table 16
A-R Binders

Property	Test Procedure	Binder Type					
		Type I		Type II		Type III	
		Min	Max	Min	Max	Min	Max
Apparent viscosity, 347°F, cP	D 2196, Method A	1,500	5,000	1,500	5,000	1,500	5,000
Penetration, 77°F, 100 g, 5 sec.	T 49	25	75	25	75	50	100
Penetration, 39.2°F, 200 g, 60 sec.	T 49	10	–	15	–	25	–
Softening point, °F	T 53	135	–	130	–	125	–
Resilience, 77°F, %	D 5329	25	–	20	–	10	–
Flash point, C.O.C., °F	T 48	450	–	450	–	450	–
Tests on residue from Thin-Film Oven Test:	T 179						
Retained penetration ratio, 39.2°F, 200 g, 60 sec., % of original	T 49	75	–	75	–	75	–

J. Performance-Graded Binders. PG binders must be smooth and homogeneous, show no separation when tested in accordance with Tex-540-C, and meet Table 17 requirements.

Separation testing is not required if:

- a modifier is introduced separately at the mix plant either by injection in the asphalt line or mixer,
- the binder is blended on site in continuously agitated tanks, or
- binder acceptance is based on field samples taken from an in-line sampling port at the hot mix plant after the addition of modifiers.

Table 17
Performance-Graded Binders

Property and Test Method	Performance Grade																	
	PG 58			PG 64			PG 70			PG 76			PG 82					
	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28
Average 7-day max pavement design temperature, °C	< 58			< 64			< 70			< 76			< 82					
Min pavement design temperature, °C	>-22	>-28	>-34	>-16	>-22	>-28	>-34	>-16	>-22	>-28	>-34	>-16	>-22	>-28	>-34	>-16	>-22	>-28
ORIGINAL BINDER																		
Flash point, T 48, Min, °C	230																	
Viscosity, T 316: ^{2, 3} Max, 3.0 Pa-s, test temperature, °C	135																	
Dynamic shear, T 315: ⁴ G*/sin(□□), Min, 1.00 kPa Test temperature @ 10 rad/sec., °C	58			64			70			76			82					
Elastic recovery, D 6084, 50°F, % Min	-	-	30	-	-	30	50	-	30	50	60	30	50	60	70	50	60	70
ROLLING THIN-FILM OVEN (Tex-541-C)																		
Mass loss, Tex-541-C, Max, %	1.0																	
Dynamic shear, T 315: G*/sin(□□), Min, 2.20 kPa Test temperature @ 10 rad/sec., °C	58			64			70			76			82					
PRESSURE AGING VESSEL (PAV) RESIDUE (R 28)																		
PAV aging temperature, °C	100																	
Dynamic shear, T 315: G*/sin(□□), Max, 5000 kPa Test temperature @ 10 rad/sec., °C	2	2	1	2	2	2	1	2	2	2	1	2	2	2	1	2	2	2
	5	2	9	8	5	2	9	8	5	2	9	8	5	2	9	8	5	2

Table 17
Performance-Graded Binders

Property and Test Method	Performance Grade																	
	PG 58			PG 64			PG 70			PG 76			PG 82					
	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28
Average 7-day max pavement design temperature, °C	< 58			< 64			< 70			< 76			< 82					
Min pavement design temperature, °C	>-22	>-28	>-34	>-16	>-22	>-28	>-34	>-16	>-22	>-28	>-34	>-16	>-22	>-28	>-34	>-16	>-22	>-28
Creep stiffness, T 313: ^{5, 6}	-	-	-	-	-	-	-	-	-	-	-	-6	-	-	-	-	-	-
S, max, 300 MPa	1	1	2	6	1	1	2	6	1	1	2		1	1	2	6	1	1
m-value, min, 0.300	2	8	4		2	8	4		2	8	4		2	8	4		2	8
Test temperature @ 60 sec., °C																		
Direct tension, T 314: ⁶	-	-	-	-	-	-	-	-	-	-	-	-6	-	-	-	-	-	-
Failure strain, min, 1.0%	1	1	2	6	1	1	2	6	1	1	2		1	1	2	6	1	1
Test temperature @ 1.0 mm/min., °C	2	8	4		2	8	4		2	8	4		2	8	4		2	8

1. Pavement temperatures are estimated from air temperatures using an algorithm contained in a Department-supplied computer program, may be provided by the Department, or by following the procedures outlined in AASHTO MP 2 and PP 28.

2. This requirement may be waived at the Department's discretion if the supplier warrants that the asphalt binder can be adequately pumped, mixed, and compacted at temperatures that meet all applicable safety, environmental, and constructability requirements. At test temperatures where the binder is a Newtonian fluid, any suitable standard means of viscosity measurement may be used, including capillary (T 201 or T 202) or rotational viscometry (T 316).

3. Viscosity at 135°C is an indicator of mixing and compaction temperatures that can be expected in the lab and field. High values may indicate high mixing and compaction temperatures. Additionally, significant variation can occur from batch to batch. Contractors should be aware that variation could significantly impact their mixing and compaction operations. Contractors are therefore responsible for addressing any constructability issues that may arise.

4. For quality control of unmodified asphalt binder production, measurement of the viscosity of the original asphalt binder may be substituted for dynamic shear measurements of $G^*/\sin(\delta)$ at test temperatures where the asphalt is a Newtonian fluid. Any suitable standard means of viscosity measurement may be used, including capillary (T 201 or T 202) or rotational viscometry (T 316).

5. Silicone beam molds, as described in AASHTO TP 1-93, are acceptable for use.

6. If creep stiffness is below 300 MPa, direct tension test is not required. If creep stiffness is between 300 and 600 MPa, the direct tension failure strain requirement can be used instead of the creep stiffness requirement. The *m*-value requirement must be satisfied in both cases.

2.2 EQUIPMENT

- A. Provide all equipment necessary to transport, store, sample, heat, apply, and incorporate asphalts, oils and emulsions.

PART 3 – EXECUTION

3.1 CONSTRUCTION

- A. Typical Material Use. Table 18 shows typical materials used for specific applications, These are typical uses only. Circumstances may require use of other material.

Table 18
Typical Material Use

Material Application	Typically Used Materials
Hot-mixed, hot-laid asphalt mixtures	PG binders, A-R binders Types I and II
Surface treatment	AC-5, AC-10, AC-5 w/2% SBR, AC-10 w/2% SBR, AC-15P, AC-20-5TR, HFRS-2, MS-2, CRS-2, CRS-2H, HFRS-2P, CRS-2P, A-R binders Types II and III
Surface treatment (cool weather)	RS-1P, CRS-1P, RC-250, RC-800, RC-3000, MC-250, MC-800, MC-3000, MC-2400L
Precoating	AC-5, AC-10, PG 64-22, SS-1, SS-1H, CSS-1, CSS-1H
Tack coat	PG Binders, SS-1H, CSS-1H, EAP&T
Fog seal	SS-1, SS-1H, CSS-1, CSS-1H
Hot-mixed, cold-laid asphalt mixtures	AC-0.6, AC-1.5, AC-3, AES-300, AES-300P, CMS-2, CMS-2S
Patching mix	MC-800, SCM I, SCM II, AES-300S
Recycling	AC-0.6, AC-1.5, AC-3, AES-150P, AES-300P, recycling agent, emulsified recycling agent
Crack sealing	SS-1P, polymer mod AE crack sealant, rubber asphalt crack sealers (Class A, Class B)
Microsurfacing	CSS-1P
Prime	MC-30, AE-P, EAP&T, PCE
Curing membrane	SS-1, SS-1H, CSS-1, CSS-1H, PCE
Erosion control	SS-1, SS-1H, CSS-1, CSS-1H, PCE

- B. Storage and Application Temperatures. Use storage and application temperatures in accordance with Table 19. Store and apply materials at the lowest temperature yielding satisfactory results. Follow the manufacturer's instructions for any agitation requirements in storage. Manufacturer's instructions regarding recommended application and storage temperatures supercede those of Table 19.

Table 19
Storage and Application Temperatures

Type–Grade	Application		Storage Maximum (°F)
	Recommended Range, °F	Maximum Allowable (°F)	
AC-0.6, AC-1.5, AC-3	200–300	350	350
AC-5, AC-10	275–350	350	350
AC-5 w/2% SBR, AC-10 w/2% SBR, AC-15P, AC-20-5TR	300–375	375	360
RC-250	125–180	200	200
RC-800	170–230	260	260
RC-3000	215–275	285	285
MC-30, AE-P	70–150	175	175
MC-250	125–210	240	240
MC-800, SCM I, SCM II	175–260	275	275
MC-3000, MC-2400L	225–275	290	290
HFRS-2, MS-2, CRS-2, CRS-2H, HFRS-2P, CRS-2P, CMS-2, CMS-2S, AES-300, AES-300S, AES-150P, AES-300P	120–160	180	180
SS-1, SS-1H, CSS-1, CSS-1H, PCE, EAP&T, SS-1P, RS-1P, CRS-1P, CSS-1P, recycling agent, emulsified recycling agent, polymer mod AE crack sealant	50–130	140	140
PG binders	275–350	350	350
Rubber asphalt crack sealers (Class A, Class B)	350–375	400	–
A-R binders Types I, II, and III	325–425	425	425

END OF SECTION 312100

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SECTION 321270

FLEXIBLE BASE

PART I - GENERAL

1.1 DESCRIPTION

- A. Construct a foundation course composed of flexible base.

PART 2 -PRODUCTS

2.1 MATERIALS

- A. Furnish uncontaminated materials of uniform quality that meet the requirements of the plans and specifications. Notify the Engineer of the proposed materials at any time before compaction throughout the duration of the project to assure specification compliance. Use Tex-100-E material definitions.
- B. Aggregate. Furnish aggregate of the type and grade shown on the plans and conforming to 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 shown on the next page, unless shown on the plans.

Table 1
Material Requirements

Property	Test Method	Grade 1	Grade 2	Grade 3	Grade 4
Master gradation sieve size (% retained)	Tex-110-E				As shown on the plans
2-1/2 in.		–	0	0	
1-3/4 in.		0	0–10	0–10	
7/8 in.		10–35	–	–	
3/8 in.		30–50	–	–	
No. 4		45–65	45–75	45–75	
No. 40		70–85	60–85	50–85	
Liquid limit, % max. ¹	Tex-104-E	35	40	40	As shown on the plans
Plasticity index, max. ¹	Tex-106-E	10	12	12	As shown on the plans
Plasticity index, min. ¹		As shown on the plans			
Wet ball mill, % max. ²	Tex-116-E	40	45	–	As shown on the plans
Wet ball mill, % max. increase passing the No. 40 sieve		20	20	–	
Classification ³	Tex-117-E	1.0	1.1–2.3	–	As shown on the plans
Min. compressive strength ³ , psi		45	35	–	As shown on the plans
lateral pressure 0 psi		175	175	–	
lateral pressure 15 psi					

1. Determine plastic index in accordance with Tex-107-E (linear shrinkage) when liquid limit is unattainable as defined in Tex-104-E.

2. When a soundness value is required by the plans, test material in accordance with Tex-411-A.

3. Meet both the classification and the minimum compressive strength, unless otherwise shown on the plans.

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. **Material Types.** Do not use fillers or binders unless approved. Furnish the type specified on the plans in accordance with the following.
 - a. **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.
 - b. **Type B.** Crushed or uncrushed gravel. Blending of 2 or more sources is allowed.

- c. 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.
 - d. 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.A.3.b, "Recycled Material (Including Crushed Concrete) Requirements," and be managed in a way to provide for uniform quality. The Engineer may require separate dedicated stockpiles in order to verify compliance.
 - e. Type E. As shown on the plans.
3. Recycled Material. Recycled 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.
- a. Limits on Percentage. When RAP is allowed, do not exceed 20% RAP by weight unless otherwise shown on the plans. The percentage limitations for other recycled materials will be as shown on the plans.
 - b. Recycled Material (Including Crushed Concrete) Requirements.
 - 1) Contractor Furnished Recycled Materials. 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 asphalt.
 - 2) 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, classification, 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.
 - 3) 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.
 - c. 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 by the Engineer.

- B. Water. Furnish water free of industrial wastes and other objectionable matter.
- C. Material Sources. When non-commercial sources are used, expose the vertical faces of all strata of material proposed for use. Secure and process the material by successive vertical cuts extending through all exposed strata, when directed.

2.2 EQUIPMENT

- A. Provide machinery, tools, and equipment necessary for proper execution of the work. Provide rollers in accordance with Item 210, "Rolling." Provide proof rollers in accordance with Item 216, "Proof Rolling," when required.

PART 3 - EXECUTION

3.1 CONSTRUCTION

- A. 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 shown on the plans. 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 as a result of adding or removing material will be deducted from the Contractor's estimates.

Haul approved flexible base in clean trucks. Deliver the required quantity to each 100-ft. station or designated stockpile site as shown on the plans. Prepare stockpile sites as directed. When delivery is to the 100-ft. station, manipulate in accordance with the applicable Items.

- B. Preparation of Subgrade or Existing Base. Remove or scarify existing asphalt concrete pavement in accordance with Item 105, "Removing Stabilized 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.

When shown on the plans or directed, proof roll the roadbed in accordance with Item 216, "Proof Rolling," before pulverizing or scarifying. Correct soft spots as directed.

- C. 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. On superelevated curves, begin rolling at the low side and progress toward the high side. 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 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.

1. 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 recompact.

2. Density Control. Compact to at least 100% of the maximum density determined by Tex-113-E unless otherwise shown on the plans. Determine the moisture content of the material at the beginning and during compaction in accordance with Tex-103-E.

The Engineer will determine roadway density 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.

- D. 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.

In areas where surfacing is to be placed, correct grade deviations greater than 1/4 in. in 16 ft. measured longitudinally or greater than 1/4 in. over the entire width of the cross-section. Correct by loosening, adding, or removing material. Reshape and recompact in accordance with Section 247.4.C, "Compaction."

- E. 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.

END OF SECTION 321270

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SECTION 321280

PRIME COAT

PART 1 - GENERAL

1.1 GENERAL DESCRIPTION

- A. Prepare and treat existing or newly constructed surface with a bituminous material. Apply blotter material as required.

PART 2- PRODUCTS

2.1 MATERIALS

- A. Bituminous: Use material of the type and grade shown on the plans in accordance with Item 300, "Asphalts, Oils, and Emulsions."
- B. Blotter: Unless otherwise shown on the plans or approved, use either base course sweepings obtained from cleaning the base or native sand as blotter materials.

2.2 EQUIPMENT

- A. Provide applicable equipment in accordance with Article 316.3, "Equipment."

PART 3 - EXECUTION

3.1 CONSTRUCTION

- A. General: Apply the mixture when the air temperature is 60°F and above, or above 50°F and rising. Measure the air temperature in the shade away from artificial heat. The Engineer will determine when weather conditions are suitable for application. Do not permit traffic, hauling, or placement of subsequent courses over freshly constructed prime coats. Maintain the primed surface until placement of subsequent courses or acceptance of the work.
- B. Surface Preparation: Prepare the surface by sweeping or other approved methods. When directed, before applying bituminous material, lightly sprinkle the surface with water to control dust and ensure absorption.
- C. Application:
 - 1. Bituminous. The Engineer will select the application temperature within the limits recommended in Item 300, "Asphalts, Oils, and Emulsions." Apply material within 15°F of the selected temperature. Distribute the material smoothly and evenly at the rate selected by the Engineer. When directed, roll the freshly applied prime coat with a pneumatic-tire roller to ensure penetration.
 - 2. Blotter. Spread blotter material before allowing traffic to use a primed surface. When "Prime Coat and Blotter" is shown on the plans as a bid item, apply blotter material to primed surface at the rate shown in the plans or as directed. When "Prime Coat" is shown on the

plans as a bid item, apply blotter to spot locations or as directed to accommodate traffic movement through the work area. Remove blotter material before placing the surface. Dispose of blotter material according to applicable state and federal requirements.

END OF SECTION 321280

SECTION 321313
CONCRETE PAVING

PART 1 - GENERAL

RELATED DOCUMENTS

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 exterior cement concrete pavement for the following:

1. Walkways.

B. Related Sections include the following:

1. Section 321373: "Concrete Paving Joint Sealants"

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.4 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

1. Aggregates.

D. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Admixtures.
4. Curing compounds.
5. Joint fillers.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. Mockups: Cast mockups of full-size sections of concrete pavement to demonstrate typical joints, surface finish, texture, color, and standard of workmanship.
 - 1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Landscape Architect.
 - 2. Notify Landscape Architect seven days in advance of dates and times when mockups will be constructed.
 - 3. Obtain Landscape Architect's approval of mockups before starting construction.
 - 4. Maintain approved mockups during construction in an undisturbed condition as a standard for judging the completed pavement.
 - 5. Demolish and remove approved mockups from the site when directed by Landscape Architect.
 - 6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities. Maintain control of construction activities around new pours to protect against construction related damages for 7 days per pour.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 - 2. Products: Subject to compliance with requirements, provide one of the products specified.
 - 3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces. Use flexible or curved forms for curves with a radius 100 feet or less.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
- C. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.
- D. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.
- E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:
 - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use one of the following cementitious materials, of the same type, brand, and source throughout the Project:
 - 1. Portland Cement: ASTM C 150, Type I, gray.
- B. General Mix Design:
 - 1. 3000 psi compressive strength at 28 days
 - 2. 2"-4" slump
 - 3. 5%-8% air content
- C. Normal-Weight Aggregates: ASTM C 33, Class 1N coarse aggregate, uniformly graded. Provide aggregates from a single source.
 - 1. Maximum Coarse-Aggregate Size: 1 inch nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Water: potable
- E. Air-Entraining Admixture: ASTM C 260.

2.5 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete

mixture designs for the trial batch method.

B. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 3000 psi.

C. Calcium chloroxide will not be allowed.

D. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.6 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to

centerline, unless otherwise indicated. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated. Provide tie bars at sides of pavement strips where indicated.
 - 1. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.
- C. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
 - 1. Control Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to as per the drawings. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
 - 2. Doweled Expansion Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.
- D. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to as per the drawings. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- C. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- D. Do not add water to concrete during delivery or at Project site.
- E. Do not add water to fresh concrete after testing.
- F. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint

devices.

- G. Screed pavement surfaces with a straightedge and strike off.
- H. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- I. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
 - 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 - 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
 - 1. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.8 PAVEMENT TOLERANCES

- A. Comply with tolerances of ACI 117 and as follows:
 - 1. Elevation: 1/4 inch.
 - 2. Thickness: Plus 3/8 inch, minus 1/4 inch.
 - 3. Surface: Gap below 10-foot- long, unlevelled straightedge not to exceed 1/4 inch.
 - 4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
 - 5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.

6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.
8. Joint Spacing: As per the drawings.
9. Contraction Joint Depth: Plus 1/4 inch, no minus.
10. Joint Width: Plus 1/8 inch, no minus.
11. Running slope: No greater than 5% (1:20) slope unless otherwise noted.
12. Cross-slope: No greater than 2% (1:50) slope unless otherwise noted.

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed by Testing Agency according to the following requirements:
 1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
 5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
 6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

- D. Test results shall be reported in writing to Landscape Architect, concrete manufacturer, and Contractor within 7 days of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Landscape Architect but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Landscape Architect.
- G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.10 REPAIRS AND PROTECTION

- A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.
- B. Drill test cores, where directed by Landscape Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement area with portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

End of Section 321313

SECTION 321313

CONCRETE PAVEMENT

PART 1 - GENERAL

- 1.0 The General Conditions, Special Provisions and applicable requirements of Division 1 - General Requirements are hereby made a part of this section.
- 1.1 SCOPE: This work consists of street pavement, sidewalk, curb and gutter or rip rap slope pavement composed of Portland Cement Concrete with or without reinforcement, constructed on subgrade or base courses prepared in accordance with these specifications and to the lines, grades, thicknesses and typical cross-sections shown on the plans. Reinforcement, when required, will be subsidiary to the specified Concrete Pavement.
- 1.2 Submittals shall be in accordance with Section 013300, SUBMITTALS, and shall include:
 - A. Manufacturer's Literature: Descriptive data of installation methods and procedures.
 - B. Certificates: Manufacturer's certification that materials meet specification requirements.

PART 2 - PRODUCTS

- 2.0 Portland cement concrete shall conform to the requirements of "Section 321313 – Concrete Pavement" for each type and strength indicated in the plans.
- 2.1 JOINT FILLER AND SEALER: Joint sealants and expansion joint filler materials shall conform to "Item #433, JOINT SEALANTS & FILLERS" in the 1993 edition of TXDOT Standard Specifications for Construction of Highways, Streets and Bridges.
- 2.2 STEEL REINFORCEMENT: Reinforcing bars shall conform to the requirements of AASHTO M31 or M53, Grade 60. Fabricated bar mats may be used if they conform to the requirements of AASHTO M54.
- 2.3 DOWELS AND TIE BARS: Dowels and tie bars shall conform to the requirements of AASHTO M31 or M53, Grade 60 or Grade 40, as specified on the plans. Tie bars shall be deformed meeting the requirements of AASHTO M31 or M53. Dowel and tie bars may conform to the requirements of AASHTO M 42, except that rail steel shall not be used for tie bars that are to be bent or restraightened during construction. Dowel bars shall be plain round bars of the size specified and the ends shall be sawed. Before delivery to the construction site, a minimum of two-thirds of the length of each dowel bar shall be painted with one coat of lead or tar paint. Prior to placement of concrete, the dowels shall be coated with grease if specified on the plans.
- 2.4 WATER: Water used in mixing or curing shall be as clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product as possible. Water will be tested in accordance with the requirements of AASHTO Method T26. Water known to be of potable quality may be used without testing.

- 2.5 COVER MATERIALS FOR CURING: Curing materials shall conform to one of the following specifications:
- A. "Sheet Materials for Curing Concrete" shall conform to AASHTO M171.
 - B. "Burlap Cloth Made from Jute or Kenat" shall conform to AASHTO M182, Class 3.
 - C. "Liquid Membrane - Forming Compounds for Curing Concrete" shall conform to AASHTO M148, Type 2 (all-resin base), or Federal Specification TT-C-800, Type 2. Liquid Membrane shall be delivered and stored in bulk. Bulk storage shall be equipped with an agitator. All membranes shall be pigmented to allow visible inspection of coverage.
- 2.6 POZZOLANIC ADMIXTURE: The use of fly ash as a partial replacement for cement in pavement mix designs, at the rate specified in this paragraph will be allowed at the Contractor's option. Pozzolan admixtures shall be fly ash meeting the requirements of ASTM C-618; Type C except loss on ignition shall not exceed three (3) percent. When fly ash is used as a partial replacement for cement, the minimum cement content may be met by considering portland cement plus fly ash as the total cementitious component. The replacement rate should not exceed 15 percent.

PART 3 - EXECUTION

- 3.1 EQUIPMENT: Equipment and tools necessary for handling materials and performing all parts of the work shall be approved by the Engineer as to design, capacity, and mechanical condition. The equipment shall be at the job site before the start of construction operations for examination and approval.
- A. Batching Plant and Equipment.
 - 1. General. The batching plant shall include bins, weighing hoppers, and scales for the fine aggregate and coarse aggregate. If bulk cement is used, a bin, hopper, and a separate scale for cement shall be included. The weighing hoppers shall be properly sealed and vented to preclude dusting during operation.
 - 2. Bins and Hopper. Bins with adequate separate compartments for fine aggregate and coarse aggregate shall be provided in the batching plant. Each compartment shall discharge efficiently and freely into the weighing hopper. Means of control shall be provided so that, as the quantity desired in the weighing hopper is approached, the material may be added slowly and shut off with precision. A port or other opening for removing an overload of any one of the several materials from the hopper shall be provided. Weighing hoppers shall be constructed to eliminate accumulations of materials and to discharge fully.
 - 3. Scales. The scales for weighing aggregates and cement shall be of either the beam or the springless dial type. They shall be accurate within 0.5 percent throughout their range of use. When beam-type scales are used, provisions such as a "telltale" dial shall be made for indicating to the operator that the required load in the weighing hopper is being approached. A device on the weighing beams shall clearly indicate critical position. Poises shall be designed to be locked in any

position and to prevent unauthorized change. The weight beam and "telltale" device shall be in full view of the operator while charging the hopper, and the operator shall have convenient access to all controls.

Scales shall be inspected and sealed as often as the Engineer may deem necessary to assure their continued accuracy. The Contractor shall have on hand not less than ten 50-pound (23 kg) weights for testing of all scales when directed by the Engineer.

B. Mixers.

1. General. Concrete may be mixed at a central plant, or wholly or in part in truck mixers. Each mixer shall have attached in a prominent place a manufacturer's nameplate showing the capacity of the drum in terms of volume of mixed concrete and the speed of rotation of the mixing drum or blades.

A device accurate within 3 percent and satisfactory to the Engineer shall be provided at the mixer for determining the amount of air-entraining agent or other admixture to be added to each batch requiring such admixtures.

Mixers shall be examined daily for the accumulation of hard concrete or mortar and the wear of blades.

2. Central Plant Mixer. Mixing shall be in an approved mixer capable of combining the aggregates, cement, and water into a thoroughly mixed and uniform mass within the specified mixing period, and of discharging the mixture without segregation. Central plant mixers shall be equipped with an acceptable timing device that will not permit the batch to be discharged until the specified mixing time has elapsed. The water system for a central mixer shall be either a calibrated measuring tank or a meter and shall not necessarily be an integral part of the mixer.

The mixers shall be examined daily for changes in condition due to accumulation of hard concrete or mortar or wear of blades. The pickup and throwover blades shall be replaced when they have worn down 3/4-inch (19 mm) or more. The Contractor shall have a copy of the manufacturer's design on hand showing dimensions and arrangement of blades in reference to original height and depth.

3. Truck Mixers and Truck Agitators. Truck mixers used for mixing and hauling concrete and truck agitators used for hauling central-mixed concrete shall conform to the requirements of ASTM C94.

C. Finishing Equipment.

1. Finishing Machine. The finishing machine shall be equipped with one or more oscillating-type transverse screeds.
2. Vibrators. For side-form construction, vibrators may be either the surface pan type for pavements less than 8 inches (20 cm) thick or the internal type

with either immersed tube or multiple spuds, for the full width of the concrete slab. They may be attached to the spreader or the finishing machine, or they may be mounted on a separate carriage. They shall not come in contact with the joint, load-transfer devices, subgrade, or side forms. The frequency of the surface vibrators shall not be less than 3,500 vibrations per minute, and the frequency of the internal type shall not be less than 7,000 vibrations per minute for spud vibrators. When spud-type internal vibrators are used adjacent to the side forms, they shall have a frequency of not less than 3,500 vibrations per minute. Hand vibrators should be used to consolidate the concrete along forms and other isolated areas.

For slip-form construction, the paver shall vibrate the concrete for the full width and depth of the strip of pavement being placed. Vibration shall be accomplished by internal vibrators with a frequency range variable between 7,000 and 12,000 vibrations per minute. The amplitude of vibration shall be between 0.025 (0.6 mm) and 0.06 (1.5 mm) inches.

The number, spacing, frequency, and eccentric weights shall be provided as necessary to achieve an acceptable concrete density and finishing quality. Adequate power to operate all vibrators at the weight and frequency required for a satisfactory finish shall be available on the paver. The internal vibrators may be supplemented by vibrating screeds operating on the surface of the concrete. The frequency of surface vibrators shall not be less than 3,500 vibrations per minute. The Contractor shall furnish a tachometer or other suitable device for measuring the frequency of the vibrators. The vibrators and tamping elements shall be automatically controlled so that they shall be stopped as forward motion ceases. Any override switch shall be of the springloaded, momentary contact type.

For hand placed pavement the contractor shall consolidate concrete with the use of a hand held vibrator regardless of the type of strike off machinery used. Vibration shall be done to sufficiently remove air voids and consolidate concrete around reinforcing steel and side forms. **VIBRATORS SHALL NOT BE USED TO DISTRIBUTE CONCRETE.** The contractor shall limit disturbances of consolidated concrete during strike-off and finishing by using adequately sized floats and straight edges as approved by the Engineer. Vibrators, floats, and finishing tools to be on job site at all times during concrete placement.

3. Concrete Saw. When sawing of joints is specified, the Contractor shall provide sawing equipment adequate in number of units and power to complete the sawing to the required dimensions and at the required rate. The Contractor shall provide at least one standby saw in good working order. An ample supply of saw blades shall be maintained at the site of the work at all times during sawing operations. The Contractor shall provide adequate artificial lighting facilities for night sawing. All of this equipment shall be on the job both before and at all times during concrete placement.
4. Forms. Straight side forms shall be made of steel having a thickness of not less than 7/32 inch (6 mm) and shall be furnished in sections not less than 10 feet (3 m)

in length. Forms shall have a depth equal to the prescribed edge thickness of the concrete without horizontal joint, and a base width equal to the depth of the forms. Flexible or curved forms of proper radius shall be used for curves of 100-foot (31 m) radius or less. Flexible or curved forms shall be of a design acceptable to the Engineer. Forms shall be provided with adequate devices for secure settings so that when in place they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Flange braces shall extend outward on the base not less than two-thirds the height of the form. Forms with battered top surfaces and bent, twisted, or broken forms shall be removed from the work. Repaired forms shall not be used until inspected and approved. Built-up forms shall not be used, except as approved by the Engineer. The top face of the form shall not vary from a true plane more than 1/8 inch (3 mm) in 10 feet (3 m), and the upstanding leg shall not vary more than 1/4-inch (6 mm). The forms shall contain provisions for locking the ends of abutting sections together tightly for secure setting.

5. Slip-form Pavers. The paver shall be fully energized, self-propelled, and designed for the specific purpose of placing, consolidating, and finishing the concrete pavement, true to grade, tolerances, and cross section. It shall be of sufficient weight and power to construct the maximum specified concrete paving lane width as shown in the plans, at adequate forward speed, without transverse, longitudinal or vertical instability or without displacement. The paver shall be equipped with electronic or hydraulic horizontal and vertical control devices.

- 3.2 FORM SETTING: Forms shall be set sufficiently in advance of the concrete placement to insure continuous paving operation. After the forms have been set to correct grade, the grade shall be thoroughly tamped, either mechanically or by hand, at both the inside and outside edges of the base of the forms. Forms shall be staked into place with not less than 3 pins for each 10-foot (3 m) section. A pin shall be placed at each side of every joint.

Form sections shall be tightly locked and shall be free from play or movement in any direction. The forms shall not deviate from true line by more than 1/4-inch (6 mm) at any joint. Forms shall be so set that they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms shall be cleaned and oiled prior to the placing of concrete.

The alignment and grade elevations of the forms shall be checked and corrections made by the Contractor immediately before placing the concrete. When any form has been disturbed or any grade has become unstable, the form shall be reset and rechecked.

CONDITIONING OF UNDERLYING COURSE AND REINFORCING: The prepared grade shall be well moistened with water, without saturating, immediately ahead of concrete placement to prevent rapid loss of moisture from the concrete. Ruts or depressions in the subgrade or subbase caused by hauling or usage of other equipment shall be filled as they develop with suitable material (not with concrete or concrete aggregates) and thoroughly compacted by rolling. If damage occurs to a stabilized subbase, it shall be corrected full depth by the Contractor, or the damaged areas filled with concrete integral with the pavement. All excess material shall be removed. Low areas may be filled and compacted to a condition similar to that of the surrounding grade, or filled with concrete

integral with the pavement. In cold weather, the underlying subbase shall be protected so that it will be entirely free from frost when the concrete is placed. The use of chemicals to eliminate frost in the underlying material will not be permitted. The work described under the foregoing paragraphs does not constitute a regular subgrading operation, but rather a final accurate check of the underlying course.

Reinforcing steel, at the time concrete is placed, shall be free of mud, oil, or other organic matter that may adversely affect or reduce bond. Reinforcing steel with rust, mill scale, or a combination of both will be considered satisfactory, provided the minimum dimensions, weight, and tensile properties of a hand wire-brushed test specimen are not less than the applicable ASTM specification requirements and provided the rust or scale is not loose. Reinforcing bars shall be securely wired together at all intersections and splices and shall be securely wired to each dowel and load transmission unit intersected. All bars shall be installed in their required position as shown on the plans.

- 3.3 MIXING CONCRETE: The concrete may be mixed at the work site, in a central mix plant or in truck mixers. The mixer shall be of an approved type and capacity. Mixing time shall be measured from the time all materials, except water, are emptied into the drum. Ready-mixed concrete shall be mixed and delivered in accordance with the requirements of ASTM C94, except that the minimum required revolutions of the mixing speed for transit mixed concrete may be reduced to not less than that recommended by the mixer manufacturer. The number of revolutions recommended by the mixer manufacturer shall be indicated on the manufacturer's serial plate attached to the mixer.

When mixed at the work site or in a central mixing plant, the mixing time shall not be less than 50 seconds nor more than 90 seconds. Mixing time ends when the discharge chute opens. Transfer time in multiple drum mixers is included in mixing time. The contents of an individual mixer drum shall be removed before a succeeding batch is emptied therein.

The mixer shall be operated at the drum speed as shown on the manufacturer's nameplate on the approved mixer. Any concrete mixed less than the specified time shall be discarded at the Contractor's expense. The volume of concrete mixed per batch shall not exceed the mixer's nominal capacity in cubic feet (cubic meters), as shown on the manufacturer's standard rating plate on the mixer. An overload up to 10 percent above the mixer's nominal capacity may be permitted provided concrete test data for segregation and uniform consistency are satisfactory, and provided no spillage of concrete takes place. The batch shall be charged into the drum so that a portion of the mixing water shall enter in advance of the cement and aggregates. The flow of water shall be uniform, and all water shall be in the drum by the end of the first 15 seconds of the mixing period. The throat of the drum shall be kept free of such accumulations as may restrict the free flow of materials into the drum.

Mixed concrete from the central mixing plant shall be transported in truck mixers, truck agitators, or nonagitating trucks. The time elapsing from the time water is added to the mix until the concrete is deposited in place at the work site shall not exceed 30 minutes when the concrete is hauled in nonagitating trucks, nor 60 minutes when the concrete is hauled in truck mixers or truck agitators. Retempering concrete by adding water or by other means will not be permitted, except when concrete is delivered in transit mixers. With transit mixers additional water may be added to the batch materials and additional mixing performed to increase the slump to meet the specified requirements, if permitted by the Engineer. All these operations must be performed within 45

minutes after the initial mixing operations and the water-cement ratio must not be exceeded. Admixtures for increasing the workability or for accelerating the set will be permitted only when specified for in the contract.

- 3.4 LIMITATIONS OF MIXING: No concrete shall be mixed, placed, or finished when the natural light is insufficient, unless an adequate and approved artificial lighting system is operated.

Unless authorized in writing by the Engineer, mixing and concreting operations shall be discontinued when a descending air temperature in the shade and away from artificial heat reaches 40 degrees F (4 degrees C) and shall not be resumed until an ascending air temperature in the shade and away from artificial heat reaches 35 degrees F (2 degrees C).

When concreting is authorized during cold weather, the aggregates may be heated by either steam or dry heat prior to being placed in the mixer. The apparatus used shall heat the mass uniformly and shall be arranged to preclude the possible occurrence of overheated areas which might be detrimental to the materials. Unless otherwise authorized, the temperature of the mixed concrete shall not be less than 50 degrees F (10 degrees C) at the time of placement in the forms.

If the air temperature is 35 degrees F (2 degrees C) or less at the time of placing concrete, the Engineer may require the water and/or the aggregates to be heated to not less than 70 degrees F (21 degrees C) nor more than 150 degrees F (66 degrees C). Concrete shall not be placed on frozen subgrade nor shall frozen aggregates be used in the concrete.

During periods of warm weather when the maximum daily air temperature exceeds 85 degrees F (30 degrees C), the following precautions should be taken. The forms and/or the underlying material shall be sprinkled with water immediately before placing the concrete. The concrete shall be placed at the coolest temperature practicable, and in no case shall the temperature of the concrete when placed exceed 90 degrees F (32 degrees C). The aggregate and/or mixing water shall be cooled as necessary to maintain the concrete temperature at or not more than the specified maximum.

- 3.5 PLACING CONCRETE:

- A. Side-form Method: For the side-form method, the concrete shall be deposited on the moistened grade to require as little rehandling as possible. Unless truck mixers, truck agitators, or nonagitating hauling equipment are equipped with means for discharge of concrete without segregation of the materials, the concrete shall be unloaded into an approved spreading device and mechanically spread on the grade to prevent segregation of the materials. Placing shall be continuous between transverse joints without the use of intermediate bulkheads. Necessary hand spreading shall be done with shovels -- **NOT RAKES**. Workmen shall not be allowed to walk in the freshly mixed concrete with boots or shoes coated with earth or foreign substances.

Concrete for side-form construction shall be placed on cement treated base. No concrete shall be placed before the cement treated base has obtained a compressive strength specified at 7 days.

When concrete is to be placed adjoining a previously constructed lane of pavement and when mechanical equipment will be operated upon the existing lane of pavement, the concrete shall be at least 7 days old and at a flexural strength approved by the Engineer. If only finishing equipment is carried on the existing lane, paving in adjoining lanes may be permitted after 3 days, if approved by the Engineer.

Concrete shall be thoroughly consolidated against and along the faces of all forms and along the full length and on both sides of all joint assemblies by means of vibrators inserted in the concrete. Vibrators shall not be permitted to come in contact with a joint assembly, the grade, or a side form. In no case shall the vibrator be operated longer than 15 seconds in any one location, nor shall the vibrators be used to move the concrete. Concrete shall be deposited as near to expansion and contraction joints as possible without disturbing them but shall not be dumped from the discharge bucket or hopper onto a joint assembly unless the hopper is well centered on the joint assembly.

Should any concrete materials fall on or be worked into the surface of a completed slab, they shall be removed immediately by approved methods.

- B. Slip Form Method. For the slip-form method, the concrete shall be placed with an approved crawler-mounted, slip-form paver designed to spread, consolidate, and shape the freshly placed concrete in one

Complete pass of the machine so that a minimum of hand finishing will be necessary to provide a dense and homogeneous pavement in conformance with requirements of the plans and specifications. The concrete should be placed directly on top of the joint assemblies to prevent them from moving when the paver moves over them. Side forms and finishing screeds shall be adjustable to the extent required to produce the specified pavement edge and surface tolerance. The side forms shall be of dimensions, shape, and strength to support the concrete laterally for a sufficient length of time so that no appreciable edge slumping will occur. Final finishing shall be accomplished while the concrete is still in the plastic state.

Concrete for slip form construction shall be placed on cement treated base or lime stabilized subgrade. No concrete shall be placed before the cement treated base has obtained the compressive strength specified at 7 days. The Contractor shall set grade stakes and stringline for each lane placement. The stringline shall be supported at intervals of not more than 25 feet. Additional supports shall be installed to prevent sag of the stringline. The horizontal alignment of the stringline shall be within plus or minus 1/4-inch in 10 feet of true alignment. The Contractor shall provide a suitable method of securing the stringline to maintain proper grade where vertical curves are to be constructed.

- C. Hand Placement Method. When the hand method of striking off and consolidating is permitted, the concrete, as soon as placed, shall be approximately leveled and then truck off and screeded to such elevation above grade that, when consolidated and finished, the surface of the pavement shall be at the grade elevation shown on the plans. The entire surface shall then be tamped and the concrete consolidated so as to insure maximum compaction and a minimum of voids. For the strike off and consolidation, both a strike template and tamping template shall be provided on the work. In operation the strike

template shall be moved forward with a combined longitudinal and transverse motion and so manipulated that neither end of the template is raised from the forms during the striking-off process. A slight excess of material shall be kept in front of the cutting edge at all times. The straightedging, surfacing and joint finishing shall be as described herein.

- 3.7 STRIKE-OFF OF CONCRETE: Following the placing of the concrete, it shall be struck off to conform to the cross section shown on the plans and to an elevation such that when the concrete is properly consolidated and finished, the surface of the pavement shall be at the elevation shown on the plans. All reinforcement shall be positioned in advance of concrete placement. All reinforcing bars and bar mats shall be installed in the slab at the required depth below the finished surface and supported by chairs installed on 4-foot centers. After the reinforcing steel is securely installed above the subgrade, as specifically required by plans and as herein prescribed, there shall be no loading imposed upon (or walking upon) the bar mats or individual bars that will cause deformation of reinforcing before or during the placing or finishing of the concrete.
- 3.8 JOINTS.

A. General:

- A. Longitudinal and Transverse Joints. Longitudinal and transverse joints shall be constructed as indicated on the plans and in accordance with these requirements. All joints shall be constructed true to line with their faces perpendicular to the surface of the pavement. Joints shall not vary more than 1/2-inch (13 mm) from a true line or from their designated position. The vertical surface of the pavement adjacent to all expansion joints shall be finished to a true plane and edged to a radius of 1/4-inch (6 mm) or as shown on the plans. The surface across the joints shall be tested with a 10-foot (3 m) straightedge as the joints are finished and any irregularities in excess of 1/4-inch (6 mm) shall be corrected before the concrete has hardened. Longitudinal construction joints that do not meet these requirements or which show significant cracking or planes of weakness shall be sawed-off full depth at the Contractor's expense using the minimum practical width at locations designated by the Engineer. When required, keyways shall be accurately formed with a template of metal or wood. The gauge or thickness of the material in the template shall be such that the full keyway, as specified, is formed and is in the correct location. Transverse joints shall be right
- B. Angles to the centerline of the pavement and shall extend the full width of the slab. All joints shall be so prepared, finished, or cut to provide a groove of the width and depth shown on the plans.
- B. Tie Bars: Tie bars shall consist of deformed bars installed principally in longitudinal joints as shown on the plans or the bars shall be extensions of the distributed reinforcing steel across the joints. Tie bars shall be placed at right angles to the centerline of the concrete slab. They shall be held in position parallel to the surface and midway between the surfaces of the slab. These bars shall not be painted, greased, or enclosed in sleeves. At all locations where tie bars are specified and where pavement is in place, the tie bars shall be inserted by drilling and grouting with approved epoxy material. Tie bars in longitudinal construction joints may be installed by bending the bars flush with a keyed joint.

- C. Dowel Bars: If used, dowel bars or other load-transfer units of an approved type shall be placed across transverse or other joints in the manner as specified on the plans. They shall be of the dimensions and spacings as shown and held rigidly in the middle of the slab depth in the proper horizontal and vertical alignment by an approved assembly device to be left permanently in place. The dowel or load-transfer and joint devices shall be rigid enough to permit complete assembly as a unit ready to be lifted and placed into position. A metal, or other type, dowel expansion cap or sleeve shall be furnished for each dowel bar used with expansion joints. These caps shall be substantial enough to prevent collapse and shall be placed on the ends of the dowels as shown on the plans. The caps or sleeves shall fit the dowel bar tightly and the closed end shall be watertight.
- D. Installation: Joints in concrete pavements shall be cut as shown on the plans. Equipment shall be as described in Paragraph 3.1. The circular cutter shall be capable of cutting a groove in a straight line and shall produce a slot at least 1/8-inch (3 mm) wide and to the depth shown on the plans. When shown on the plans or required by the specifications, the top portion of the slot or groove shall be widened by means of a second shallower cut or by suitable and approved beveling to provide adequate space for joint sealers. Sawing of the joints shall commence as soon as the concrete has hardened sufficiently to permit cutting without chipping, spalling, or tearing. Sawing shall be carried on both during the day and night as required. The joints shall be sawed at the required spacing consecutively in sequence of the concrete placement, unless otherwise approved by the Engineer.
- D. Longitudinal Joints.
1. Construction. Longitudinal construction joints shall be formed against suitable side forms (usually made of steel) with or without keyways. Wooden forms may be used under special conditions, when approved by the Engineer. Where butt-type joints with dowels are designated, the dowels for this type shall be painted and greased. The edges of the joint shall be finished with a grooving tool or edging tool, and a space or slot shall be formed along the joint of the dimensions, as indicated, to receive the joint sealing material. Longitudinal construction joints shall be sawed to provide a groove at the top conforming to the details and dimensions indicated on the plans. Provisions shall be made for the installation of tie bars as noted on the plans.
 2. Contraction or Weakened-plane type. The longitudinal groove sawed in the top of the slab shall be installed where indicated on the drawings. The groove shall be sawed with approved equipment in the hardened concrete to the dimensions required. The sawed groove shall be straight and of uniform width and depth. The groove shall be clean cut so that spalling will be avoided at intersections with transverse joints. Tie bars or distributed reinforcing steel shall be installed across these joints where indicated on the plans.
 3. Expansion. Longitudinal expansion joints shall be installed as indicated on the plans. The premolded filler, of the thickness as shown on the plans, shall extend for the full depth and width of the slab at the joint, except for space for sealant at the top of the slab. The filler shall be securely staked or fastened into position perpendicular to the proposed finished surface. A cap shall be provided to protect

the top edge of the filler and to permit the concrete to be placed and finished. After the concrete has been placed and struck off, the cap shall be carefully withdrawn leaving the space over the premolded filler. The edges of the joint shall be finished and tooled while the concrete is still plastic.

E. Transverse Joints.

1. Expansion. Transverse expansion joints shall be installed at the locations and spacing as shown on the plans. The joints shall be installed at right angles to the centerline and perpendicular to the surface of the pavement. The joints shall be installed and finished to insure complete separation of the slabs. Expansion joints shall be of a premolded type conforming to these specifications and with the plans and shall be the full width of the pavement strip.

All concrete shall be cleaned from the top of the joint material. Before the pavement is opened to traffic, this space shall be swept clean and filled with approved joint sealing material.

All devices used for the installation of expansion joints shall be approved by the Engineer. They shall be easily removable without disturbing the concrete and held in proper transverse and vertical alignment. Immediately after forms are removed, any concrete bridging the joint space at the ends shall be removed for the full width and depth of the joint.

When specified, expansion joints shall be equipped with dowels of the dimensions and at the spacing and location indicated on the plans. The dowels shall be firmly supported in place and accurately aligned parallel to the subgrade and the centerline of the pavement by means of a dowel assembly which will remain in the pavement and will ensure that the dowels are not displaced during construction.

Other types of load-transfer devices may be used, when approved by the Engineer.

2. Contraction. Transverse contraction joints, weakened-plane joints, or both, shall be installed at the locations and spacing as shown on the plans. These joints will be installed by sawing a groove into the concrete surface after the concrete has hardened in the same manner as specified in Paragraph 3.8(c)(2). Dowel bar assemblies shall be installed, when required, as shown on the plans.
3. Construction. Transverse construction joints shall be installed at the end of each day's placing operations and at any other points within a paving lane when concrete placement is interrupted for more than 30 minutes or it appears that the concrete will obtain its initial set before fresh concrete arrives. When the installation of the joint can be planned in advance, it shall be located at a contraction or expansion joint. The joint shall not be allowed within 8 feet (2.4 m) of a regular spaced transverse joint. If the pouring of the concrete has been stopped, causing a joint to fall within this limit, it shall not be installed, and the fresh placed concrete shall be removed back to the 8 foot (2.4 m) limit.

3.9 FINAL STRIKE-OFF, CONSOLIDATION, AND FINISHING:

- A. Sequence. The sequence of operations shall be the strike-off and consolidation, floating and removal of laitance, straightedging, and final surface finish. **The addition of superficial water to the surface of the concrete to assist in finishing operations generally will not be permitted.** If the application of water to the surface is permitted, it shall be applied as a fog spray by means of approved spray equipment.
- B. Finishing at Joints. The concrete adjacent to joints shall be compacted or firmly placed without voids or segregation against the joint material; it shall be firmly placed without voids or segregation under and around all load-transfer devices, joint assembly units, and other features designed to extend into the pavement. Concrete adjacent to joints shall be mechanically vibrated. After the concrete has been placed and vibrated adjacent to the joints, the finishing machine shall be operated in a manner to avoid damage or misalignment of joints. If uninterrupted operations of the finishing machine, to, over, and beyond the joints, cause segregation of concrete, damage to, or misalignment of the joints, the finishing machine shall be stopped when the screed is approximately 8 inches (20 cm) from the joint. Segregated concrete shall be removed from the front of and off the joint; the screed shall be lifted and set directly on top of the joint, and the forward motion of the finishing machine shall be resumed. Thereafter, the finishing machine may run over the joint without lifting the screed, provided there is no segregated concrete immediately between the joint and the screed or on top of the joint.
- C. Machine Finishing. The concrete shall be spread as soon as it is placed, and it shall be struck off and screeded by an approved finishing machine. The machine shall go over each area as many times and at such intervals as necessary to give the proper consolidation and to leave a surface of uniform texture. Excessive operation over a given area shall be avoided. When side forms are used, the tops of the forms shall be kept clean by an effective device attached to the machine, and the travel of the machine on the forms shall be maintained true without lift, wobbling, or other variation tending to affect the precision finish. During the first pass of the finishing machine, a uniform ridge of concrete shall be maintained ahead of the front screed for its entire length. When in operation, the screed shall be moved forward with a combined longitudinal and transverse shearing motion, always moving in the direction in which the work is progressing, and so manipulated that neither end is raised from the side forms during the striking-off process. If necessary, this shall be repeated until the surface is of uniform texture, true to grade and cross section, and free from porous areas.
- D. Hand Finishing. Hand finishing methods will not be permitted, except under the following conditions: In the event of breakdown of the mechanical equipment, hand methods may be used to finish the concrete already deposited on the grade; in areas of narrow widths or of irregular dimensions where operation of the mechanical equipment is impractical. Concrete, as soon as placed, shall be struck off and screeded. An approved portable screed shall be used.

The screed for the surface shall be at least 2 feet (0.6 m) longer than the maximum width of the slab to be struck off. It shall be of approved design, sufficiently rigid to retain its shape,

and shall be constructed either of metal or of other suitable material covered with metal. Wood will not be permitted. Consolidation shall be attained by the use of a suitable vibrator.

- E. Floating. After the concrete has been struck off and consolidated, it shall be further smoothed, trued, and consolidated by means of a longitudinal float, using one of the following methods:
1. Hand Method. The hand-operated longitudinal float shall not be less than 12 feet (3.6 m) in length and 6 inches (15 cm) in width, properly stiffened to prevent flexibility and warping. The longitudinal float, operated from foot bridges resting on the side forms and spanning but not touching the concrete, shall be worked with a sawing motion, while held in a floating position parallel to the slab centerline and passing gradually from one side of the slab to the other. Forward movement along the centerline of the slab shall be in successive advances of not more than one-half the length of the float. Any excess water or soup material shall be wasted over the slab edge on each pass.
 2. Mechanical Method. The Contractor may use a machine composed of a cutting and smoothing float(s), suspended from and guided by a rigid frame. The frame shall be carried by four or more visible wheels riding on, and constantly in contact with, the side forms or pavement subgrade. If necessary, long-handled floats having blades not less than 5 feet (1.5 m) in length and 6 inches (1.5 cm) in width may be used to smooth and fill in open-textured areas in the slab. Long-handled floats shall not be used to float the entire surface of the slab in lieu of mechanical methods. After floating, any excess water and laitance shall be removed from the surface of the slab by a straightedge 10 feet (3 m) or more in length. Successive drags shall be lapped one-half the length of the blade.
- F. Straight-edge Testing and Surface Correction. After the pavement has been struck off and consolidated and while the concrete is still plastic, it shall be tested for trueness with a 16-foot (4.8 m) straightedge. For this purpose the Contractor shall furnish and use an accurate 16-foot (4.8 m) straightedge swung from handles 3 feet (0.4 m) longer than one-half the width of the slab. The straightedge shall be held in contact with the surface in successive positions parallel to the centerline and the whole area gone over from one side of the slab to the other, as necessary. Advancing shall be in successive stages of not more than one-half the length of the straightedge. Any excess water and laitance shall be removed from the surface of the pavement. Any depressions shall be immediately filled with freshly mixed concrete, struck off, consolidated, and refinished. High areas shall be cut down and refinished. Special attention shall be given to assure that the surface across joints meets the requirements for smoothness. Straightedge testing and surface corrections shall continue until the entire surface is found to be free from observable departures from the straightedge and until the slab conforms to the required grade and cross section. The use of long-handled wood floats shall be confined to a minimum; they may be used only in emergencies and in areas not accessible to finishing equipment.

- 3.10 SURFACE TEXTURE: A light broom drag shall be used for slab concrete pavements. The direction of the texture device shall be as directed by the Engineer. Contractor to match existing pavement finishes.
- 3.11 SURFACE TEST: As soon as the concrete has hardened sufficiently, the pavement surface shall be tested with a 16-foot (5 m) straightedge or other specified device to determine its compliance with design grades. Where the departure from correct cross section exceeds ½ inch (13 mm), the pavement shall be ground down with a approved grinding machine to within 1/4 inch of tolerance or removed and replaced at the expense of the Contractor when so directed by the Engineer. Cracked or damaged slabs shall be removed and replaced at the expense of the Contractor when so directed by the Engineer.

Any area or section so removed shall not be less than 20 feet (6 m) in length nor less than the full width of the lane involved. When it is necessary to remove and replace a section of pavement, and remaining portion of a slab adjacent to the joints that is less than 10 feet (3 m) in length shall also be removed and replaced.

- 3.12 CURING: Immediately after the finishing operations have been completed and marring of the concrete will not occur, the entire surface of the newly placed concrete shall be cured in accordance with one of the methods below. In all cases in which curing requires the use of water, the curing shall have prior right to all water supply or supplies. Failure to provide sufficient cover material of whatever kind the Contractor may elect to use, or lack of water to adequately take care of both curing and other requirements, shall be cause for immediate suspension of concreting operations. The concrete shall not be left exposed for more than 1/2 hour during the curing period. The following are alternate approved methods for curing concrete pavements.

- A. Impervious Membrane Method. The entire surface of the pavement shall be sprayed uniformly with white pigmented curing compound immediately after the finishing of the surface and before the set of the concrete has taken place. The curing compound shall not be applied during rainfall. Curing compound shall be applied by mechanical sprayers under pressure at the rate of 1 gallon (4 liters) to not more than 150 square feet (14 square meters). The spraying equipment shall be of the fully atomizing type equipped with a tank agitator. At the time of use, the compound shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. During application the compound shall be stirred continuously by effective mechanical means. Hand spraying of odd widths or shapes and concrete surfaces exposed by the removal of forms will be permitted. Curing compound shall not be applied to the inside faces of joints to be sealed, but approved means shall be used to insure proper curing for 72 hours. The curing compound shall be of such character that the film will harden within 30 minutes after application. Should the film become damaged from any cause within the required curing period, the damaged portions shall be repaired immediately with additional compound. Upon removal of the side forms, the sides of the exposed slabs shall be protected immediately to provide a curing treatment equal to that provided for the surface. For the Impervious Membrane Method, the Contractor is encouraged to include Polyethylene Film dispensing equipment in the Paving Train to provide protection to the finished work in case of rainfall.
- B. Polyethylene Films. The top surface and sides of the pavement shall be entirely covered with polyethylene sheeting. The units shall be lapped at least 18 inches (457 mm). The

sheeting shall be placed and weighted to cause it to remain in contact with the surface covered. The sheeting shall have dimensions that will extend at least twice the thickness of the pavement beyond the edges of the pavement. Unless otherwise specified, the sheeting shall be maintained in place for 72 hours after the concrete has been placed.

- C. Waterproof Paper. The top surface and sides of the pavement shall be entirely covered with waterproofed paper. The units shall be lapped at least 18 inches (457 mm). The paper shall be placed and weighted to cause it to remain in contact with the surface covered. The paper shall have dimensions that will extend at least twice the thickness of the pavement beyond the edges of the slab. The surface of the pavement shall be thoroughly wetted prior to placing of the paper. Unless otherwise specified, the paper shall be maintained in place for 72 hours after the concrete has been placed.
- D. White Burlap-Polyethylene Sheets. The surface of the pavement shall be entirely covered with sheeting. The sheeting used shall be such length (or width) that it will extend at least twice the thickness of the pavement beyond the edges of the slab. The sheeting shall be placed so that the entire surface and both edges of the slab are completely covered. The sheeting shall be placed and weighted to remain in contact with the surface covered, and the covering shall be maintained fully wetted and in position for 72 hours after the concrete has been placed.
- E. Curing in Cold Weather. When the average daily temperature is below 40 degrees F (4 degrees C), curing shall consist of covering the newly laid pavement with not less than 12 inches (30 cm) of loose, dry hay or straw, or equivalent protective curing authorized by the Engineer, which shall be retained in place for 10 days. The hay or straw shall be secured to avoid being blown away. Admixture for curing or temperature control may be used only when authorized by the Engineer.

When concrete is being placed and the air temperature may be expected to drop below 35 degrees F (2 degrees C), a sufficient supply of straw, hay, grass, or other suitable blanketing material such as burlap or polyethylene shall be provided along the work. Any time the temperature may be expected to reach the freezing point during the day or night, the material so provided shall be spread over the pavement to a sufficient depth to prevent freezing of the concrete. The period of time such protection shall be maintained shall not be less than 10 days. A minimum of 3 days is required when high, early strength concrete is used. The Contractor shall be responsible for the quality and strength of the concrete placed during cold weather, and any concrete injured by frost action shall be removed and replaced at the Contractor's expense.

- 3.13 REMOVING FORMS: Unless otherwise specified, forms shall not be removed from freshly placed concrete until it has set for at least 12 hours, except where auxiliary forms are used temporarily in widened areas. Forms shall be removed carefully to avoid damage to the pavement. After the forms have been removed, the sides of the slab shall be cured as outlined in one of the methods indicated in Paragraph 3.17. Major honeycombed areas shall be considered as defective work and shall be removed and replaced. Any area or section so removed shall not be less than 20 feet (6 m) in length nor less than the full width of the lane involved. When it is necessary to remove and replace a section of pavement, any remaining portion of the slab adjacent to the joints that is less than 10 feet (3 m) in length shall also be removed and replaced.

- 3.14 SEALING JOINTS: The joints in the pavement shall be prepared and sealed in strict accordance with the sealant manufacturer's printed recommendations.
- 3.15 PROTECTION OF PAVEMENT: The Contractor shall protect the pavement and its appurtenances against both public traffic and traffic caused by the Contractor's employees and agents. This shall include watchmen to direct traffic and the erection and maintenance of warning signs, lights, pavement bridges, or crossovers, etc. The plans or special provisions will indicate the location and type of device or facility required to protect the work and provide adequately for traffic. Any damage to the pavement occurring prior to final acceptance shall be repaired or the pavement replaced at the Contractor's expense. In order that the concrete be properly protected against the effects of rain before the concrete is sufficiently hardened, the Contractor is encouraged to have available at all times materials for the protection of edges and surface of the unhardened concrete. Such protective materials shall consist of rolled polyethylene sheeting at least 4 mils (0.1 mm) thick of sufficient length and width to cover the plastic concrete slab and any edges. The sheeting may be mounted on either the paver or a separate movable bridge from which it can be unrolled without dragging over the plastic concrete surface. When rain appears imminent, all paving operations shall stop and all available personnel should begin covering the surface of the unhardened concrete with the protective covering.
- 3.16 OPENING TO TRAFFIC: The Engineer shall decide when the pavement shall be opened to traffic. The pavement will not be opened to traffic until test specimens molded and cured in accordance with ASTM C31 have attained a flexural strength of 550 pounds per square inch (3792 kPa) when tested in accordance with ASTM C78. If such tests are not conducted, the pavement shall not be opened to traffic until 14 days after the concrete was placed. Prior to opening to traffic, the pavement shall be thoroughly cleaned.
- 3.17 SURFACE AND THICKNESS TOLERANCES: Extreme care must be exercised in all phases of the operation to assure the pavement will pass the specified tolerances. The following tolerances are applicable:
- A. Lateral deviation from established alignment of the pavement edge shall not exceed plus or minus 0.10 foot (30 mm) in any lane.
 - B. Vertical deviation from established grade shall not exceed plus or minus 0.04 foot (12 mm) at any point.
 - C. Surface smoothness deviations shall not exceed 3/8 inch (6 mm) from a 16-foot (5 m) straightedge placed in any direction, including placement along and spanning any pavement joint or edge.
- No additional payment over the contract unit price shall be made for any pavement of a thickness exceeding that required by plans.
- 3.18 INTEGRAL CURBS: Where shown on the drawings, integral curbs shall be installed to the dimension shown using identical concrete to the paving mix. Expansion and contraction joints shall extend through curb section. Reinforcing for integral curb, when shown on the plans, shall be supported from the ground with driven stakes or as directed by the Engineer. Once the forms are

removed, all voided areas shall be rubbed and filled with non-shrink grout within 24 hours. If the forms are removed within 2 days of placement, the curb shall be treated with a specified curing membrane.

- 3.19 **CONCRETE CURB AND GUTTER:** Concrete curb and gutter shall be constructed using concrete of the type and strength specified in the plans. The placement, strike-off consolidation and finishing shall be made using applicable portions of this specification as determined by the Engineer. Contraction joints shall be placed at 20-foot centers with the use of a 1/2" deep grooving tool. Expansion joints shall be placed at a maximum spacing of 400 feet and at all radius points, curb returns and junctions with structures. For curves of 100 feet radius or less, contraction joints shall be tooled at 10-foot centers and expansion joints constructed at 50-foot centers. Expansion joints shall contain a minimum of two smooth dowels a minimum of one bar size larger than the longitudinal reinforcing and 3/4-inch thick expansion joint material of the type specified in the plans. Expansion joints shall be sealed in accordance with the plan details.
- 3.20 **SIDEWALKS AND SLOPE PAVING:** Concrete sidewalks and slope paving shall be constructed to use concrete of the type and strength specified in the plans. The placement, strike-off, consolidation and finishing shall be made using applicable portions of this specification as determined by the Engineer. Contraction joints shall be tooled at a depth of 1/2" at a spacing equal to the width of the sidewalk not to exceed six feet. For walks wider than six feet, longitudinal joints shall be tooled at equal spacing, not less than three feet. Edges shall be tooled with a 1/4-inch radius and finish slightly higher than adjacent curbs to ensure proper drainage if some settlement occurs. Expansion joints shall be placed at 100-foot intervals or at intersecting walk locations. Expansion joints shall be 3/4-inch in thickness and contain smooth dowels at not less than 12" spacing. The size of the dowels will be equal to the thickness of the sidewalk in inches. Scoring and tooling for barrier free ramps shall be made in accordance with governing City standards or as directed by the Engineer.
- 3.21 **FIELD TEST SPECIMENS:** Concrete samples shall be furnished by the Contractor and shall be taken in the field to determine the consistency, air content, and strength of the concrete. Compressive test cylinders shall be made each day that the concrete is placed. However, at the start of paving operations and when the aggregate source, aggregate characteristics, or mix design is changed, additional groups of test cylinders may be required until the Engineer is satisfied that the concrete mixture being used complies with the strength requirements of these specifications. Test ages will be 7 days and 28 days.

Test cylinders for compressive strength tests shall be taken and cured in accordance with ASTM C-31 and tested in accordance with ASTM C-39. At least four cylinders (a set) shall be made for each 1,000 cubic yards or fraction thereof placed and tested at 7 days and 28 days. No extra compensation will be allowed for materials and work involved in fulfilling these requirements. Concrete will be accepted on the basis of tests conducted on a "lot" of concrete. A lot will consist of 160 cubic yards and will be divided into four equal sublots. One set of tests will be made for each subplot. Random samples will be taken from the plastic concrete at the site in accordance with accepted statistical procedures.

The concrete shall be sampled in accordance with ASTM C172.

The lot will be accepted without adjustment in payment if the average 28 day compressive strength, based on four acceptance tests, indicates a strength deficiency of not less than 100 psi. The pay factor for 28-day compressive strengths showing a deficiency greater than 100 psi are listed in the table below.

PAY FACTOR SCHEDULE FOR COMPRESSIVE STRENGTH
AT THE SPECIFIED INTERVAL

Strength Deficiency (Based on an Average of 4 Cylinders) psi	Pay Factor (Percent of Contract Unit Price) psi
0 - 100	100
100 - 150	85
151 - 200	75
201 - 250	70
251 - 300	60
301 - 375	55
375 - 500	50
>500	Reject

END OF SECTION 321313

SECTION 321320

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 321313, Concrete Pavement.

1.2 QUALITY ASSURANCE

A. Reference Standards:

1. ACI 315, Manual of Standard Practice for Detailing Reinforced Concrete Structures.
2. ASTM A615, Specification for Deformed Billet Steel Bars for concrete.
3. ASTM A185, Specifications for Welded Steel Wire Fabric for Concrete Reinforcement.
4. Concrete Reinforcing Steel Institute, Manual of Standard Practice.

B. Allowable Tolerances:

1. Fabricating: (per ACI 117-90)
 - a. Saw cut length to: Plus or minus 1". (Remove all burrs).
 - b. Stirrups and ties: Plus or minus 1/2".
 - c. All other bends: Plus or minus 1".
2. Placing:
 - a. Concrete cover to formed surfaces: Plus or minus 1/4".
 - b. Minimum spacing between bars: Plus or minus 1/4".
 - c. Top bars in slabs and beams:
 - (1) Members 8" deep or less: Plus or minus 1/4".
 - (2) Members more than 8" but not over 2'-0" deep: Plus or minus 1/2".
 - (3) Members more than 2'-0" deep: Plus or minus 1".
 - (4) Crosswise of members: Space evenly within 2" of stated separation.
 - (5) Lengthwise of members: Plus or minus 2".
3. Maximum bar relocation to avoid interference with other reinforcing steel, conduits, or other embedded item: 1 bar diameter.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver reinforcement to project site in bundles marked with tags indicating bar size, length and mark.
- B. Unload reinforcing carefully to prevent damage. Store above ground in dry, well drained area; protect from mud, dirt and corrosion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Reinforcing Bars: ASTM A615, deformed billet steel bars, domestic manufacture, Grades 40 and/or 60 as indicated on structural drawings.
- B. Welded Wire Fabric Reinforcing: ASTM A185, steel wire spot welded at intersections and of size indicated.
- C. Metal Accessories: Include spacers, chairs, bolsters, ties and other devices necessary for properly placing, spacing, supporting and fastening reinforcement in place, conforming to requirements to CRSI "Manual of Standard practice for Detailing Reinforced Concrete Structures." Metal accessories shall be galvanized or plastic coated where legs will be exposed in finished concrete surfaces.
- D. Tie Wire: FS QQ-W-461, black annealed steel, 16 ga. min.

2.2 FABRICATION:

- A. In accordance with CRSI "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 PREPARATION

- A. Cleaning: Before placing in work, thoroughly clean reinforcement of loose rust, mill, scale, dirt, oil, and other coating which might tend to reduce bonding. Reinspect reinforcing left protruding for future bonding, or following delay in work, and reclean if necessary.

3.2 INSTALLATION

- A. Bar Placement: In accordance with CRSI "Recommended Practice for Placing Reinforcing Bars" and "Recommended Practice for Placing Bar Supports."
 - 1. Bending: Bend bars cold; do not heat reinforcing or bend by make-shift methods. Discard bent, kinked or otherwise damaged bars.
 - 2. Splices: In accordance with ACI 315.
 - 3. Placing: Accurately position reinforcement; securely saddle tie at intersections.
 - 4. Supports: In accordance with ACI 315 for number, type, spacing and placing.

END OF SECTION 321320

SECTION 321373

CONCRETE PAVING JOINT SEALANTS

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 the following:
 - 1. Expansion and contraction joints within cement concrete pavement.
 - 2. Joints between cement concrete and asphalt pavement.
- B. Related Sections include the following:
 - 1. Section 321313: "Concrete Paving"

1.3 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Verification: For each type and color of joint sealant required. Install joint-sealant samples in **1/2-inch- (13-mm-)** wide joints formed between two **6-inch- (150-mm-)** long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
- D. Qualification Data: For Installer.
- E. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for sealants.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Use manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
 - 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
 - 5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.
- D. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing of current sealant products within a 36-month period preceding the commencement of the Work.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 for testing indicated, as documented according to ASTM E 548.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
 - 2. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (4.4 deg C).
 - 3. When joint substrates are wet or covered with frost.

4. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
5. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.
- B. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.
- B. Colors of Exposed Joint Sealants: to match concrete color.

2.3 COLD-APPLIED JOINT SEALANTS

- A. Multi-component Pourable, chemically curing elastomeric formulation complying with the following requirements for formulation and with ASTM C 920 for type, grade, class, and uses indicated:
 1. Urethane Formulation: Type M; Grade P; Class 12-1/2; Uses T, M, and, as applicable to joint substrates indicated, O.
 2. Coal-Tar-Modified Polymer Formulation: Type M; Grade P; Class 25; Uses T and, as applicable to joint substrates indicated, O.
 3. Bitumen-Modified Urethane Formulation: Type M; Grade P; Class 25; Uses T, M, and, as applicable to joint substrates indicated, O.
- B. Type NS Silicone Sealant for Concrete: Single-component, low-modulus, neutral-curing, nonsag silicone sealant complying with ASTM D 5893 for Type NS.
- C. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.

- D. Multi-component Low-Modulus Sealant for Concrete and Asphalt: Proprietary formulation consisting of reactive petropolymer and activator components producing a pourable, self-leveling sealant.

2.4 JOINT-SEALANT BACKER MATERIALS

- A. General: Provide joint-sealant backer materials that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.
- B. Round Backer Rods for Cold- and Hot-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.
- C. Backer Strips for Cold- and Hot-Applied Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.
- D. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

2.5 PRIMERS

- A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from pre-construction joint-sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint-sealant manufacturer, based on pre-construction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install backer materials of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability. Do not leave gaps between ends of backer materials. Do not stretch, twist, puncture, or tear backer materials. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.
- D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses provided for each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below 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. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions, unless otherwise indicated.
- G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

3.4 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants 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 sealants immediately

and replace with joint sealant so installations with repaired areas are indistinguishable from the original work.

END OF SECTION 321373

SECTION 323000

CAST-IN-PLACE CONCRETE FOR SITE WORK

PART 1 - GENERAL

1.1 GENERAL DESCRIPTION OF WORK COVERED

- A. Mixing, placing, finishing and providing all related services necessary to construct all cast-in-place concrete work indicated on plans.

1.2 QUALITY ASSURANCE

- A. Comply with the latest published edition of the American Concrete Institute (ACI) and American Society of Testing and Materials (ASTM) standards and codes:
 - 1. ACI 315 - Manual of Standard practice for Detailing.
 - 2. ACI 318 - Building Code Requirements for Reinforced Concrete.
 - 3. ACI 347 - Recommended Practice for Concrete Formwork.
 - 4. ASTM A36 - Structural Steel.
 - 5. ASTM C33 - Concrete Aggregates.
 - 6. ASTM C39 - Concrete Strength of Molded Concrete Cylinders.
 - 7. ASTM C94 - Ready-Mixed Concrete.
 - 8. ASTM C143 - Slump of Portland Cement Concrete.
 - 9. ASTM C150 - Portland Cement.
 - 10. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
 - 11. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
 - 12. ACI 301 - Specification for Structural Concrete for Building.
- B. Submit compliance submittals as specified in Division 1, including but not limited to the following: bar schedule, bar details, shop drawings including size and location of openings, waterstops, joint systems and curing method.
- C. Submit proposed concrete mix proportions to Engineer prior to placing concrete.

1.3 SUBMITTALS

- A. Conform to requirements of section 013300 SUBMITTALS.
- B. Manufacturer's Literature: Manufacturer's descriptive literature and recommended method of installation.
- C. Certificates: Manufacturer's certification that products meet specification requirements.

PART 2 - PRODUCTS

2.1 PORTLAND CEMENT

- A. Type I, Type II or Type III conforming to ASTM C150 as modified by Texas State Department of Highways and Public Transportation, Most Recent Edition Standard Specifications.
- B. Type I or II cement may be used unless Type II is specified.
- C. Except when Type II specified, Type III may be used when the anticipated air temperature for the succeeding 12 hours will not exceed 60°F.
- D. Type III may be used in all pre-cast pre-stressed concrete except in piling when Type II cement is required for substructure concrete.
- E. All cement used in a monolithic placement shall be of the same type.
- F. May be either bagged or bulk. Partially set or caked cement will be rejected.
- G. All types of cements shall be "low alkali" cements.

2.2 WATER:

- A. Clear, fresh, free from injurious amounts of oil, alkaline, acid or organic matter or other deleterious substances and shall not contain more than 1000 parts per million of chlorides as Cl nor more than 1000 parts per million of sulfates as SO₄.
- B. Water of known potable quality requires no testing. Other sources shall meet the requirements of AASHTO T-26.
- C. Water shall have a pH of not less than 4.5 or more than 8.5.

2.3 FINE AGGREGATE

- A. Natural sand, manufactured sand or a combination of the two, with or without mineral filler.
- B. The sand, or mixture of sand, comprising a single fine aggregate, shall consist of clean, hard, durable, uncoated grains and shall be essentially free from clay lumps, salt or alkali, and other foreign material.
- C. The maximum permissible percentage, by weight of deleterious substances shall not exceed the following:

Material removed by decantation	3.0%
Other deleterious substances such as coal, shale, coated grains and soft flaky particles	3.0%

An additional loss of 2% by decantation may be allowed, provided this new additional loss is material of the same quality as specified for fine aggregate or mineral filler.
- D. Gradation, percent of weight retained:

Sieve Size	Percent Retained

3/8 inch	0
No. 4	0 - 5
No. 8	0 - 20
No. 16	15 - 50
No. 30	35 - 75
No. 50	65 - 90
No. 100	90 - 100
No. 200	97 - 100

E. Fineness Modulus:

1. For Grade 1 only - 2.3 minimum, 3.1 maximum.

F. Mineral Filler:

1. May be added upon written authorization of Engineer
2. Shall be stone dust or clean crushed sand, or other approved inert material.
3. Shall not exceed 5% of the fine aggregate.
4. Shall meet the following requirements:
 - a. Passing No. 30 sieve 95 to 100%
 - b. Passing No. 100 sieve 70 to 100%

2.4 COARSE AGGREGATE

- A. Crushed stone, gravel, crushed gravel, crushed blast furnace slag or a combination of these.
- B. Gravel and crushed gravel shall consist of clean, hard durable particles, free from adherent coating, thin or elongated pieces, soft or disintegrated particles, dirt, organic or deleterious substances, salt or alkali, and other foreign material.
- C. Crushed stone shall consist of the clean, dust free product resulting from crushing of stone. There shall be no adherent coatings, clay, loam organic or deleterious substances, salt or alkali, and other foreign material.
- D. The maximum permissible percentage, by weight, of deleterious substances shall not exceed the following:

Material removed by decantation	1.00%
Shale, Slate or other similar material	1.00%
Clay lumps	0.25%
Soft fragments	3.00%
Other deleterious substances, including friable, thin, elongated or laminated pieces	3.00%
The sum of all deleterious substances exclusive of material removed by decantation, shall not exceed by weight	5.00%

E. Coarse aggregates shall have a percent wear of not more than 45 when tested in accordance with Test Method Tex-410-A.

F. Gradation, percent of weight retained on:

1. Grade No. 1 - Maximum Nominal Size 2 1/2-inches (63 mm)

Sieve	Percentage Retained
2 1/2-inches	0%
2-inches	0 - 20%
1 1/2-inches	15 - 50%
3/4-inches	60 - 80%
No. 4	95 - 100%

2. Grade No. 2 - Maximum Nominal Size 1 1/2-inches (37.5 mm)

Sieve	Percentage Retained
2-inches	0%
1 1/2-inches	0 - 5%
3/4-inches	30 - 65%
3/8-inches	70 - 90%
No. 4	95 - 100%

3. Grade No. 3 - Maximum Nominal Size 1-inch (25 mm)

Sieve	Percentage Retained
1 1/2-inches	0 - 5%
3/4-inches	10 - 40%
1/2-inches	40 - 75%
No. 4	95 - 100%

4. Grade No. 4 - Maximum Nominal Size 3/8-inch (9.5 mm)

Sieve	Percentage Retained
1/2-inches	0 - 5%
3/8-inches	5 - 30%
No. 4	75 - 100%

G. Gradation Requirements - maximum size of aggregate for structural concrete shall not exceed three inches, and shall be reduced in size to meet the following conditions:

1. One-sixth (1/6) of the least dimension between forms of that part of the structure in which concrete is to be placed.
2. Three-fourths (3/4) of the clear space between reinforcement.
3. The maximum size aggregate is defined as the clear space between the sides of the smallest square openings through which 95 percent of the weight of the aggregate can be passed.
4. Unless otherwise noted or restricted by above Grade No. 2, gradation shall be used.

2.5 PIT-RUN AGGREGATE

A. Pit-run aggregate is the natural gravel and sand obtained from pits without the addition of other fine or coarse aggregates, and shall consist of hard, durable, uncoated pebbles or stone particles mixed with sand.

- B. Pit-run aggregate shall be free from lumps of clay and injurious amounts of dust, shale, soft or flaky particles, salt and alkali.
- C. Pit-run aggregate shall be well graded from coarse to fine when tested by standard laboratory methods and shall meet the following minimum requirements for percentages by weight:
 - 1. Retained on 1/4 in sieve 55 to 60%
- D. Pit-run aggregate shall not be used for high-strength concrete of 3000 psi and above.
- E. Pit-run aggregate may be used only for concrete cushion, cradle and protection for pipe.

2.6 ADMIXTURES:

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Water-Reducing Admixture: ASTM C 494, Type A.
- D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
- E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
- G. Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Catexol 1000CL; Axim Concrete Technologies.
 - b. MCI 2000 or MCI 2005; Cortec Corporation.
 - c. DCI or DCI-S; W. R. Grace & Co., Construction Products Div.
 - d. Rheocrete 222+; Master Builders, Inc.
 - e. FerroGard-901; Sika Corporation.

2.7 REINFORCING STEEL

- A. Reinforcing steel shall comply with Section 03200.

2.8 CURING MATERIALS

- A. Liquid Membrane: white pigmented chlorinated rubber, ASTI C309.

- B. Liquid Membrane: resin base, clear compound, permitting application of paint, Serviced Products Corporation - Code 2802 or equal.
- C. Plastic Film: White pigmented, 0.00085-inches (minimum) thick.
- D. Burlap: jute fabric, lean, free of impurities.
- E. Surface Hardener: gray crystal, acidic fluosilicate base, slightly hygroscopic chemical surface hardener, SIKKA Hardener, SIKKA Chemical Corporation, or equal.

2.9 JOINT MATERIALS

- A. Joint Sealer: hot poured, non-extruding, elastic, ASTI 01190.
- B. Preformed Expansion Joint Filler: non-extruding, bituminous fiber, ASTI D1751.

2.10 WATERSTOP

- A. Polyvinyl chloride or rubber, centerbulb.
- B. Size to suit joinings, minimum 6-inches.

2.11 FORM MATERIALS

- A. Use plywood, metal, metal framed plywood faced or other acceptable panel-type material.
- B. Coat forms with non-bonding, non-staining commercial compounds.

2.12 MOISTURE BARRIER

- A. Polyethylene sheet, minimum 8-mil., ASTI E154.

2.13 CONCRETE MIX DESIGN AND CONTROL

- A. Submit not less than 10 days prior to the start of concreting operations to the Engineer:
 - 1. Mix design, using a coarse aggregate factor acceptable to the Engineer.
 - 2. Sufficient samples of all materials to be incorporated into the mix for testing.
 - 3. Full description of the source of supply of each material component.
- B. Coarse aggregate factor:
 - 1. Not more than 0.82 when voids less than 48%.
 - 2. Not more than 0.85 when voids exceed 48%.
 - 3. Not less than 0.68.

- C. No changes or deviations from proportions or sources of supply without approval of Engineer.
- D. No concrete may be placed on the job site until the mix design has been approved by Engineer in writing to the Contractor.

2.14 CONCRETE QUALITY:

A. Consistency:

- 1. Mortar shall cling to the coarse aggregate.
- 2. The aggregate shall not segregate during transport.
- 3. The concrete and mortar shall show no free water when removed from the mixer.

B. The consistency should allow the completion of all finishing operations with the addition of water to the surface.

C. The concrete shall be uniform, workable, cohesive, possess satisfactory finishing qualities and be of the stiffest consistency that can be placed and vibrated into a homogeneous mass.

D. Excessive bleeding shall be avoided.

D. Slump requirements shall be as follows:

Structural Concrete	Average Slump	Maximum Slump
1. Cased Drilled Shafts and Thin-walled Sections (9-inches or less)	4	5
2. Slabs, Caps, Columns, Piers, wall sections over 9-inches.etc.	3	4
3. Slip Form Paving	1/2	2
4. Underwater or Seal Concrete	5	6
5. Rip-rap, Curb, Gutter and other Miscellaneous Surfaces	As Specified	As Specified
By Owner	By Owner	

NOTE: No concrete shall be permitted with slump in excess of the maximums shown. Any concrete mix failing to meet the above consistency requirements, although meeting the slump requirements shall be considered unsatisfactory; and the mix shall be changed to correct such unsatisfactory conditions.

F. The concrete shall comply with Table 1 below:

TABLE 1 - CLASSES OF CONCRETE

Class Of Concrete	Minimum Maximum SX Cement	Minimum Compressive Strength	Minimum Beam Strength	Maximum Water Cement	Coarse Aggregate Number

	Per CY	28-day p.s.i.	7-day p.s.i. ****	Item 2.1.1(c)(4)	
A	5.0	3000	500	6.5	2-3-4
B	4.0	2000	330	8.0	2-3-4
C*	6.0	3600	600	6.0	1-2-3**
D	3.0	1500	250	11.0	2-3-4
E	6.0	3000	500	7.0	2-3
F	6.5	4200	700	5.5	2-3
H***	6.5-8.0	As Spec'd On plans	N/A	5.5	3

*Entrained Air.

**No. 1 coarse aggregate may be used in foundations only (Except cased drilled shafts).

***Prestressed Concrete.

****ASTI C293 (Center Point).

2.15 GROUT:

A. Non-Shrink:

1. Use premixed non-shrink, Embeco Pre-Mixed Grout or Embeco Pre-Mixed Mortar by Master Builders Company or equal.
2. Keep water to a minimum for placing by the dry packing method.

PART 3 - EXECUTION

3.1 SUBGRADE

- A. Insure subgrade is true to line and grade and compacted as specified.
- B. Fill and recompact any ruts or depressions.
- C. Check cross section with a template.
- D. Place moisture barrier or motion subgrade prior to placing of concrete. Method to be approved by Engineer.

3.2 FORMS

- A. Provide forms for all concrete work including footings and base slabs.
- B. Construct forms so that completed concrete will conform to shapes, lines, grades and dimensions indicated and required.
- C. Forms shall be true, plumb and level with reasonably tight joints. Adequately support and brace forms.
- D. Place anchors, inserts, blots, sleeves and other devices indicated or required for the various portions of all the work.

- E. Oil temporary forms with non-staining form oil before reinforcing steel is placed.
- F. Rough form finish as defined by ACI 301 permitted for concealed concrete.
- G. Smooth form finish as defined by ACI 301 permitted for concealed concrete.
- H. Provide 3/4 inch chamfer on exposed corners and edges, and 1-foot below ground level.

3.3 REMOVAL OF FORMS

- A. Do not remove forms or supports until concrete has acquired sufficient strength to safely support its own weight and the superimposed loads.
- B. Remove formwork for columns, walls, beam sides and other parts not supporting the weight of the concrete as soon as the concrete has hardened sufficiently to resist damage from removal operations.
- C. Formwork for slabs, beam soffits and other parts supporting the weight of the concrete shall remain in place until the concrete has reached its specified 28-day strength.
- D. Protect concrete from damage prior to acceptance.
- E. Prohibit traffic until concrete is at least 10 days old.
- F. Cure areas previously covered by forms.

3.4 MIXING CONCRETE

- A. Maintain all equipment, tools, and machinery used for hauling materials and performing any part of the work to insure completion of the work underway without excessive delays for repairs or replacement.
- B. Mixing shall be done in a mixer of adequate size and type to produce uniform distribution of the material throughout the mass.
- C. The mixer shall have a plate affixed showing the manufacturer's recommended operating data and it shall be operated within the speed and capacity limits stated thereon.
- D. The absolute volume of the concrete batch shall not exceed the rated capacity of the mixer.
- E. The entire contents of the drum shall be discharged before any materials are placed.
- F. Improperly mixed concrete will not be placed.
- G. The mixing time shall be in accordance with the recommendations of the mixer manufacturer.
- H. Transit Mix Concrete:

1. Sufficient transit mix equipment shall be assigned exclusively to the project as required for continuous operation.
2. Satisfactory evidence shall be furnished so that the delivery of concrete shall be continuous at regular and uniform intervals, without stoppage or interruption.
3. Concrete shall not be placed on the job after a period of 1 hour after the cement has been placed in the mixer, with mixer turning; 30 minutes without turning.

H. Continuous Volumetric Mix Concrete:

1. A mobile, continuous, volumetric mixer of the rotating puddle type may be used for when approved by Engineer.
2. Mixers shall be designed to receive all the concrete ingredients, including admixtures, required by the mix design in a continuous uniform rate and mix them to the required consistency before discharging.
3. The mixers shall have adequate water supply and metering devices.
4. Calibration of these mixers will be required.

3.5 PLACING CONCRETE

- A. The minimum temperature of all concrete at the time of placement shall not be less than 50°F.
- B. Clean transporting equipment, reinforcing and embedded items before placing concrete.
- C. Batch trucks or paving equipment not permitted on prepared subgrade unless authorized by the Engineer based on actual job conditions.
- D. Place no concrete until after inspection of forms by Engineer.
- E. The maximum time interval between the addition of cement to the batch, and the placing of concrete in the forms shall not exceed the following:

Air of Concrete Temperature	NonAgitated Concrete	Maximum Time
80°F or Above 35°F to 79°F	26.6°C 1.6°C to 26.1°C	15 minutes 30 minutes
Air of Concrete Temperature	Agitated Concrete	Maximum Time
90°F and Above 75°F to 89°F 35°F to 74°F	32.2°C 23.9°C to 31.6°C 1.6°C to 23.3°C	45 minutes 60 minutes 90 minutes

- F. Prevent segregation during placing.

- G. Consolidate flat work with one pass of a mechanical vibrator moving parallel to the centerline. Unusual sections and widths may be hand puddled and finished.
- H. Place concrete continuously so that each pour unit will be monolithic in construction and will terminate at an expansion, contraction or construction joint. Permit no more than 30 minutes between depositing adjacent batches.
- I. Place slab concrete over membrane waterproofing before waterproofing has become damaged or dirty.
- J. Concrete placement will not be permitted when impending weather conditions will impair the quality of the work.
- K. Slope horizontal surfaces of exterior concrete for drainage.
- L. Deposit concrete in forms in horizontal layers not deeper than 24 inches. . Avoid inclined construction joints. Place each layer while preceding layer is still plastic to avoid cold joints.
- M. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.
- N. Do not use vibrators to transport concrete inside of forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to penetrate placed layer of concrete and at least 6-inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. Limit vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

3.6 PLACING CONCRETE IN WATER

- A. Concrete shall be deposited in water only when specified on the plans or with written permission of the Engineer.
- B. The forms or cofferdams shall be sufficiently tight to prevent any water current passing through the space in which the concrete is deposited.
- C. Water pumping will not be permitted during the concrete placing, nor until it has set for at least 36 hours.
- D. The concrete shall be placed with a tremie, closed bottom-dump bucket or other approved method.
- E. The concrete shall not be allowed to fall freely through the water nor shall it be disturbed after it has been placed. Its surface shall be kept approximately level during placement.
- F. The tremie shall consist of a water-tight tube 14-inches or less in diameter. It shall be constructed so that the bottom can be sealed and opened after it is in place and fully charged with concrete. It shall be supported so that it can be easily moved horizontally to cover all the work area and

vertically to control the concrete flow. The lower end of the tremie shall be submerged in the concrete at all times.

- G. Bottom-dump buckets used for underwater placing shall have a capacity of not less than one-half cubic yard. It shall be lowered gradually and carefully until it rests upon the concrete already placed and raised very slowly during the upward travel; the intent being to maintain still water at the point of discharge and to avoid agitating the mixture.
- H. The placing operations shall be continuous until the work is complete.
- I. Unless otherwise specified, all concrete placed under water, except seal concrete, shall contain an additional sack of cement per cubic yard.

3.7 JOINTS

A. Contraction Joints:

- 1. Extend entirely across flat slabs at locations shown.
- 2. Location where not shown; maximum spacing is:
 - a. Driveways: 10-feet.
 - b. Sidewalks: 4-feet.
 - c. Other flat slabs: 20 times slab thickness.
- 3. Saw depth not less than 1/4 slab thickness.

B. Expansion Joints:

- 1. Install where shown on the plans.
- 2. Locations where not shown: all structures and features which project through, into or against slab.
- 3. Install according to manufacturer's recommendations, set material securely before placing concrete.
- 4. Install 1-inch width unless shown otherwise.

C. Filling Joints:

- 1. Fill not later than 14 days after sawing.
- 2. Fill immediately following cleaning.
- 3. Fill to 1/8-inch of surface.
- 4. Remove excess while material is still pliable.
- 5. Refill low areas where necessary.
- 6. Omit filling sidewalk joints.

3.8 FINISHING EXTERIOR FLAT WORK

A. Strike off and float as required.

B. Check surface with ten foot straight edge, maximum variance allowed -1.8-inch.

- C. Drag concrete surface longitudinally with double thickness burlap drag after completion of straight edging unless noted otherwise.
- D. Use edger on edges of slab.
- E. Use hand finishing only when approved by Engineer.

3.9 FINISHING OTHER CONCRETE

- A. Interior floors: smooth, steel-troweled finish; use edger on exposed edges. Grind smooth defects which would telegraph through applied finish flooring.
- B. Exterior walks and steps lightly broomed finish transverse to traffic flow; use edger on exposed edges.
- C. Other surfaces:
 - 1. Remove fins, projections and loose material.
 - 2. Clean surfaces of form oil.
 - 3. Patch honeycomb, aggregate pockets, voids and holes as follows:
 - a. Chip out until sound concrete is exposed to minimum depth of 1-inch.
 - b. Prepare patching mortar with approximately two parts of normal Portland Cement, one part white cement, nine parts fine aggregate; vary proportions of aggregate as necessary to match color of adjacent concrete.
 - 4. Fill holes left by form ties to within 1-inch of surface with non-shrink grout. Fill remainder with patching mortar specified hereinbefore.
 - 5. Apply grout-cleaned finish to all exposed vertical surfaces. Wet surface and rub grout on surfaces with rubber or cork float. Scrape off excess grout and finish with brick rubbing or as approved by Engineer.
- E. Coordinate required finish with Engineer.

3.10 CURING

- A. Contractor shall inform the Engineer fully of the methods and procedures proposed for curing; shall provide proper equipment and in adequate amounts; and shall have approval of the proposed method, equipment and materials prior to placing concrete.
- B. All concrete shall be cured for a period of 4 curing days except as noted herein.
 - 1. Exceptions to 4-day Curing.
 - a. Upper surfaces of Bridge Roadway, Median and Sidewalk Slabs and Top Slabs of Direct Traffic Culverts require 8 curing days.
 - b. A curing day is defined as a calendar day when the ambient temperature, taken in the shade away from artificial heat, is above 50° Fahrenheit (10°C) for at least 19 hours, or the ambient temperature is 50° or less; and if satisfactory provisions are made to maintain the temperature at all surfaces of the concrete above 40° Fahrenheit (4.4°C) for the entire 24 hours.
- C. Form Curing:

1. When forms are left in contact with the concrete, other curing methods shall not be required except for cold-weather protection.

D. Water Curing:

1. All exposed surfaces of the concrete shall be kept wet continuously for the required curing time. The water used for curing shall meet requirements for concrete mixing water.
 - a. Wet Mat:
 - (1) Cotton mats shall be used for this curing method. The mats shall not be placed in contact with the concrete until such time that damage shall not occur to the surfaces.
 - (2) Damp burlap blankets made from 9-ounce stock may be placed upon the damp concrete surface for temporary protection prior to the application of the cotton mats.
 - (3) The mats may be placed by and wetted down after placement.
 - (4) Mat curing, except for continuous placements, shall commence not later than three hours after finishing of the roadway slab.
 - (5) The mats shall be weighted down adequately to provide continuous contact with all concrete surfaces where possible.
 - (6) The surfaces of the concrete shall be kept wet for the required curing time.
 - (7) Surfaces which cannot be cured by contact shall be enclosed with mats, anchored positively to the forms, or to the ground, so that outside air cannot enter the enclosure. Sufficient moisture shall be provided inside the enclosure to keep all surfaces of the concrete wet.
 - b. Water spray:
 - (1) This method shall be accomplished by overlapping sprays or sprinklers, so that all unformed surfaces are kept continuously wet.
 - c. Ponding:
 - (1) This method requires the covering of the surface with a minimum of two inches (5 cm) of clean granular material, kept wet at all times; or water to a minimum depth of one inch (2.5 cm). Satisfactory provisions shall be made to provide a dam to retain the granular material or water.

E. Membrane Curing

1. Unless otherwise shown on the plans, Type 2 membrane curing compound may be used where permitted.
2. Membrane shall be applied in a single, uniform coating at the rate of coverage recommended by the manufacturer and as approved by the Engineer, but not less than nine gallons per 210 feet (.0038M³ 63M) of area. Tests for acceptance shall be at this specified rate.
3. Membrane curing shall not be applied to dry surfaces; but shall be applied to horizontal surfaces just before free moisture has disappeared.
4. Formed surfaces and surfaces which have been given a first rub shall be dampened and shall be moist at the time of application of the membrane.

5. When a membrane is used for complete curing, the film shall remain unbroken for the minimum curing period specified. A membrane which is damaged shall be corrected immediately by reapplication of membrane.

	REQUIRED		PERMITTED	
	Water for Complete Curing	Membrane for Interim Curing	Water for Complete Curing	Membrane for Interim Curing
A. Upper surfaces of Bridge Roadway, Median and Sidewalk Slabs, Top Slabs of Direct Traffic Culverts	X	X (Resin Base)		
B. Top Surface of any Concrete Unit upon which Concrete is to be placed and bonded at a later interval (Stub Walls, Risers, etc.) Other Super structure Concrete (Curbs, Wingwalls, Parapets walls, etc.)	X			
C. Top surface of precast and/or prestressed piling	X	X		
D. All substructure Concrete, Culverts, Box Sewers, Inlets, Manholes, Retaining walls, Riprap.			X	X

*Polyethylene sheeting or burlap polyethylene mats fastened to prevent outside air from entering shall be considered equivalent to water or membrane curing per this item.

3.11 TESTING

- A. Furnish at least three cylinders or beams from each 40 cubic yard, or portion thereof for test purposes unless otherwise directed by Engineer. Test one cylinder at 7 days, test second cylinder at 28 days and test third cylinder only if needed for confirmation of compression strength.

3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Filling-in: fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Use non-shrink grout as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.
- B. Equipment bases and foundations: provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of the manufacturer furnishing machines and equipment. Use non-shrink grout as shown on plans.
- C. Steel pan stairs: provide concrete fill for steel pan stair treads and landings and associated items. Cast-in safety inserts and accessories as shown on drawings. Screen, tamp and finish concrete surfaces as

scheduled.

- D. Reinforced masonry; provide concrete grout for reinforced masonry lintels and bond beams where indicated on drawings and as scheduled. Maintain accurate location of reinforcing steel during concrete placement.

END OF SECTION 323000

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SECTION 323119

DECORATIVE METAL FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Swing gates.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For gates. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Include diagrams for power, signal, and control wiring.
- C. Samples: For each fence material and for each color specified.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Product Test Reports: For decorative metallic-coated-steel tubular picket fences, including finish, indicating compliance with referenced standard[**and other specified requirements**].

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For gate operators to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 SWING GATES

- A. Galvanized-Steel Frames and Bracing: Fabricate members from square tubes [**1-1/2 by 1-1/2 inches (38 by 38 mm)**] [**1-3/4 by 1-3/4 inches (45 by 45 mm)**] [**2 by 2 inches (51 by 51 mm)**] [**2-1/2 by 2-1/2 inches (64 by 64 mm)**] formed from **0.108-inch (2.74-mm)** nominal-thickness, metallic-coated steel sheet or formed from **0.105-inch (2.66-mm)** nominal-thickness steel sheet and hot-dip galvanized after fabrication.

- B. Steel Frames and Bracing: Fabricate members from square steel tubing [**1-1/2 by 1-1/2 inches (38 by 38 mm)**] [**2 by 2 inches (51 by 51 mm)**] [**2-1/2 by 2-1/2 inches (64 by 64 mm)**] <Insert dimensions> with [**1/8-inch (3.2-mm)**] <Insert dimension> wall thickness.[**Hot-dip galvanize frames after fabrication.**]
- C. Aluminum Frames and Bracing: Fabricate members from square extruded-aluminum tubes [**1-1/2 by 1-1/2 inches (38 by 38 mm)**] [**2 by 2 inches (51 by 51 mm)**] [**2-1/2 by 2-1/2 inches (64 by 64 mm)**] <Insert dimensions> with [**0.100-inch (2.54-mm)**] [**0.125-inch (3.18-mm)**] [**0.140-inch (3.56-mm)**] [**0.154-inch (3.91-mm)**] <Insert dimension> wall thickness.
- D. Hardware: Latches permitting operation from both sides of gate, hinges, and keepers for each gate leaf more than **5 feet (1.52 m)** wide. Provide [**center gate stops**] [**and**] [**canne bolts**] for pairs of gates.[**Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.**]
- 1. <Insert requirements for padlocks and chains if not Owner furnished>.
- E. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A 123/A 123M. For hardware items, hot-dip galvanize to comply with ASTM A 153/A 153M.
- F. Metallic-Coated-Steel Finish: [**High-performance coating**] [**Galvanized finish**].
- G. Steel Finish: [**Primed**] [**Shop painted**] [**High-performance coating**].
- H. Aluminum Finish: Baked enamel or powder coating.

2.2 STEEL AND IRON

- A. Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Bars (Pickets): Hot-rolled, carbon steel complying with ASTM A 29/A 29M, Grade 1010.
- C. Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- D. Bar Grating: NAAMM MBG 531.
 - 1. Bars: Hot-rolled steel strip, ASTM A 1011/A 1011M, Commercial Steel, Type B.
 - 2. Wire Rods: **ASTM A 510 (ASTM A 510M)**.
- E. Uncoated Steel Sheet: [**Hot-rolled steel sheet, ASTM A 1011/A 1011M, Structural Steel, Grade 45 (Grade 310)**] [**or**] [**cold-rolled steel sheet, ASTM A 1008/A 1008M, Structural Steel, Grade 50 (Grade 340)**].
- F. Galvanized-Steel Sheet: ASTM A 653/A 653M, structural quality, **Grade 50 (Grade 340)**, with [**G90 (Z275)**] [**G60 (Z180)**] coating.
- G. Aluminum-Zinc, Alloy-Coated Steel Sheet: ASTM A 792/A 792M, structural quality, **Grade 50 (Grade 340)**, with **AZ60 (AZM180)** coating.

2.3 COATING MATERIALS

- A. Epoxy Zinc-Rich Primer for Uncoated Steel: Complying with MPI #20 and compatible with coating specified to be applied over it.
- B. Epoxy Primer for Galvanized Steel: Epoxy primer recommended in writing by topcoat manufacturer.
- C. Intermediate Coat for Uncoated Steel: Epoxy or polyurethane intermediate recommended in writing by primer and topcoat manufacturer.
- D. Polyurethane[**Intermediate Coat and**] Topcoat: Complying with MPI #72 and compatible with undercoat.

2.4 MISCELLANEOUS MATERIALS

- A. Concrete: Normal-weight, air-entrained, ready-mix concrete complying with requirements in Section 033000 "Cast-in-Place Concrete" with a minimum 28-day compressive strength of **3000 psi (20 MPa)**, **3-inch (75-mm)** slump, and **1-inch (25-mm)** maximum aggregate size[**or dry, packaged, normal-weight concrete mix complying with ASTM C 387/C 387M mixed with potable water according to manufacturer's written instructions**].

2.5 STEEL FINISHES

- A. Surface Preparation: Clean surfaces according to [SSPC-SP 5/NACE No. 1, "**White Metal Blast Cleaning**] [SSPC-SP 6/NACE No. 3, "**Commercial Blast Cleaning**]."
 - 1. After cleaning, apply a conversion coating compatible with the organic coating to be applied over it.
- B. Powder Coating: Immediately after cleaning, apply two-coat finish consisting of epoxy primer and TGIC polyester topcoat, with a minimum total dry film thickness of not less than **8 mils (0.20 mm)**. Comply with coating manufacturer's written instructions.
 - 1. Color and Gloss: [As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from manufacturer's full range] <Insert color and gloss>.
- C. Primer Application: Apply zinc-rich epoxy primer immediately after cleaning, to provide a minimum dry film thickness of **2 mils (0.05 mm)** per applied coat, to surfaces that are exposed after assembly and installation, and to concealed surfaces.
- D. High-Performance Coating: Apply intermediate and polyurethane topcoats to prime-coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Apply at spreading rates recommended by coating manufacturer.
 - 1. Match approved Samples for color, texture, and coverage. Remove and refinish, or recoat work that does not comply with specified requirements.

2.6 METALLIC-COATED-STEEL FINISHES

- A. Galvanized Finish: Clean welds, mechanical connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.
- B. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a [**zinc-phosphate**] conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.
- C. Powder Coating: Immediately after cleaning and pretreating, apply TGIC polyester powder-coat finish, with a minimum dry film thickness of **2 mils (0.05 mm)**.
 - 1. Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range**] <Insert color and gloss>.
- D. Powder Coating: Immediately after cleaning and pretreating, apply two-coat finish consisting of [**zinc-rich**] epoxy prime coat and TGIC polyester topcoat, with a minimum dry film thickness of **2 mils (0.05 mm)** for topcoat. Comply with coating manufacturer's written instructions to achieve a minimum total dry film thickness of **4 mils (0.10 mm)**.
 - 1. Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range**] <Insert color and gloss>.
- E. High-Performance Coating: Apply epoxy primer, polyurethane intermediate coat, and polyurethane topcoat to prepared surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Apply at spreading rates recommended by coating manufacturer.
 - 1. Match approved Samples for color, texture, and coverage. Remove and refinish, or recoat work that does not comply with specified requirements.

PART 3 - EXECUTION

3.1 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.2 FIELD QUALITY CONTROL

- A. Testing Agency: [**Owner will engage**] [**Engage**] a qualified testing agency to perform tests and inspections.

1. Grounding-Resistance Tests: Subject completed grounding system to a megger test at each grounding location. Measure grounding resistance not less than two full days after last trace of precipitation, without soil having been moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural grounding resistance. Perform tests by two-point method according to IEEE 81.

END OF SECTION 323119

SECTION 328400

PLANTING IRRIGATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Furnish all work and materials, appliances, tools, equipment, facilities, transportation, point of connection and all other services required for the installation of a complete underground permanent, as shown on drawings and/or specified herein. When the term "Contractor" is used in this section, it shall refer to the irrigation Contractor.
- B. Related Work Specified Elsewhere:
 - 1. Seeding and Sodding: Section 02930.
 - 2. Landscaping: Section 02950.
 - 3. Organic Landscape Maintenance – One (1) Year: Section 02980.

1.2 QUALITY ASSURANCE

The following Codes, Regulations, Reference Standards, and Specifications apply to work included in this section: ASTM: D2241, D2464, D2466, D2564, and D855.

1.3 WARRANTY AND MAINTENANCE

- A. The Contractor shall warranty material and workmanship for one year after final acceptance including repair and replacement of defective materials, workmanship, and labor.
- B. Maintenance during warranty shall include, but not necessarily be limited to, the following:
 - 1. Adjustment of sprinkler height and plumb to compensate for settlement and/or plant growth.
 - 2. Backfilling of all trenches.
 - 3. Adjustment of head coverage (arc of spray) as necessary.
 - 4. Unstopping heads plugged by foreign material.
 - 5. Drip System:
 - a. Remove disc stack and rinse with water and replace every 6 months.
 - b. Compare the controller runtimes and frequency to the to the application rate for Techline CV at the spacing used. If the amount of water in inches/hour is insufficient or exceeds the requirement of the plant, adjust accordingly.
 - c. Refer to "Techline Design Manual" by Netafimusa.com.
 - 6. Adjustment of controller as necessary to insure proper sequence and watering time.
 - 7. All maintenance necessary to keep the system in good operating order. Repair of damage caused by vandals, other contractors or weather conditions shall be considered extra to these specifications.
- C. Warranty and maintenance after final acceptance does not include alterations as necessitated by re-landscaping, re-grading, addition of trees or the addition, and/or changes in sidewalks, walls, driveways, etc.

- D. Installations must declare compliance with section 1903.251, Texas Occupations Code.

1.4 SUBMITTALS

- A. The Contractor shall submit shop drawings or manufacturer's "cut sheet" for each type of sprinkler head, pipe, controller, valves, check valve assemblies, valve boxes, wire, conduit, fittings, drip irrigation lines and components, and all other types of fixtures and equipment proposed to install on the job. The submittal shall include the manufacturer's name, model number, equipment capacity, and manufacturer's installation recommendation, if applicable, for each proposed item.
- B. No partial submittal will be accepted and submittals shall be neatly bound into a brochure and logically organized. After the submittal has been approved, substitutions will not be allowed except by written consent of the Owner's Representative.
- C. Shop drawings shall include dimensions, elevations, construction, details, arrangements, and capacity of equipment, as well as manufacturer's installation recommendations.

1.5 "APPROVED EQUAL" SUBSTITUTIONS

Several items in this section and on the plans are specified by a manufacturer's brand name and catalog number, followed by the phrase "or approved equal". This is not intended to unduly restrict competitive procurements or bidding, but is done to assure a minimum standard of quality which is believed to be best for the item specified.

1.6 CODES/PERMITS

- A. All work under this section shall comply with the provisions of these Specifications, as illustrated on the accompanying drawings, or as directed by the Owner's Representative and shall satisfy all applicable local codes, ordinances, or regulations of the governing bodies and all authorities having jurisdiction over this Project.
- B. Installation of equipment and materials shall be done in accordance with requirements of the National Electrical Code, City of Edinburg Plumbing Code, and standard plumbing procedures. The drawings and these Specifications are intended to comply with all the necessary rules and regulations; however, some discrepancies may occur, the Contractor shall immediately notify the Owner's Representative in writing of the discrepancies and apply for an interpretation. Should the discovery and notification occur after the execution of a contract, any additional work required for compliance with the regulations shall be paid for as covered by these Contract Documents.
- C. The Contractor shall give all necessary notices, obtain all permits, and pay all costs in connection with his work; file with all governmental departments having jurisdiction; obtain all required certificates of inspection for his work and deliver to the Owner's Representative.
- D. The Contractor shall include in the work any labor, materials, services, apparatus, or drawings in order to comply with all applicable laws, ordinances, rules and regulations whether or not shown on the drawings and/or specified.
- E. The installation of the irrigation system shall be made by an individual or firm duly qualified with a minimum of five years experience installing systems of similar size and scope, and

licensed under Article No. 8751 VTCS, Titled "Licensed Irrigators Act", S.B. No. 259 as passed by the 66th Texas Legislature.

1.7 EXISTING UTILITIES

- A. Locations and elevations of various utilities included with the scope of this work have been obtained from the most reliable sources available and should serve as a general guide without guarantee to accuracy. The Contractor shall examine the Site and verify to his own satisfaction the locations and elevation of all utilities and availability of utilities and services required. The Contractor shall inform himself as to their relation to the work and the submission of bids shall be deemed as evidence thereof. The Contractor shall repair at his own expense, and to the satisfaction of the Landscape Architect, for damage to any utility shown or not shown on the plans.
- B. Should utilities not shown on the plans be found during excavations, Contractor shall promptly notify the Landscape Architect for instructions as to further action.
- C. Contractor shall make necessary adjustments in the layout as may be required to connect to existing stub-outs, should such stub-outs not be located exactly as shown and as may be required to work around existing work, at no increase in cost to the Owner. All such work will be recorded on record drawings and turned over to the Landscape Architect prior to final acceptance.

1.8 RETRO-FIT

- A. Various locations marked "RETRO-FIT" on the plan includes:
 - 1. Sprinkler pressure line re-routing (do not exceed pipe flows greater than 5fps).
 - 2. Existing gate valves, Controllers, control valves, drip irrigation shall be repaired, replaced and or re-routed in the field to best fit properties impacted.
 - 3. Follow all installation details shown on irrigation detail sheet.
 - 4. All adjustments made to other property owner's irrigation systems shall be approved in writing by all parties impacted (BEFORE COMENCING ANY WORK).

1.9 RECORD DRAWINGS

- A. Record dimensioned locations and depths for each of the following:
 - 1. Point of connection to proposed backflow device as shown on plan.
 - 2. Sprinkler pressure line routing (provide dimensions for each 100 lineal feet (maximum) along each routing, and for each change in directions).
 - 3. Gate valves.
 - 4. Sprinkler control valves (buried only).
 - 5. Control wire routing.
 - 6. Drip irrigation assemblies.
 - 7. Other related items as may be directed by the Owner's Representative.
- B. Locate all dimensions from two permanent points (buildings, monuments, sidewalks, curbs, or pavements).
- C. Record all changes which are made from the Contract drawings, including changes in the pressure and non-pressure lines.

- D. Record all required information on a set of blackline prints of the Contract drawings. Do not use these prints for any other purpose.
- E. Maintain information daily. Keep Contract drawings at the Worksite at all times and available for review by the Owner's Representative.
- F. When record drawings have been approved by the Owner's Representative, transfer all information to a set of reproducible mylars using permanent ink or provide a bond copy and electronic file on CD of the final record as-built drawings. Changes using ball-point pen are not acceptable. Make dimensions accurately at the same scale used on original Drawings, or larger. If photo reduction is required to facilitate controller chart housing, notes or dimension must be a minimum 1/4 inch in size.
- G. Reproducible mylars and/or bonds and CD will be furnished by the Owner cost for printing and handling.

1.10 CONTROLLER CHART

- A. Do not prepare chart until record drawings have been approved by the Owner's Representative.
- B. Provide one controller chart for the stations used on the automatic controller(s).
 - 1. Chart may be a reproduction of the record drawing, if the scale permits fitting within the controller door. If photo reduction prints are required, keep reduction to maximum size possible to retain full legibility.
 - 2. Chart shall be blackline print of the actual system, showing the area covered by that controller.
- C. Identify the area of coverage of each remote control valve, using a distinctly different pastel color, drawn over the entire area of coverage.
- D. Following approval of chart by the Owner's Representative, it shall be hermetically sealed between two layers of 20 mil. thick plastic sheet.
- E. Chart must be completed and approved prior to final acceptance of the irrigation system.

1.11 OPERATING AND MAINTENANCE MANUALS

- A. Provide individual bound manuals detailing operating and maintenance requirements for irrigation systems.
- B. Manuals shall be delivered to the Owner's representative for review and approval no later than 10 days prior to completion of work. Revise manual as required.
- C. Provide descriptions of all installed materials and systems in sufficient detail to permit maintenance personnel to understand, operate, and maintain the equipment.
- D. Provide the following in each manual:
 - 1. Index sheet, stating Irrigation Contractor's name, address, telephone number, and name of person to contact.
 - 2. Duration of guarantee period.
 - 3. Equipment list providing the following for each item:
 - a. Manufacturer's name.

- b. Make and model number.
 - c. Name and address of local manufacturer's representative.
 - d. Spare parts list in detail.
 - e. Detailed operating and maintenance instructions of major equipment.
4. Recommended programs for watering by season.

1.12 CHECKLIST

- A. Provide a signed and dated checklist, and deliver to the Owner's Representative prior to final acceptance of the work.
- B. Use the following format:
 - 1. Plumbing permits: if none required, so note.
 - 2. Material approvals: approved by and date.
 - 3. Pressure line tests: by whom and date.
 - 4. Record Drawings: received by and date.
 - 5. Controller charts: received by and date.
 - 6. Materials furnished: received by and date.
 - 7. Operation and maintenance manuals: received by and date.
 - 8. System and equipment operation instructions: received by and date.
 - 9. Manufacturer's warranties if required: received by and date.
 - 10. Written guarantee: received by and date.
 - 11. Lowering of heads in lawn areas: if incomplete, so state.

1.13 ELECTRIC POWER

Electric power to operate the controller shall be furnished by the Electrical Contractor unless otherwise noted on the plans. Service wiring to the controller cabinet shall be furnished by the Irrigation Contractor.

1.14 WATER FOR TESTING

Unless noted otherwise on the plans or elsewhere, water is available on the site necessary for testing, flushing, and jetting.

1.15 BORINGS, SLEEVES AND ELECTRICAL CONDUITS

Sleeves and electrical conduits are the responsibility of the Irrigation Contractor to install prior to paving or related construction and should be installed as noted on the approved irrigation plan. Contractors shall be responsible for locating all sleeves and conduits at no additional cost to the Authority. Borings under existing paving will be required where noted on the drawings and shall be provided at no additional cost to the Owner. Borings shall be a minimum of 18 inch depth and new pipes shall be incased in Schedule 40 PCV sleeves.

1.16 ATTIC STOCK - SPARE PARTS

The Contractor shall supply the Owner with five parts each of irrigation system components excluding controller, mainline pipe and lateral pipe. These items will be kept for use by the Owner after the Organic Landscape Maintenance for One (1) Year (Section 02980) period is completed.

1.17 COMMISSIONING

- A. This Section specifies a system which will be commissioned as part of the construction process. Documentation and testing of these systems, as well as training of the Owner's operation and maintenance personnel, is required in cooperation with the Owner's Commissioning Coordinator.
- B. Refer to Division 1 Section 01810, Commissioning, for detailed commissioning requirements.
- C. Commissioning requires the participation of this Contractor to ensure that all systems are operating in a manner consistent with the Contract Documents. The general commissioning requirements and coordination are detailed in the Division 1 Section 01810 referenced above. This Contractor shall be familiar with all parts of the Commissioning Section and the commissioning plan issued by the Commissioning Coordinator and shall execute all commissioning responsibilities assigned to them in the Contract Documents.

1.18 POINT OF CONNECTION

- A. Verify main, meter location, and water pressure at the site, if minimum residual water pressure is less than required, notify owner's representative prior to construction. Contractor shall notify the owner's representative of such and shall receive owners' approval prior to any construction.
- B. Follow all state and local codes.

PART 2 - PRODUCTS

2.1 GENERAL

Unless otherwise noted on the plans, all materials shall be new and unused. The irrigation equipment catalog numbers used for reference in these Specifications are to establish minimum quality standards and may be substituted with an "approved equal" as outlined in Paragraph 1.06 of this section, unless specifically requested by the campus maintenance staff and noted as having no "approved equal" to be accepted.

2.2 POLYVINYL CHLORIDE PIPE (PVC PIPE)

PVC pipe manufactured in accordance with ASTM Standards noted herein.

- A. Marking and Identification: PVC pipe shall be continuously and permanently marked with following information: Manufacturer's name, size, type of pipe, and material, PVC number, Product Standard number, and the NSF (National Sanitation Foundation) Seal.
- B. PVC pipe fittings: Shall be of the same material as the PVC pipe specified and compatible with PVC pipe furnished. Solvent weld type shall be for Schedule 40.
- C. PVC Pipe: Lateral line pipe shall be Class 200 solvent weld, SDR-21, PS 22-70 for all sizes 3/4" - 2". All 1/2" pipe shall be solvent weld SDR- 13.5, Class 315. Mainline pipe shall schd.40 pvc.
- D. Flexible PVC Risers (Nipples): All flexible PVC nipples shall be made from virgin PVC material, and shall comply with ASTM D2287, shall be tested at 200 P.S.I. static pressure for 2 hours and have a quick burst rating of a minimum 400 P.S.I. Flexible PVC pipe nipples shall be factory assembled only.

2.3 SWING JOINTS

Swing joints shall be O-ring seal type. Use Lasco or approved equal.

2.4 WIRE AND SPLICES

- A. All wire shall be single strand solid copper, minimum 14 gauge with type UF insulation which is Underwriters Laboratory approved for direct underground burial when used in a National Electrical Code Class II Circuit (30 volts AC or less) as per Articles 725 and 300. Voltage drop shall be taken into consideration.
- B. All wire shall be color coded so that the common wire shall have white insulation and the signal wires shall have red insulation.
- C. All splices shall be made with King one step Dry splices Tan or Larger.
- D. All connectors shall be UL listed, rated 600 volt, for PVC insulated wire. No wire splices shall be buried.

2.5 MANUAL VALVES

- A. Manual valves 2 ½" and smaller shall be all brass, globe type with composition disc rated at 150 pounds W.O.G.
- B. All valves shall have wheel handles unless cross handles are called for on the plan.

2.6 VALVE BOXES – AMATEK

- A. A box shall be provided for all valves.
- B. Valve boxes shall be made of high-strength plastic suitable for turf irrigation purposes.
- C. Boxes shall be suitable in size and configuration for the operability and adjustment of the valve.
- D. Extension sections will be used as appropriate to the depth of piping.
- E. All valve box covers shall bolt down or have locking mechanisms and shall be colored black.

2.7 POP-UP SPRAY, MICRO SPRAY, ROTOR AND BUBBLER HEADS

- A. Pop-up spray, rotor and bubbler heads are specified on the drawings.
- B. Two bubbler head shall be provided per each tree at 2" caliper and larger and one bubbler head for each 1" caliper tree per locations as shown on the plans.
- C. Spray heads shall have a minimum 4" pop-up or 12" pop-up as designated on the drawings. The sprinkler body and all related parts shall be plastic cyclac or polycarbonate. They shall have a spring retraction for positive return action of the pop-up nozzle. The spring for retraction and the adjustable nozzle screw shall be made of corrosion resistant materials.
- D. All heads are to be operated and site adjusted to match precipitation rate of all heads in the zone with proper nozzle selection and arc adjustments.
- E. MICRO-SPRAYS -The nozzle shall be constructed of corrosion and UV-resistant plastic. The nozzle shall have a pop-up stem that when under water pressure, pops up an additional inch. It

shall also have a stainless steel retraction spring to retract the stem when water pressure is released. The stem shall have an integral elastomeric flow bushing for maintaining a constant flow rate over the operating pressure range of 25 to 60 PSI (1.7 to 4.1 bars; 172 to 413 kPa). The nozzle shall be protected from debris by a stainless steel screen that is integral to the pop-up stem. The nozzle shall have standard female threads that are compatible with the threaded riser on Hunter spray heads as well as some other manufacturer's spray heads. The nozzle shall carry a two-year, exchange warranty (not prorated). Must be installed in Institutional spray body.

2.8 DRIP IRRIGATION

- A. The dripperline shall be Techline CV as manufactured by Netafim Irrigation, Inc. Dripper flow rate and spacing shall be as indicated on drawings.
- B. Soil Staples (TLS6): All on-surface/under mulch Techline CV/Techline Techlite installations shall be held in place with Techline Soil Staples spaced evenly every 3' to 5' on center, and with two staples on each change of location.
- C. Line Flushing Valves: All Techline/Techlite systems shall be installed with Netafim Automatic Line Flushing Valves as indicated on drawings. Techline CV zones do not require an automatic line flushing valve but must have a manual flushing port(s) in the position that an automatic flush valve would be positioned.
- D. Pressure Regulator: A pressure regulator shall be installed at each zone valve or on the main line to ensure operating pressures do not exceed system requirements. The pressure regulator shall be a Netafim Pressure Regulator.
- E. Disc Filter: A disc filter shall be installed at each zone valve or on the main line to ensure proper filtration. The filter shall be a Netafim Disc Filter. Model number and mesh as indicated on drawings.

2.9 ELECTRIC CONTROLLER (PERMANENT IRRIGATION)

- A. Electric irrigation controller shall be capable of operating the number of stations as indicated on the drawings. The system is designed to operate only one section valve at a time, unless otherwise noted. The controller will be specified on the irrigation plan.
- B. Power source shall be standard 117± volt 60 Cycle AC. Output for operation of companion solenoid actuated valves shall be 24 volts 60 Cycle AC.
- C. Operation of the controller shall be full automatic, incorporating one 24 hour clock and 14 day calendar per controlled number of electric valves shown on the plan to start the sprinkling cycle any hour or hours of the day or night of any day or days over a repeating 14 day period.
- D. The controller shall be capable of repeating watering cycles as required with a maximum delay between the ending of one cycle and the beginning of the next not to exceed 2 hours. Control shall provide optional semi-automatic operation whereby the automatic cycle may be started independent of the clock and manual operation whereby any station may be operated by hand independent of all timing mechanism. The choice of automatic day or hour programming shall be available to the operator on the face of the control panel without the use of tools.
- E. The automatic controller shall be equipped with rainproof housing.

- F. Provide automatic rain/freeze shutoff with controller.

2.10 BATTERY OPERATED CONTROLLER (TEMPORARY IRRIGATION)

- A. The controller shall resist moisture intrusion and be waterproof to a depth of 12 feet. It shall operate for one full year on a 9-volt alkaline battery. The controller shall have 9 daily start times available and run times available from 0 to 240 minutes in 1-minute increments. The controller shall have a weekly 7-day schedule that allows user to choose day(s) of week for desired watering or an optional 31-day interval schedule. The controller shall be capable of manual operation and shall have a programmable rain delay of between 1 and 7 days. All programming shall be accomplished by use of selection buttons with user feed back provided by a LCD display. Program backup shall be provided by a non-volatile memory circuit that will hold the program data indefinitely. The controller shall have a rubber cover that attaches over the display area and shall be compatible with micro-switch based weather sensors.
- B. The SVC battery-operated controller shall consist of a programming module that is pre-wired to a DC latching solenoid. The programming module shall attach to the valve by a solenoid adapter. The DC latching solenoid supplied shall screw into and operate any Hunter PGV, HPV, SRV and ICV valve. The controller shall activate a single valve zone by way of the latching solenoid. The SVC shall also be available pre-attached to a PGV 1-inch, globe valve with flow-control and either Female Pipe Threads or BSP threads.
- C. The controller shall be installed in accordance with the manufacturer's published instructions. The controller shall carry a conditional two year exchange warranty. The automatic controller(s) shall be the SVC single-station series, as manufactured for Hunter Industries Incorporated, San Marcos, California.

2.11 ELECTRIC REMOTE CONTROL GLOBE VALVES

- A. Electric remote control valves shall have plastic bodies and covers and shall be globe-type diaphragm valves of normally closed design.
- B. Commissioning requires the participation of this Contractor to ensure that all systems are operating in a manner consistent with the Contract Documents. The general commissioning requirements and coordination are detailed in the Division 1 Section 01810 referenced above. This Contractor shall be familiar with all parts of the Commissioning Section and the commissioning plan issued by the Commissioning Coordinator and shall execute all commissioning responsibilities assigned to them in the Contract Documents.
- C. A flow stem adjustment shall be included in each valve.

2.12 BACKFLOW PREVENTER

- A. A double-check assembly shall be located and sized as shown on the plans.
- B. This assembly shall be installed in a box and shall conform to the City Plumbing Codes.
- C. Use Rectangle Jumbo Plastic Amatek box.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Design Pressure: This irrigation system has been designed to operate with a minimum static inlet water pressure as indicated on the drawing. The Contractor shall take a pressure reading prior to beginning construction. If the pressure reading is 5% less than above, the Contractor shall notify the Owner's Representative.
- B. Contractor Responsibility: The Contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in equipment usage, area dimensions or water pressure exist that might not have been considered in the engineering. Such obstructions or differences shall be brought to the attention of the Owner's Representative in writing. In the event this notification is not performed, the Contractor shall assume full responsibility for any revision necessary.
- C. Staking: Before installation is started, place a stake or flag where each sprinkler is to be located, in accordance with drawing. Staking shall be approved by the Owner's Representative before proceeding.
- D. Piping Layout: Piping layout is diagrammatic. Route piping around existing trees and root zones in such a manner as to avoid damage to plantings. Where access is restricted, bore under large existing trees to avoid damage and exposure of the root system. Do not dig within the ball of newly planted trees or shrubs.
- E. In areas where trees are present, trenches will be adjusted on site to provide a minimum clearance of four times the trunk diameter of the tree (at its base) between any tree and any trench.
- F. All material and equipment shall be delivered to the Worksite in unbroken reels, cartons or other packaging to demonstrate that such material is new and of a quality and grade in keeping with the intent of these Specifications.
- G. Refer to plan details for drip installation.
- H. Spray heads and Rotor heads cannot be located closer than 4" of any sidewalk, driveway or foundation.

3.2 EXCAVATION AND TRENCHING

- A. The Contractor shall perform all excavation to the depth indicated in these Specifications and Contract drawings. The banks of trenches shall be kept as nearly vertical as practicable. Trenches shall be wide enough to allow a minimum of 4" between parallel pipelines or electrical wiring. Where rock excavation is required, or where stones are encountered in the bottom of the trench that would create a concentrated pressure on the pipe, the rock or stones shall be removed to a depth of six (6) inches minimum below the trench depth indicated. The over depth rock excavation and all excess trench excavation shall be backfilled with loose, moist earth or sand, thoroughly tamped. Whenever wet or otherwise unstable soil that is incapable of properly supporting the pipe is encountered in the trench bottom, such shall be

removed to a depth and length required, and the trench backfilled to trench bottom grade as hereinafter specified, with course sand, fine gravel or other suitable material.

- B. Bottom of trench grade shall be continued past ground surface deviations to avoid air pockets and low collection points in the line. The minimum cover specifications shall govern regardless of variations in ground surface profile and the occasional deeper excavation required at banks and other field conditions. Excavation shall be such that a uniform trench grade variation will occur in all cases where variations are necessary.
- C. Trench excavation shall comprise the satisfactory removal and disposition of all materials, and shall include all shoring and sheeting required to protect the excavation and to safeguard employees.
- D. During excavation, material suitable for backfilling shall be stockpiled in an orderly manner a sufficient distance back from edge of trenches to avoid overloading and prevent slides or cave-ins. Material unsuitable for backfilling shall be wasted as directed by the Owner's Representative. When excavated material is of a rocky nature and the topsoil or any other layer of excavated material is suitable for pipe bedding and backfill in the vicinity of the pipe, such material shall be separately stockpiled for use in such bedding and pipe backfill operations, unless satisfactory imported material is used.
- E. All excavations and backfill shall be unclassified and covered in the basic bid. No additional compensation will be allowed for rock encountered.
- F. Restore all surfaces, existing underground installations, etc., damaged or cut as a result of the excavations to their original conditions in a manner acceptable to the Owner's Representative.

3.3 PIPE INSTALLATION

- A. Sprinkler Mains: Sprinkler mains are that portion of piping from water source to electric valves. This portion of piping is subject to surges since it is a closed portion of the sprinkler system. Sprinkler mains shall be installed in a trench with a minimum of 18 inches of cover.
- B. Lateral Piping: Lateral piping is that portion of piping from electrical valve to sprinkler heads. This portion of piping is not subject to surges since it is an "open end" portion of the sprinkler system. Lateral piping shall be installed in a trench with a minimum of 12 inches of cover.
- C. Remove lumber, rubbish, and rocks from trenches. Provide firm, uniform bearing for entire length of each pipeline to prevent uneven settlement. Wedging or blocking of pipe will not be permitted. Remove foreign matter or dirt from inside of pipe before welding, and keep piping clean during and after laying pipe.
- D. PVC pipe shall not be installed where there is water in the trench, nor shall PVC pipe be laid when temperature is 40 deg. F or below or when rain is imminent. PVC pipe will expand and contract as the temperature changes. Therefore, pipe shall be snaked from side to side of trench bottom to allow for expansion and contraction.

3.4 PVC PIPE AND FITTING ASSEMBLY

- A. Solvent: Make solvent-welded joints following standards noted herein. Thoroughly clean pipe and fittings of dirt, dust, and moisture with an approved PVC primer before applying solvent.

- B. PVC to Metal Connection: Work metal connections first. Use a non-hardening pipe dope such as Permatex No. 2 or "Teflon" tape on threaded PVC to metal joints. Use only light wrench pressure.
- C. Threaded PVC Connections: Where required, use threaded PVC adapters into which pipe may be welded.

3.5 HYDROSTATIC TESTS

Pressure Test: After the pipe is laid, the joints completed, and the trench partially backfilled, leaving the joints exposed for examination, the newly laid piping or any valved section of main pressure line piping shall, unless otherwise specified, be subjected for four hours to a hydrostatic pressure test of normal city water pressure. Each valve shall be opened and closed during the test. Enclosed pipe, joints, fittings, and valves shall be carefully examined during the partially open trench test. Joints showing visible leakage shall be replaced or remade, as necessary. Cracked or defective pipe, joints, fittings, or valves discovered in consequence of this pressure test shall be repeated until the test results are satisfactory. All replacement and repair shall be at contractor's cost.

3.6 CONTROL WIRE INSTALLATION

- A. All control wire less than 500 feet in length shall be continuous without splices or joints from the controller to the valves. Connections to the electric valves shall be made within 18 inches of the valve using connectors specified in Paragraph 2.4 of this section, unless otherwise approved by the Owner's Representative in writing.
- B. All control wires shall be installed at least 18 inches deep. Contractor shall obtain the Owner's Representative's approval for wire routing when installed in a separate ditch. Control wires may be installed in a common ditch with piping; however, wires must be installed a minimum of 4 inches below or to one side of piping.
- C. All wire passing under existing or future paving, sidewalk, construction, etc., shall be encased in PVC Schedule 40 conduit extending at least 2 feet beyond edges of paving, sidewalks, or construction.

3.7 POP-UP SPRAY, MICRO-SPRAY, ROTORY AND BUBBLER HEADS

- A. Provide heads and nozzles as specified and install in locations as shown on the Contract Drawings.
- B. Pop-up spray and micro-spray heads shall be installed on a "flex" pipe connector as detailed. Rotary heads shall be installed on a double swing joint connected to the lateral pipe. Bubbler shall be a tree well flexible riser-bubbler head on a flex pipe. Provide wire staple to secure the bubbler to the top of the root ball. Keep heads a minimum of 4 inches from paved surfaces.
- C. Heads shall be installed with underside of flange flush with the finished grade.
- D. Contractor will be required to adjust heads as necessary after establishment of grass or other plant material.

3.8 QUICK COUPLING VALVES

- A. Quick coupling valves shall be installed at 100 foot on center along mainline with a ball valve preceding the QC for shut off.

- B. Quick coupling valves shall be installed with the underside of flange flush with the finished grade.
- C. Quick coupling valves shall be installed on a swing joint assembly as detailed on the submitted and approved shop drawings.
- D. Under the warranty, the Contractor shall return after grass is established and adjust valves and valve boxes to proper grade.

3.9 MANUAL VALVES

- A. Manual valves shall be sized and located where shown on the Contract drawings.
- B. Valve boxes shall be adjusted to be flush with finished grade.
- C. Valve boxes shall be properly supported and of sufficient construction that tractors, mowers or other equipment crossing over the boxes will not push boxes down and crush the pipe, valve, or box.

3.10 VALVE AND VALVE BOX PLACEMENT

- A. A ball valve shall precede each valve to provide shut off for repair of valves.
- B. All manual, electric, and quick coupling valves shall be in boxes as specified in Paragraph 2.6 of this section, and shall be set with a minimum of six (6) inches of space between their top surface and the bottom of the valve box. The base of the box shall be filled with pea gravel per manufacturer's installation instructions.
- C. Valves shall be fully opened and fully closed to ensure that all parts are in operating condition.
- D. Valve boxes shall be set plumb, vertical, and concentric with the valve stem.
- E. Any valve box which has moved from this required position so as to prevent the use of the operating wheel of the valve shall be reset by the Contractor at his own expense.

3.11 ELECTRIC CONTROLLER

- A. Electric controller shall be located as shown on the plans and shall be capable of operating the number of stations indicated.
- B. The system is designed to operate only one section at a time, unless otherwise noted on the plans in strict accordance with the manufacturer's published installation instructions.

3.12 ELECTRIC REMOTE CONTROL VALVES

- A. Remote control valves shall be located and sized as shown on the plans. All electrical connections shall be made when the weather is dry with connection kits as specified in Paragraph 2.4 of this section in strict accordance with manufacturer's recommended procedures. All remote control valves shall be installed in a horizontal position, in accordance to the manufacturer's published installation instructions.

- B. It shall be the responsibility of the Contractor to furnish and install the proper size wire on each of the low voltage circuits from the master control center to the various electric remote control valves.
- C. Consideration shall be given to each circuit for allowance of voltage drop and economy consistent with accepted practices of electrical installation. Under no circumstances shall the voltage of any branch circuit be reduced more than proper due to length of run exceeding the maximum allowable for the wire size used.

3.13 BACKFILL AND COMPACTION

- A. After system is operating and required tests and inspections have been made, the trenches shall be carefully backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand, gravel, soft shale, or other approved materials, free from large clods of earth or stone. Rock, broken concrete, or pavement, and large boulders shall not be used as backfill material. The backfill shall be thoroughly compacted and evened with the adjacent soil level.
- B. Compact trenches in areas to be planted by thoroughly flooding the backfill. Compact all other areas by flooding or hand tamping. The jetting process may be used in areas when flooding.
- C. Backfill for all trenches, regardless of the type of pipe covered, shall be compacted to a minimum of 90% density.
- D. Any trenches improperly backfilled, or where settlement occurs, shall be reopened to the depth required for compaction, then refilled and compacted with the surface restored to the required grade and left in a completed surface condition as described above.
- E. Specifically tamp backfill under heads and around the flange of heads for one foot (1') by a suitable means after trench backfill has dried from flooding to prevent heads loosening in the ground.

3.14 FINAL ADJUSTMENT

- A. After installation has been completed, make final adjustment of sprinkler system prior to Owner's Representative's final inspection.
- B. Completely flush system to remove debris from lines by removing nozzle from heads on ends of lines and turning on system.
- C. Check sprinklers for proper operation and proper alignment for direction of throw.
- D. Check each new section for operating pressure and balance to other sections by use of flow adjustment on top of each valve.
- E. Check nozzling for proper coverage. Prevailing wind conditions may indicate that arc or angle of spray should be other than as shown on drawings. In this case, change nozzles to provide correct coverage and furnish record data to Owner's Representative with each change.
- F. After system is thoroughly flushed and ready for operation, each section of sprinklers shall be adjusted to control pressure at heads. Use the following method, one section at a time:

1. Remove last head on section and install a temporary riser above grade. Install tee with pressure gauge attached on top of riser and re-install head with nipple onto tee.
2. Correct operating pressure at last head of each section as follows: Spray Heads - 20-25 psi; rotor heads - 30 to 40 psi (and as recommended by the manufacturer).
3. After replacing head, at grade, tamp thoroughly around head.

3.15 CLEAN-UP

- A. The Worksite shall be thoroughly cleaned of all waste materials and all unused or salvaged materials, equipment, tools, etc.
- B. After completion of the work, areas disturbed shall be leveled and the Worksite shall be raked clean and left in an orderly condition.

3.16 TEMPORARY IRRIGATION FOR GRASS ESTABLISHMENT

The contractor shall provide temporary irrigation for all new turf areas. Temporary irrigation may include equipment securely staked above grade. It shall be the contractor's responsibility to provide complete, consistent temporary coverage in order to establish a viable, mowable stand of grass. Any above grade equipment shall be removed by the contractor upon acceptance of the turf by the owner.

PART 4 - METHOD OF MEASUREMENT

MEASUREMENT:

Landscape Irrigation Systems described in this section will be paid for on a lump sum basis wherein no measurement will be made.

PART 5 BASIS OF PAYMENT

PAYMENT:

- A. Landscape Irrigation Systems will be paid for at the Contract lump sum, which price will be full compensation for furnishing and installing equipment; shop drawings; providing all submittals and warranties; furnishing all labor, materials, tools, equipment; and incidentals necessary to complete the work as described in this section and related other sections of these Specifications and plans, as well as maintenance until final acceptance.
- B. Payment will be made under:

<u>Number</u>	<u>Pay Item</u>	<u>Pay Unit</u>
02975 - 1	Landscape Irrigation System	Lump Sum

END OF SECTION 328400

SECTION 329100

PLANTING SOIL

PART 1 – GENERAL

1.1 SUMMARY

- A. The scope of work includes all labor, materials, tools, supplies, equipment, facilities, transportation and services necessary for, and incidental to performing all operations in connection with furnishing, delivery, and installation of Planting Soil and /or the modification of existing site soil for use as Planting Soil, complete as shown on the drawings and as specified herein.
- B. The scope of work in this section includes, but is not limited to, the following:
 - 1. Locate, purchase, deliver and install Imported Planting Soil and soil amendments.
 - 2. Modify existing stockpiled site soil.
 - a. Modify existing site soil in place for use as Planting Soil.
 - b. Install existing or modified existing soil for use as Planting Soil.
 - 3. Locate, purchase, deliver and install subsurface Drain Lines.
 - 4. Fine grade Planting Soil.
 - 5. Install Compost into Planting Soil.
 - 6. Clean up and disposal of all excess and surplus material.

1.2 CONTRACT DOCUMENTS

- A. Shall consist of specifications, general conditions, and the drawings. The intent of these documents is to include all labor, materials, and services necessary for the proper execution of the work. The documents are to be considered as one. Whatever is called for by any parts shall be as binding as if called for in all parts.

1.3 RELATED DOCUMENTS AND REFERENCES

- A. Related Documents:
 - 1. Drawings and general provisions of contract, including general and supplementary conditions and Division I specifications, apply to work of this section.
 - 2. Related Specification Section
 - a. Section – Planting
 - b. Section - Irrigation
 - c. Section – Turf and Grasses
- B. References: The following specifications and standards of the organizations and documents listed in this paragraph form a part of the Specification to the extent required by the references thereto. In the event that the requirements of the following referenced standards and specification conflict with this specification section the requirements of this specification shall prevail. In the event that the requirements of any of the following referenced standards and specifications conflict with each other the more stringent requirement shall prevail.
 - 1. ASTM: American Society of Testing Materials cited section numbers.
 - 2. U.S. Department of Agriculture, Natural Resources Conservation Service, 2003. National Soil Survey Handbook, title 430-VI. Available Online.
 - 3. US Composting Council www.compostingcouncil.org and

http://compostingcouncil.org/admin/wp-content/plugins/wp-pdfupload/pdf/191/LandscapeArch_Specs.pdf.

4. *Methods of Soil Analysis*, as published by the Soil Science Society of America (<http://www.soils.org/>).
5. *Up by Roots: healthy soils and trees in the built environment*. 2008. J. Urban. International Society of Arboriculture, Champaign, IL.

1.4 VERIFICATION

- A. All scaled dimensions on the drawings are approximate. Before proceeding with any work, the Contractor shall carefully check and verify all dimensions and quantities, and shall immediately inform the Owner's Representative of any discrepancies between the information on the drawings and the actual conditions, refraining from doing any work in said areas until given approval to do so by the Owner's Representative.

1.5 PERMITS AND REGULATIONS

- A. The Contractor shall obtain and pay for all permits related to this section of the work unless previously excluded under provision of the contract or general conditions. The Contractor shall comply with all laws and ordinances bearing on the operation or conduct of the work as drawn and specified. If the Contractor observes that a conflict exists between permit requirements and the work outlined in the contract documents, the Contractor shall promptly notify the Owner's Representative in writing including a description of any necessary changes and changes to the contract price resulting from changes in the work.
- B. Wherever references are made to standards or codes in accordance with which work is to be performed or tested, the edition or revision of the standards and codes current on the effective date of this contract shall apply, unless otherwise expressly set forth.
- C. In case of conflict among any referenced standards or codes or among any referenced standards and codes and the specifications, the more restrictive standard shall apply or Owner's Representative shall determine which shall govern.

1.6 PROTECTION OF WORK, PROPERTY AND PERSON

- A. The Contractor shall adequately protect the work, adjacent property, and the public, and shall be responsible for any damages or injury due to the Contractor's actions.

1.7 CHANGES IN WORK

- A. The Owner's Representative may order changes in the work, and the contract sum adjusted accordingly. All such orders and adjustments plus claims by the Contractor for extra compensation must be made and approved in writing before executing the work involved.
- B. All changes in the work, notifications and contractor's request for information (RFI) shall conform to the contract general condition requirements.

1.8 CORRECTION OF WORK

- A. The Contractor shall re-execute any work that fails to conform to the requirements of the contract and shall remedy defects due to faulty materials or workmanship upon written notice from the Owner's Representative, at the soonest possible time that can be coordinated with other work and seasonal weather demands but not more than 180 (one hundred and eighty) days after notification.

1.9 DEFINITIONS

- A. Acceptable drainage: Drainage rate is sufficient for the plants to be grown. Not too fast and not too slow. Typical rates for installed Planting Soil are between 1 - 5 inches per hour. Turf soils are often higher, but drainage rates above 2 - 3 inches per hour will dry out very fast. In natural undisturbed

- soil a much lower drainage rate, as low as 1/8th inch per hour can still support good plant growth. Wetland plants can grow on top of perched water layers or even within seasonal perched water layers, but could become unstable in high wind events.
- B. Amendment: material added to Topsoil to produce Planting Soil Mix. Amendments are classified as general soil amendments, fertilizers, biological, and pH amendments.
 - C. Biological Amendment: Amendments such as Mycorrhizal additives, compost tea or other products intended to change the soil biology.
 - D. Compacted soil: soil where the density of the soil is greater than the threshold for root limiting, and further defined in this specification.
 - E. Compost: well decomposed stable organic material as defined by the US Composting Council and further defined in this specification.
 - F. Drainage: The rate at which soil water moves through the soil transitioning the soil from saturated condition to field capacity. Most often expressed as saturated hydraulic conductivity (Ksat; units are inches per hour).
 - G. End of Warranty Acceptance: The date when the Owner's Representative accepts that the plants and work in this section meet all the requirements of the warranty. It is intended that the materials and workmanship warranty for Planting, Planting Soil, and Irrigation (if applicable) work run concurrent with each other, and further defined in this specification.
 - H. Existing Soil: Mineral soil existing at the locations of proposed planting after the majority of the construction within and around the planting site is completed and just prior to the start of work to prepare the planting area for soil modification and/or planting, and further defined in this specification.
 - I. Fertilizer: amendment used for the purpose of adjusting soil nutrient composition and balance.
 - J. Fine grading: The final grading of the soil to achieve exact contours and positive drainage, often accomplished by hand rakes or drag rakes or other suitable devices, and further defined in this specification, and further defined in this specification.
 - K. Finished grade: surface or elevation of Planting Soil after final grading and 12 months of settlement of the soil, and further defined in this specification.
 - L. Graded soil: Soil where the A horizon has been stripped and relocated or re-spread; cuts and fills deeper than 12 inches, and further defined in this specification.
 - M. Installed soil: Planting soil and existing site soil that is spread and or graded to form a planting soil, and further defined in this specification.
 - N. Minor disturbance: Minor grading as part of agricultural work that only adjusts the A horizon soil, minor surface compaction in the top 6 inches of the soil, applications of fertilizers, installation of utility pipes smaller than 18 inches in diameter thru the soil zone.
 - O. Owner's Representative: The person or entity, appointed by the Owner to represent their interest in the review and approval of the work and to serve as the contracting authority with the Contractor. The Owner's Representative may appoint other persons to review and approve any aspects of the work.
 - P. Ped: a clump or clod of soil held together by a combination of clay, organic matter, and fungal hyphae, retaining the original structure of the harvested soil.
 - Q. Planting Soil: Topsoil, or Planting Soil Mixes which are imported or existing at the site, or made from components that exist at the site, or are imported to the site; and further defined in this specification.
 - R. *Poor drainage: Soil drainage that is slower than that to which the plants can adapt. This is a wide range of metrics, but generally if the soil is turning grey in color it is reasonable preferable to either*

to plant moisture adaptive plants at smaller sizes that are young in age with shallow root balls or look at options to improve the drainage

- S. Scarify: Loosening and roughening the surface of soil and sub soil prior to adding additional soil on top, and further defined in this specification.
- T. Soil Horizons: as defined in the USDA National Soil Survey Handbook
http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242.
- U. Soil Tilling: Loosening the surface of the soil to the depths specified with a rotary tine tilling machine, roto tiller, (or spade tiller), and further defined in this specification.
- V. Subgrade: surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing Planting Soil.
- W. Substantial Completion Acceptance: The date at the end of the Planting, Planting Soil, and Irrigation installation (if applicable) where the Owner's Representative accepts that all work in these sections is complete and the Warranty period has begun. This date may be different than the date of substantial completion for the other sections of the project, and further defined in this specification.
- X. Topsoil: naturally produced and harvested soil from the A horizon or upper layers or the soil as further defined in this specification.
- Y. Undisturbed soil: Soils with the original A horizon intact that have not been graded or compacted. Soils that have been farmed, subjected to fire or logged but not graded, and natural forested land will be considered as undisturbed.

1.10 SUBMITTALS

- A. See the contract General Conditions for policy and procedures related to submittals.
- B. Submit all product submittals eight weeks prior to the start of the soil work.
- C. Product data and certificates: For each type of manufactured product, submit data and certificates that the product meets the specification requirements, signed by the product manufacturer, and complying with the following:
 - 1. Submit manufacturers or supplier's product data and literature certified analysis for standard products and bulk materials, complying with testing requirements and referenced standards and specific requested testing.
 - a. For each Compost product submit the following analysis by a recognized laboratory:
 - 1.) pH
 - 2.) Salt concentration (electrical conductivity)
 - 3.) Moisture content %, wet weight basis
 - 4.) Particle size % passing a selected mesh size, dry weight basis
 - 5.) Stability carbon dioxide evolution rate mg CO₂-C per g OM per day
 - 6.) Solvita maturity test
 - 7.) Physical contaminants (inerts) %, dry weight basis
 - 8.) US EPA Class A standard, 40CFR § 503.13, Tables 1 and 3 levels Chemical Contaminants mg/kg (ppm)
 - b. For Coarse Sand product submit the following analysis by a recognized laboratory:
 - 1.) pH
 - 2.) Particle size distribution (percent passing the following sieve sizes):
 - 3/8 inch (9.5 mm)
 - No 4 (4.75 mm)
 - No 8 (2.36 mm)
 - No 16(1.18 mm)

No 30 (.60 mm)
No 50 (.30 mm)
No 100 (.15 mm)
No 200 (.075 mm)

- D. Samples: Submit samples of each product and material, where required by Part 2 of the specification, to the Owner's Representative for approval. Label samples to indicate product, characteristics, and locations in the work. Samples will be reviewed for appearance only.
1. Submit samples a minimum of 8 weeks prior to the anticipated date of the start of soil installation.
 2. Samples of all Topsoil, Coarse Sand, Compost and Planting Soil shall be submitted at the same time as the particle size and physical analysis of that material.
- E. Soil testing for Imported and Existing Topsoil, existing site soil to be modified as Planting Soil and Planting Soil Mixes.
1. Topsoil, existing site soil and Planting Soil Mix testing: Submit soil test analysis report for each sample of Topsoil, existing site soil and Planting Soil from an approved soil-testing laboratory and where indicated in Part 2 of the specification as follows:
 - a. Submit Topsoil, Planting Soil, Compost, and Coarse Sand for testing at least 8 weeks before scheduled installation of Planting Soil Mixes. Submit Planting Soil Mix test no more than 2 weeks after the approval of the Topsoil, Compost and Coarse Sand. Do not submit to the testing laboratory, Planting Soil Mixes, for testing until all Topsoil, Compost and Coarse Sand have been approved.
 - b. If tests fail to meet the specifications, obtain other sources of material, retest and resubmit until accepted by the Owner's Representative.
 - c. All soil testing will be at the expense of the Contractor.
 2. Provide a particle size analysis (% dry weight) and USDA soil texture analysis. Soil testing of Planting Soil Mixes shall also include USDA gradation (percentage) of gravel, coarse sand, medium sand, and fine sand in addition to silt and clay.
 3. Provide the following other soil properties:
 - a. pH and buffer pH.
 - b. Percent organic content by oven dried weight.
 - c. Nutrient levels by parts per million including: phosphorus, potassium, magnesium, manganese, iron, zinc and calcium. Nutrient test shall include the testing laboratory recommendations for supplemental additions to the soil for optimum growth of the plantings specified.
 - d. Soluble salt by electrical conductivity of a 1:2 soil water sample measured in Milliohm per cm.
 - e. Cation Exchange Capacity (CEC).

1.11 OBSERVATION OF THE WORK

- A. The Owner's Representative may observe the work at any time. They may remove samples of materials for conformity to specifications. Rejected materials shall be immediately removed from the site and replaced at the Contractor's expense. The cost of testing materials not meeting specifications shall be paid by the Contractor.
1. The Owner's Representative may utilize the Contractor's penetrometer and moisture meter at any time to check soil compaction and moisture.
- B. The Owner's Representative shall be informed of the progress of the work so the work may be observed at the following key times in the construction process. The Owner's Representative shall be afforded sufficient time to schedule visit to the site. Failure of the Owner's Representative to make

field observations shall not relieve the Contractor from meeting all the requirements of this specification.

1. EXISTING SOIL CONDITIONS REVIEW: Prior to the start of any soil modification that will utilize or modify the existing soil.
2. EXCAVATION REVIEW: Observe each area of excavation prior to the installation of any Planting Soil.
3. DRAIN LINE INSTALLATION REVIEW: Upon completion of the installation of drain lines and prior to the installation of any Planting Soil
4. COMPLETION of SOIL MODIFICATIONS REVIEW: Upon completion of all soil modification and installation of planting soil.
5. COMPLETION OF FINE GRADING AND SURFACE SOIL MODIFICATIONS REVIEW: Upon completion of all surface soil modifications and fine grading but prior to the installation of shrubs, ground covers, or lawns.

1.12 PRE-CONSTRUCTION CONFERENCE

- A. Schedule a pre-construction meeting with the Owner's Representative at least seven (7) days before beginning work to review any questions the Contractor may have regarding the work, administrative procedures during construction and project work schedule.

1.13 QUALITY ASSURANCE

- A. Installer Qualifications: The installer shall be a firm having at least 5 years of experience of a scope similar to that required for the work, including the preparation, mixing and installation of soil mixes to support planting. The installer of the work in Section: Planting, shall be the same firm installing the work in this section.
 1. The bidders list for work under this section shall be approved by the Owner's Representative.
 2. Installer Field Supervision: When any Planting Soil work is in progress, installer shall maintain, on site, an experienced full-time supervisor who can communicate in English with the Owner's Representative.
 3. Installer's field supervisor shall have a minimum of five years experience as a field supervisor installing soil, shall be trained and proficient in the use of field surveying equipment to establish grades and can communicate in English with the Owner's Representative.
 4. The installer's crew shall be experienced in the installation of Planting Soil, plantings, and irrigation (where applicable) and interpretation of planting plans, soil installation plans, and irrigation plans (where applicable).
 5. Submit references of past projects and employee training certifications that support that the Contractors meet all of the above installer qualifications and applicable licensures.
- B. Soil testing laboratory qualifications: an independent laboratory, with the experience and capability to conduct the testing indicated and that specializes in USDA agricultural soil testing, Planting Soil Mixes, and the types of tests to be performed. Geotechnical engineering testing labs shall not be used.
- C. All delivered and installed Planting Soil shall conform to the approved submittals sample color, texture and approved test analysis.
 1. The Owner's Representative may request samples of the delivered or installed soil be tested for analysis to confirm the Planting Soil conforms to the approved material.
 2. All testing shall be performed by the same soil lab that performed the original Planting Soil testing.

3. Testing results shall be within 10% plus or minus of the values measured in the approved Planting Soil Mixes.
 4. Any Planting Soil that fails to meet the above criteria, if requested by the Owner's Representative, shall be removed and new soil installed.
- D. Soil compaction testing: following installation or modification of soil, test soil compaction with a penetrometer.
1. Maintain at the site at all times a soil cone penetrometer with pressure dial and a soil moisture meter to check soil compaction and soil moisture.
 - a. Penetrometer shall be AgraTronix Soil Compaction Meter distributed by Ben Meadows, www.benmeadows.com or approved equal.
 - b. Moisture meter shall be "general digital soil moisture meter" distributed by Ben Meadows, www.benmeadows.com or approved equal.
 2. Prior to testing the soil with the penetrometer check the soil moisture and penetrometer readings in the mockup soils. Penetrometer readings are impacted by soil moisture and excessively wet or dry soils will read significantly lower or higher than soils at optimum moisture.
 3. The penetrometer readings shall be within 20% plus or minus of the readings in the approved mockup when at similar moisture levels.

1.14 SITE CONDITIONS

- A. It is the responsibility of the Contractor to be aware of all surface and subsurface conditions, and to notify the Owner's Representative, in writing, of any circumstances that would negatively impact the health of plantings. Do not proceed with work until unsatisfactory conditions have been corrected.
1. Should subsurface drainage or soil conditions be encountered which would be detrimental to growth or survival of plant material, the Contractor shall notify the Owner's Representative in writing, stating the conditions and submit a proposal covering cost of corrections. If the Contractor fails to notify the Owner's Representative of such conditions, they shall remain responsible for plant material under the warrantee clause of the specifications.
 2. This specification requires that all Planting Soil and Irrigation (if applicable) work be completed and accepted prior to the installation of any plants.

1.15 SOIL COMPACTION – GENERAL REQUIREMENTS

- A. Except where more stringent requirements are defined in this specification. The following parameters shall define the general description of the threshold points of soil compaction in existing, modified or installed soil and subsoil.
3. Penetration Resistance Method
Units – PSI (lb. pressure per sq. in.) Threshold results that determine critical bulk density are somewhat the same for each soil texture.
Measurement tool - Penetrometer
- B. The following are threshold levels of compaction as determined by each method.
1. Acceptable Compaction: Good rooting anticipated, but increasing settlement expected as compaction is reduced and/or in soil with a high organic matter content.
 - a. Penetration Resistance Method – about 75-250 psi, below 75 psi soil becomes increasingly unstable and will settle excessively.
 2. Root limiting Compaction: Root growth is limited with fewer, shorter and slower growing roots.
 - a. Penetration Resistance Method – about 300 psi.
 3. Excessive Compaction: Roots not likely to grow but can penetrate soil when soil is above field

capacity.

a. Penetration Resistance Method – Approximately above 400 psi

1.16 DELIVERY, STORAGE, AND HANDLING

- A. Weather: Do not mix, deliver, place or grade soils when frozen or with moisture above field capacity.
- B. Protect soil and soil stockpiles, including the stockpiles at the soil blender's yard, from wind, rain and washing that can erode soil or separate fines and coarse material, and contamination by chemicals, dust and debris that may be detrimental to plants or soil drainage. Cover stockpiles with plastic sheeting or fabric at the end of each workday.
- C. All manufactured packaged products and material shall be delivered to the site in unopened containers and stored in a dry enclosed space suitable for the material and meeting all environmental regulations. Biological additives shall be protected from extreme cold and heat. All products shall be freshly manufactured and dated for the year in which the products are to be used.
- D. Deliver all chemical amendments in original, unopened containers with original labels intact and legible, which state the guaranteed chemical analysis. Store all chemicals in a weather protected enclosure.
- E. Bulk material: Coordinate delivery and storage with Owner's Representative and confine materials to neat piles in areas acceptable to Owner's Representative.

1.17 EXCAVATING AND GRADING AROUND UTILITIES

- A. Contractor shall carefully examine the civil, record, and survey drawings to become familiar with the existing underground conditions before digging.
- B. Determine location of underground utilities and perform work in a manner that will avoid damage. Hand excavate as required. Maintain grade stakes set by others until parties concerned mutually agree upon removal.
- C. Notification of the *local utility locator service*, is required for all planting areas. The Contractor is responsible for knowing the location and avoiding utilities that are not covered by the *local utility locator service*.

PART 2 – PRODUCTS

2.1 IMPORTED TOPSOIL

- A. Imported Topsoil definition: Fertile, friable soil containing less than 5% total volume of the combination of subsoil, refuse, roots larger than 1 inch diameter, heavy, sticky or stiff clay, stones larger than 2 inches in diameter, noxious seeds, sticks, brush, litter, or any substances deleterious to plant growth. The percent (%) of the above objects shall be controlled by source selection not by screening the soil. Topsoil shall be suitable for the germination of seeds and the support of vegetative growth. Imported Topsoil shall not contain weed seeds in quantities that cause noticeable weed infestations in the final planting beds. Imported Topsoil shall meet the following physical and chemical criteria:
 - 1. Soil texture: USDA loam, sandy clay loam or sandy loam with clay content between 15 and 25%. And a combined clay/silt content of no more than 55%.
 - 2. pH value shall be between 5.5 and 7.0.
 - 3. Percent organic matter (OM): 2.0-5.0%, by dry weight.
 - 4. Soluble salt level: Less than 2 mmho/cm.
 - 5. Soil chemistry suitable for growing the plants specified.
- B. Imported Topsoil shall be a harvested soil from fields or development sites. The organic content and

- particle size distribution shall be the result of natural soil formation. Manufactured soils where Coarse Sand, Composted organic material or chemical additives has been added to the soil to meet the requirements of this specification section shall not be acceptable. Retained soil peds shall be the same color on the inside as is visible on the outside.
- C. Imported Topsoil for Planting Soil shall NOT have been screened and shall retain soil peds or clods larger than 2 inches in diameter throughout the stockpile after harvesting.
 - D. Stockpiled Existing Topsoil at the site meeting the above criteria may be acceptable.
 - E. Provide a two gallon sample from each Imported Topsoil source with required soil testing results. The sample shall be a mixture of the random samples taken around the source stockpile or field. The soil sample shall be delivered with soil peds intact that represent the size and quantity of expected peds in the final delivered soil.

2.2 COMPOST

- A. Compost: Blended and ground leaf, wood and other plant based material, composted for a minimum of 9 months and at temperatures sufficient to break down all woody fibers, seeds and leaf structures, free of toxic material at levels that are harmful to plants or humans. Source material shall be yard waste trimmings blended with other plant or manure based material designed to produce Compost high in fungal material.
 - 1. Compost shall be commercially prepared Compost and meet US Compost Council STA/TMECC criteria or as modified in this section for “Compost as a Landscape Backfill Mix Component”.
http://compostingcouncil.org/admin/wp-content/plugins/wp-pdfupload/pdf/191/LandscapeArch_Specs.pdf
 - 2. Compost shall comply with the following parameters:
 - a. pH: 5.5 - 8.0.
 - b. Soil salt (electrical conductivity): maximum 5 dS/m (mmhos/cm).
 - c. Moisture content %, wet weight basis: 30 – 60.
 - d. Particle size, dry weight basis: 98% pass through 3/4 inch screen or smear.
 - e. Stability carbon dioxide evolution rate: mg CO₂-C/ g OM/ day < 2.
 - f. Solvita maturity test: > 6.
 - g. Physical contaminants (inerts), %, dry weight basis: <1%.
 - h. Chemical contaminants, mg/kg (ppm): meet or exceed US EPA Class A standard, 40CFR § 503.13, Tables 1 and 3 levels.
 - i. Biological contaminants select pathogens fecal coliform bacteria, or salmonella, meet or exceed US EPA Class A standard, 40 CFR § 503.32(a) level requirements.
- B. Provide a two gallon sample with manufacturer’s literature and material certification that the product meets the requirements.

2.3 COARSE SAND

- A. Clean, washed, sand, free of toxic materials
 - 1. Coarse concrete sand, ASTM C-33 Fine Aggregate, with a Fines Modulus Index of 2.8 and 3.2.
 - 2. Coarse Sands shall be clean, sharp, natural Coarse Sands free of limestone, shale and slate particles. Manufactured Coarse Sand shall not be permitted.
 - 3. pH shall be lower than 7.0.
 - 4. Provide Coarse Sand with the following particle size distribution:

Sieve	Percent passing
3/8 inch (9.5 mm)	100
No 4 (4.75 mm)	95-100

No 8 (2.36 mm)	80-100
No 16 (1.18 mm)	50-85
No 30 (.60 mm)	25-60
No 50 (.30 mm)	10-30
No 100 (.15 mm)	2-10
No 200 (0.75 mm)	2-5

- B. Provide a two gallon sample with manufacturer's literature and material certification that the product meets the requirements.

2.4 LIME

- A. ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:
 1. Class: Class T, with a minimum 99 percent passing through No. 8 (2.36-mm) sieve and a minimum 75 percent passing through No. 60 (0.25-mm) sieve.
 2. Provide lime in form of dolomitic limestone.
- B. Provide manufacturer's literature and material certification that the product meets the requirements.

2.5 PLANTING SOIL MIXES

- A. General definition: Mixes of Existing Soil or Imported Topsoil, Coarse Sand, and or Compost to make a new soil that meets the project goals for the indicated planting area. These may be mixed off site or onsite, and will vary in Mix components and proportions as indicated.
- B. Planting Mix - moderately slow draining soil for trees and shrub beds
 1. A Mix of Imported Topsoil, Coarse Sand and Compost. The approximate Mix ratio shall be:

<u>Mix component % by moist volume</u>	
Imported Topsoil unscreened	45-50%
Coarse sand	40-45%
Compost	10%
 2. Final tested organic matter between 2.75 and 4% (by dry weight).
 3. Mix the Coarse Sand and Compost together first and then add to the Topsoil. Mix with a loader bucket to loosely incorporate the Topsoil into the Coarse Sand/Compost Mix. DO NOT OVER MIX! Do not mix with a soil blending machine. Do not screen the soil. Clumps of Soil, Compost and Coarse Sand will be permitted in the overall Mix.
 4. At the time of final grading, add fertilizer if required to the Planting Soil at rates recommended by the testing results for the plants to be grown.
 5. Provide a two gallon sample with testing data that includes recommendations for chemical additives for the types of plants to be grown. Samples and testing data shall be submitted at the same time.

2.6 PRE-EMERGENT HERBICIDES

- A. Chemical herbicides are designed to prevent seeds of selective plants from germinating. Exact type of herbicide shall be based on the specific plants to be controlled and the most effective date of application.
- B. Submit report of expected weed problems and the recommendation of the most effective control for approval by Owner's Representative. Provide manufacturer's literature and material certification that the product meets the requirements.

PART 3 – EXECUTION

3.1 SITE EXAMINATION

- A. Prior to installation of Planting Soil, examine site to confirm that existing conditions are satisfactory for the work of this section to proceed.
 - 1. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope toward the under drain lines as shown on the drawings.
 - 2. Confirm that surface all areas to be filled with Planting Soil are free of construction debris, refuse, compressible or biodegradable materials, stones greater than 2 inches diameter, soil crusting films of silt or clay that reduces or stops drainage from the Planting Soil into the subsoil; and/or standing water. Remove unsuitable material from the site.
 - 3. Confirm that no adverse drainage conditions are present.
 - 4. Confirm that no conditions are present which are detrimental to plant growth.
 - 5. Confirm that utility work has been completed per the drawings.
 - 6. Confirm that irrigation work, which is shown to be installed below prepared soil levels, has been completed.
- B. If unsatisfactory conditions are encountered, notify the Owner's Representative immediately to determine corrective action before proceeding.

3.2 COORDINATION WITH PROJECT WORK

- A. The Contractor shall coordinate with all other work that may impact the completion of the work.
- B. Prior to the start of work, prepare a detailed schedule of the work for coordination with other trades.
- C. Coordinate the relocation of any irrigation lines, heads or the conduits of other utility lines that are in conflict with tree locations. Root balls shall not be altered to fit around lines. Notify the Owner's Representative of any conflicts encountered.

3.3 GRADE AND ELEVATION CONTROL

- A. Provide grade and elevation control during installation of Planting Soil. Utilize grade stakes, surveying equipment, and other means and methods to assure that grades and contours conform to the grades indicated on the plans.

3.4 SITE PREPARATION

- A. Excavate to the proposed subgrade. Maintain all required angles of repose of the adjacent materials as shown on the drawings or as required by this specification. Do not over excavate compacted subgrades of adjacent pavement or structures. Maintain a supporting 1:1 side slope of compacted subgrade material along the edges of all paving and structures where the bottom of the paving or structure is above the bottom elevation of the excavated planting area.
- B. Remove all construction debris and material including any construction materials from the subgrade.
- C. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope approximately parallel to the finished grade and/or toward the subsurface drain lines as shown on the drawings.
- D. In areas where Planting Soil is to be spread, confirm subgrade has been scarified.
- E. Protect adjacent walls, walks and utilities from damage or staining by the soil. Use 1/2 inch plywood and or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work.

1. At the end of each working day, clean up any soil or dirt spilled on any paved surface.
2. Any damage to the paving or site features or work shall be repaired at the Contractor's expense.

3.5 SOIL MOISTURE

- A. Volumetric soil moisture level, in both the Planting Soil and the root balls of all plants, prior to, during and after planting shall be above permanent wilt point and below field capacity for each type of soil texture within the following ranges.

Soil texture	Permanent wilting point	Field capacity
Sand, Loamy sand, Sandy loam	5-8%	12-18%
Loam, Sandy clay, Sandy clay loam	14-25%	27-36%
Clay loam, Silt loam	11-22%	31-36%
Silty clay, Silty clay loam	22-27%	38-41%

- B. The Contractor shall confirm the soil moisture levels with a moisture meter (Digital Soil Moisture Meter, DSMM500 by General Specialty Tools and Instruments, or approved equivalent). If moisture is found to be too low, the planting holes shall be filled with water and allowed to drain before starting any planting operations. If the moisture is too high, suspend planting operations until the soil moisture drains to below field capacity.

3.6 PLANTING SOIL AND PLANTING SOIL MIX INSTALLATION

- A. Prior to installing any Planting Soil from stockpiles or Planting Soil Mixes blended off site, the Owner's Representative shall approve the condition of the subgrade and the previously installed subgrade preparation and the installation of subsurface drainage.
- B. All equipment utilized to install or grade Planting Soils shall be wide track or balloon tire machines rated with a ground pressure of 4 psi or less. All grading and soil delivery equipment shall have buckets equipped with 6 inch long teeth to scarify any soil that becomes compacted.
- C. In areas of soil installation above existing subsoil, scarify the subgrade material prior to installing Planting Soil.
1. Scarify the subsoil of the subgrade to a depth of 3 – 6 inches with the teeth of the back hoe or loader bucket, tiller or other suitable device.
 2. Immediately install the Planting Soil. Protect the loosened area from traffic. DO NOT allow the loosened subgrade to become compacted.
 3. In the event that the loosened area becomes overly compacted, loosen the area again prior to installing the Planting Soil.
- D. Install the Planting Soil in 12 - 18 inch lifts to the required depths. Apply compacting forces to each lift as required to attain the required compaction. Scarify the top of each lift prior to adding more Planting Soil by dragging the teeth of a loader bucket or backhoe across the soil surface to roughen the surface.
- E. Phase work such that equipment to deliver or grade soil does not have to operate over previously installed Planting Soil. Work in rows of lifts the width of the extension of the bucket on the loader. Install all lifts in one row before proceeding to the next. Work out from the furthest part of each bed from the soil delivery point to the edge of the each bed area.

- F. Where possible place large trees first and fill Planting Soil around the root ball.
- G. Installing soil with soil or mulch blowers or soil slingers shall not be permitted due to the over mixing and soil ped breakdown cause by this type of equipment.
- H. Where travel over installed soil is unavoidable, limit paths of traffic to reduce the impact of compaction in Planting Soil. Each time equipment passes over the installed soil it shall reverse out of the area along the same path with the teeth of the bucket dropped to scarify the soil. Comply with the paragraph "Compaction Reduction" (section 3.9) in the event that soil becomes over compacted.
- I. The depths and grades shown on the drawings are the final grades after settlement and shrinkage of the compost material. The Contractor shall install the Planting Soil at a higher level to anticipate this reduction of Planting Soil volume. A minimum settlement of approximately 10 - 15% of the soil depth is expected. All grade increases are assumed to be as measured prior to addition of surface Compost till layer, mulch, or sod.

3.7 COMPACTION REQUIREMENTS FOR INSTALLED OR MODIFIED PLANTING SOIL

- A. Compact installed Planting Soil to the compaction rates indicated and using the methods approved for the soil mockup. Compact each soil lift as the soil is installed.
- B. Existing soil that is modified by tilling, ripping or fracturing shall have a density to the depth of the modification, after completion of the loosening, such that the penetrometer reads approximately 75 to 250 psi at soil moisture approximately the mid-point between wilting point and field capacity. This will be approximately between 75 and 82% of maximum dry density standard proctor.
- C. Installed Planting Soil Mix and re-spread existing soil shall have a soil density through the required depth of the installed layers of soil, such that the penetrometer reads approximately 75 to 250 psi at soil moisture approximately the mid-point between wilt point and field capacity. This will be approximately between 75 and 82% of maximum dry density standard proctor.
- D. Planting Soil compaction shall be tested at each lift using a penetrometer calibrated to the mockup soil and its moisture level. The same penetrometer and moisture meter used for the testing of the mockup shall be used to test installed soil throughout the work.
- E. Maintain moisture conditions within the Planting Soil during installation or modification to allow for satisfactory compaction. Suspend operations if the Planting Soil becomes wet. Apply water if the soil is overly dry.
- F. Provide adequate equipment to achieve consistent and uniform compaction of the Planting Soils. Use the smallest equipment that can reasonably perform the task of spreading and compaction. Use the same equipment and methods of compaction used to construct the Planting Soil mockup.
- G. Do not pass motorized equipment over previously installed and compacted soil except as authorized below.
 - 1. Light weight equipment such as trenching machines or motorized wheel barrows is permitted to pass over finished soil work.
 - 2. If work after the installation and compaction of soil compacts the soil to levels greater than the above requirements, follow the requirements of the paragraph "Over Compaction Reduction" below.

3.8 OVER COMPACTION REDUCTION

- A. Any soil that becomes compacted to a density greater than the specified density and/or the density in the approved mockup shall be dug up and reinstalled. This requirement includes compaction caused by other sub-contractors after the Planting Soil is installed and approved.
- B. Surface roto tilling shall not be considered adequate to reduce over compaction at levels 6 inches or

greater below finished grade.

3.9 INSTALLATION OF CHEMICAL ADDITIVES

- A. Following the installation of each soil and prior to fine grading and installation of the Compost till layer, apply chemical additives as recommended by the soil test, and appropriate to the soil and specific plants to be installed.
- B. Types, application rates and methods of application shall be approved by the Owner's Representative prior to any applications.

3.10 FINE GRADING

- A. The Owner's Representative shall approve all rough grading prior to the installation of Compost, fine grading, planting, and mulching.
- B. Grade the finish surface of all planted areas to meet the grades shown on the drawings, allowing the finished grades to remain higher (10 – 15% of depth of soil modification) than the grades on the grading plan, as defined in paragraph Planting Soil Installation, to anticipate settlement over the first year.
- C. Utilize hand equipment, small garden tractors with rakes, or small garden tractors with buckets with teeth for fine grading to keep surface rough without further compaction. Do not use the flat bottom of a loader bucket to fine grade, as it will cause the finished grade to become overly smooth and or slightly compressed.
- D. Provide for positive drainage from all areas toward the existing inlets, drainage structures and or the edges of planting beds. Adjust grades as directed to reflect actual constructed field conditions of paving, wall and inlet elevations. Notify the Owner's Representative in the event that conditions make it impossible to achieve positive drainage.
- E. Provide smooth, rounded transitions between slopes of different gradients and direction. Modify the grade so that the finish grade before adding mulch and after settlement is one or two inches below all paving surfaces or as directed by the drawings.
- F. Fill all dips and remove any bumps in the overall plane of the slope. The tolerance for dips and bumps in shrub and ground cover planting areas shall be a 2 inch deviation from the plane in 10 feet. The tolerance for dips and bumps in lawn areas shall be a 1 inch deviation from the plane in 10 feet.

3.11 INSTALLATION OF COMPOST TILL LAYER

- A. After Planting Soil Mixes are installed in planting bed areas and just prior to the installation of shrub or groundcover plantings, spread 3 – 4 inches of Compost over the beds and roto till into the top 4 - 6 inches of the Planting Soil. This step will raise grades slightly above the grades required in paragraph "Fine Grading". This specification anticipates that the raise in grade due to this tilling will settle within a few months after installation as Compost breaks down. Additional settlement as defined in paragraph "Planting Soil and Planting Soil Mix installation" must still be accounted for in the setting of final grades.

3.12 CLEAN-UP

- A. During installation, keep the site free of trash, pavements reasonably clean and work area in an orderly condition at the end of each day. Remove trash and debris in containers from the site no less than once a week.
 - 1. Immediately clean up any spilled or tracked soil, fuel, oil, trash or debris deposited by the Contractor from all surfaces within the project or on public right of ways and neighboring property.
- B. Once installation is complete, wash all soil from pavements and other structures. Ensure that mulch is

confined to planting beds and that all tags and flagging tape are removed from the site. The Owner's Representative seals are to remain on the trees and removed at the end of the warranty period.

1. Make all repairs to grades, ruts, and damage to the work or other work at the site.
2. Remove and dispose of all excess Planting Soil, subsoil, mulch, plants, packaging, and other material brought to the site by the Contractor.

3.13 PLANTING SOIL AND MODIFIED EXISTING SOIL PROTECTION

- A. The Contractor shall protect installed and/or modified Planting Soil from damage including contamination and over compaction due to other soil installation, planting operations, and operations by other Contractors or trespassers. Maintain protection during installation until acceptance. Utilize fencing and matting as required or directed to protect the finished soil work. Treat, repair or replace damaged Planting Soil immediately.
- B. Loosen compacted Planting Soil and replace Planting Soil that has become contaminated as determined by the Owner's Representative. Planting Soil shall be loosened or replaced at no expense to the Owner.
 - a. Till and restore grades to all soil that has been driven over or compacted during the installation of plants.
 - b. Where modified existing soil has become contaminated and needs to be replaced, provide imported soil that is of similar composition, depth and density as the soil that was removed.

3.14 PROTECTION DURING CONSTRUCTION

- A. The Contractor shall protect planting and related work and other site work from damage due to planting operations, operations by other Contractors or trespassers.
 1. Maintain protection during installation until the date of plant acceptance (see specifications section – Planting). Treat, repair or replace damaged work immediately.
 2. Provide temporary erosion control as needed to stop soil erosion until the site is stabilized with mulch, plantings or turf.
- B. Damage done by the Contractor, or any of their sub-contractors to existing or installed plants, or any other parts of the work or existing features to remain, including large existing trees, soil, paving, utilities, lighting, irrigation, other finished work and surfaces including those on adjacent property, shall be cleaned, repaired or replaced by the Contractor at no expense to the Owner. The Owner's Representative shall determine when such cleaning, replacement or repair is satisfactory. Damage to existing trees shall be assessed by a certified arborist.

3.15 SUBSTANTIAL COMPLETION ACCEPTANCE

- A. Upon written notice from the Contractor, the Owners Representative shall review the work and make a determination if the work is substantially complete.
- B. The date of substantial completion of the planting soil shall be the date when the Owner's Representative accepts that all work in Planting, Planting Soil, and Irrigation installation sections is complete.

3.16 FINAL ACCEPTANCE / SOIL SETTLEMENT

- A. At the end of the plant warrantee and maintenance period, (see Specification section - Planting) the Owner's Representative shall observe the soil installation work and establish that all provisions of the contract are complete and the work is satisfactory.
 1. Restore any soil settlement and or erosion areas to the grades shown on the drawings. When restoring soil grades remove plants and mulch and add soil before restoring the planting. Do not add soil over the root balls of plants or on top of mulch.

- B. Failure to pass acceptance: If the work fails to pass final acceptance, any subsequent observations must be rescheduled as per above. The cost to the Owner for additional observations will be charged to the Contractor at the prevailing hourly rate of the Owner's Representative.

END OF SECTION 329100

SECTION 329200
TURF AND GRASSES

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 the following:
 - 1. Soil Preparation
 - 2. Sodding.
 - 3. Maintenance
 - 4. Lawn renovation.
- B. Related Sections include the following:
 - 1. Section 311000: "Site Clearing".
 - 2. Section 312000: "Earthwork".
 - 3. Section 328400: "Planting Irrigation".
 - 4. Section 329300: "Plants".

1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Manufactured Soil: Soil produced off-site by blending soils or sand with organic soil amendments.
- C. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.
- D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Certification of Sod: From sod vendor for each seed mixture for sod identifying source.

- C. Product Certificates: For soil amendments and fertilizers.
- D. Qualification Data: For landscape Installer.
- E. Material Test Reports: For existing surface soil and imported topsoil.
- F. Planting Schedule: Indicating anticipated planting dates for each type of planting.
- G. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of lawns during one (1) calendar year.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful lawn establishment. Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.
- B. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percent of organic matter; gradation of sand, silt, and clay; deleterious material; pH; and nutrient content. Report suitability for lawn growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce a satisfactory topsoil.

1.6 WARRANTY

- A. Warrant lawns and grasses and workmanship for the warranty period indicated, against defects, poor health, unsatisfactory growth, and death, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner or Owner's Maintenance Contractor or incidents that are beyond Contractor's control.

1. Warranty period: One (1) year from date of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Sod: Harvest, deliver, store, and handle sod according to requirements in TPI's "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in its "Guideline Specifications to Turfgrass Sodding." Remove from palettes immediately upon delivery and install.

1.8 SCHEDULING

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance until date of Substantial Completion.

1. Spring Planting: between March 15 – May 1
2. Fall Planting: between August 15 – November 1

- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

1.9 LAWN MAINTENANCE

- A. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established and until date of Substantial Completion.
- B. Maintain and establish lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, re-grade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth lawn. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch. Anchor as required to prevent continued displacement.
- C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawn uniformly moist. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Install temporary watering system to avoid disturbing newly planted areas.
 - 1. Water lawn at a minimum rate of 1 inch (25 mm) per week.
- D. Mow lawn and edge as soon as top growth is tall enough to cut. Repeat mowing and edging to maintain specified height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
 - 1. Bermudagrass: 1/2 to 1 inch (13 to 25 mm).
- E. Lawn Post-fertilization: Apply fertilizer after initial mowing and when grass is dry.
 - 1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) to lawn area.

PART 2 - PRODUCTS

2.1 SOD

- A. Turfgrass Sod: Approved [Number 1 Quality/Premium, including limitations on thatch, weeds, diseases, nematodes, and insects], complying with TPI's "Specifications for Turfgrass Sod Materials" in its "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.
- B. Turfgrass Species: Bermudagrass (*Cynodon dactylon*).
- C. Turfgrass Species: Sod of grass species as follows, with not less than [95] percent germination, not less than [85] <Insert number> percent pure seed, and not more than [0.5] percent weed seed:

2.2 TOPSOIL

- A. Topsoil: Refer to Section 0329100: Planting Soil

2.3 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:
 - 1. Class: Class T, with a minimum 99 percent passing through No. 8 (2.36-mm) sieve and a minimum 75 percent passing through No. 60 (0.25-mm) sieve.
 - 2. Class: Class O, with a minimum 95 percent passing through No. 8 (2.36-mm) sieve and a minimum 55 percent passing through No. 60 (0.25-mm) sieve.
 - 3. Provide lime in form of dolomitic limestone.
- B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum 99 percent passing through No. 6 (3.35-mm) sieve and a maximum 10 percent passing through No. 40 (0.425-mm) sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Aluminum Sulfate: Commercial grade, unadulterated.
- E. Perlite: Horticultural perlite, soil amendment grade.
- F. Agricultural Gypsum: Finely ground, containing a minimum of 90 percent calcium sulfate.
- G. Sand: Clean, washed, natural or manufactured, free of toxic materials.
- H. Diatomaceous Earth: Calcined, diatomaceous earth, 90 percent silica, with approximately 140 percent water absorption capacity by weight.
- I. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.4 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through [1-inch (25-mm)] [3/4-inch (19-mm)] [1/2-inch (12.5-mm)] sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: [60] percent of dry weight.
 - 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
- B. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture, free of chips, stones, sticks, soil, or toxic materials.
 - 1. In lieu of decomposed wood derivatives, mix partially decomposed wood derivatives with at least 0.15 lb (2.4 kg) of ammonium nitrate or 0.25 lb (4 kg) of ammonium sulfate per cubic foot (cubic meter) of loose sawdust or ground bark.

- C. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.5 PLANTING ACCESSORIES

- A. Selective Herbicides: EPA registered and approved, of type recommended by manufacturer for application.

2.6 FERTILIZER

- A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of [1] [4] percent nitrogen and [10] [20] percent phosphoric acid.
- B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.
- D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.
- E. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.7 EROSION-CONTROL MATERIALS

- A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.

- B. Erosion-Control Fiber Mesh: Biodegradable twisted jute or spun-coir mesh, a minimum of 0.92 lb/sq. yd. (0.5 kg/sq. m), with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 - 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Landscape Architect and replace with new planting soil.

3.2 PREPARATION

- A. Notify Landscape Architect at least 7 working days prior to start of seeding operations.
- B. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations. Protect adjacent and adjoining areas from hydroseeding overspray. Perform seeding only after planting and other work affecting ground surface has been completed.
- C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- D. Restrict traffic from lawn areas until grass is established. Erect signs, flagging, and barriers as necessary.

3.3 PREPARATION

- A. Notify Landscape Architect at least 10 working days prior to start of seeding operations.
- B. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations. Protect adjacent and adjoining areas from

hydroseeding overspray. Perform seeding only after planting and other work affecting ground surface has been completed.

- C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- D. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.
- E. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
 - 1. Lay sod across angle of slopes exceeding 1:3.
 - 2. Anchor sod on slopes exceeding 1:6 with wood pegs or steel staples spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.
- F. Saturate sod with fine water spray within two hours of planting. During first week, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches (38 mm) below sod.

3.4 GRASS MAINTENANCE

- A. Maintain and establish grass by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable grass. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
 - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
 - 2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
 - 3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and irrigation to keep turf uniformly moist to a depth of 4 inches (100 mm).
 - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 - 2. Water turf with fine spray at a minimum rate of 1 inch (25 mm) per week unless rainfall precipitation is adequate.
 - 3. Irrigate according to the plant and seed mix requirements and avoid fixed schedules.
 - 4. Water early in the mornings.

- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
 - 1. Mow Bermuda turf to a height of 1 inch (25 mm).
- D. Turf Post fertilization: Apply fertilizer after initial mowing and when grass is dry.
 - 1. Use fertilizer only after soil has been tested and deficiencies are present. Provide actual nitrogen of at least 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) Bermuda grass area. No fertilizers should be used on roadway seed mix.

3.5 SATISFACTORY LAWNS

- A. Satisfactory Sodded Lawn: At Substantial Completion, a healthy, well-rooted, even-colored, viable lawn, free of weeds, open joints, bare areas, and surface irregularities.
- B. Reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

3.6 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period and remove after lawn is established. Remove erosion-control measures after grass establishment period.

END OF SECTION 329200

SECTION 329300

PLANTING

PART 1 – GENERAL

1.1 SUMMARY

- A. The scope of work includes all labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for, and incidental to performing all operations in connection with furnishing, delivery, and installation of plant (also known as "landscaping") complete as shown on the drawings and as specified herein.
- B. The scope of work in this section includes, but is not limited to, the following:
 - 1. Locate, purchase, deliver and install all specified plants.
 - 2. Water all specified plants.
 - 3. Mulch, fertilize, stake, and prune all specified plants.
 - 4. Maintenance of all specified plants until the beginning of the warranty period.
 - 5. Plant warranty.
 - 6. Clean up and disposal of all excess and surplus material.
 - 7. Maintenance of all specified plants during the warranty period.

1.2 CONTRACT DOCUMENTS

- A. Shall consist of specifications and general conditions and the construction drawings. The intent of these documents is to include all labor, materials, and services necessary for the proper execution of the work. The documents are to be considered as one. Whatever is called for by any parts shall be as binding as if called for in all parts.

1.3 RELATED DOCUMENTS AND REFERENCES

- A. Related Documents:
 - 1. Drawings and general provisions of contract including general and supplementary conditions and Division I specifications apply to work of this section
 - 2. Related Specification Sections
 - a. Section - Planting Soil
 - b. Section - Irrigation
 - c. Section - Lawn

3. VERIFICATION

- a. All scaled dimensions on the drawings are approximate. Before proceeding with any work, the Contractor shall carefully check and verify all dimensions and quantities, and shall immediately inform the Landscape Architect of any discrepancies between the information on the drawings and the actual conditions, refraining from doing any work in said areas until given approval to do so by the Landscape Architect.
- b. In the case of a discrepancy in the plant quantities between the plan drawings and the plant call outs, list or plant schedule, the number of plants or square footage of the planting bed actually drawn on the plan drawings shall be deemed correct and prevail.

4. PROTECTION OF WORK, PROPERTY AND PERSON

- a. The Contractor shall adequately protect the work, adjacent property, and the public, and shall be responsible for any damages or injury due to his/her actions.

5. CHANGES IN THE WORK

- a. The Landscape Architect may order changes in the work, and the contract sum should be adjusted accordingly. All such orders and adjustments plus claims by the Contractor for extra compensation must be made and approved in writing before executing the work involved.
- b. All changes in the work, notifications and contractor's request for information (RFI) shall conform to the contract general condition requirements.

6. DEFINITIONS

- a. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- b. Balled and Burlapped Stock: Exterior plants dug with firm, natural balls of earth in which they are grown, with standard ball size for type and size of tree or shrub required, wrapped, tied, rigidly supported, and drum-laced, all as recommended by ANSI Z60.1.
- c. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than sizes indicated.
- d. Boxed trees: A container root ball package made of wood in the shape of a four-sided box.
- e. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for kind, type, and size of exterior plant required.
- f. Defective plant: Any plant that fails to meet the plant quality requirement of this specification.
- g. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- h. End of Warranty Final Acceptance: The date when the Owner's Representative accepts that the plants and work in this section meet all the requirements of the warranty. It is intended that the materials and workmanship warranty for Planting, Planting Soil, and Irrigation work run concurrent with each other.
- i. Field grown trees (B&B): Trees growing in field soil for at least 12 months prior to harvest.
- j. Finish Grade: Elevation of finished surface of planting soil.
- k. Healthy: Plants that are growing in a condition that expresses leaf size, crown density, color; and with annual growth rates typical of the species and cultivar's horticultural description, adjusted for the planting site soil, drainage and weather conditions.
- l. Kinked root: A root within the root package that bends more than 90 degrees.

- m. Maintenance: Actions that preserve the health of plants after installation and as defined in this specification.
- n. Maintenance period: The time period, as defined in this specification, which the Contractor is to provide maintenance.
- o. Normal: the prevailing protocol of industry standard(s).
- p. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- q. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- r. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- s. Planting Area: Areas to be planted.
- t. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.
- u. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
- v. Reasonable and reasonably: When used in this specification relative to plant quality, it is intended to mean that the conditions cited will not affect the establishment or long term stability, health or growth of the plant. This specification recognizes that it is not possible to produce plants free of all defects, but that some accepted industry protocols and standards result in plants unacceptable to this project.

When reasonable or reasonably is used in relation to other issues such as weeds, diseased, insects, it shall mean at levels low enough that no treatment would be required when applying recognized Integrated Plant Management practices.

This specification recognizes that some decisions cannot be totally based on measured findings and that professional judgment is required. In cases of differing opinion, the Owner's Representative's expert shall determine when conditions are judged as reasonable.

- w. Root ball: The mass of roots including any soil or substrate that is shipped with the tree within the root ball package.
- x. Root ball package. The material that surrounds the root ball during shipping. The root package may include the material in which the plant was grown, or new packaging placed around the root ball for shipping.
- y. Root collar (root crown, root flare, trunk flare, flare): The region at the base of the trunk where the majority of the structural roots join the plant stem, usually at or near ground level.
- z. Shrub: Woody plants with mature height approximately less than 15 feet.

- aa. Spade harvested and transplanted: Field grown trees that are mechanically harvested and immediately transplanted to the final growing site without being removed from the digging machine.
- bb. Stem: The trunk of the tree.
- cc. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.
- dd. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- ee. Substantial Completion Acceptance: The date at the end of the Planting, Planting Soil, and Irrigation installation where the Owner's Representative accepts that all work in these sections is complete and the Warranty period has begun. This date may be different than the date of substantial completion for the other sections of the project.
- ff. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.
- gg. Stem girdling root: Any root more than ¼ inch diameter currently touching the trunk, or with the potential to touch the trunk, above the root collar approximately tangent to the trunk circumference or circling the trunk. Roots shall be considered as Stem Girdling that have, or are likely to have in the future, root to trunk bark contact.
- hh. Structural root: One of the largest roots emerging from the root collar.
- ii. Tree: Single and multi-stemmed plants with mature height approximately greater than 15 feet.

7. SUBMITTALS

- a. See contract general conditions for policy and procedure related to submittals.
- b. Submit all product submittals 3 weeks prior to installation of plantings.
- c. Product data: Submit manufacturer product data and literature describing all products required by this section to the Owner's Representative for approval. Provide submittal eight weeks before the installation of plants. Samples: Submit samples of each product and material where required by the specification to the Landscape Architect for approval. Label samples to indicate product, characteristics, and locations in the work. Samples will be reviewed for appearance only. Compliance with all other requirements is the exclusive responsibility of the Contractor.
- d. Qualification Data: For Landscape Contractor. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.
- e. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:
 - Manufacturer's certified analysis of standard products.
 - Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

- f. Material Test Reports: Material Test Reports: For standardized ASTM D 5268 topsoil, existing native surface topsoil, existing in-place surface soil with compost and imported or manufactured topsoil.
- g. Plant growers' certificates: Submit plant growers' certificates for all plants indicating that each meets the requirements of the specification, including the requirements of tree quality, to the Owner's Representative for approval. Provide submittal eight weeks before the installation of plants.
- h. Samples: Submit samples of each product and material where required by the specification to the Owner's Representative for approval. Label samples to indicate product, characteristics, and locations in the work. Samples will be reviewed for appearance only. Compliance with all other requirements is the exclusive responsibility of the Contractor.
- i. Plant sources: Submit sources of all plants as required by Article 1.11 – "Selection of Plants" to the Owner's Representative for approval.
- j. Close out submittals: Submit to the Owner's Representative for approval. Plant maintenance data and requirements.
- k. Installation plan submitted a minimum of 14 days prior to the scheduled installation. Plan should describe the methods, activities, materials and schedule to achieve installation of plants.

8. OBSERVATION OF THE WORK

- a. The Landscape Architect may observe the work at any time. They may remove samples of materials for conformity to specifications. Rejected materials shall be immediately removed from the site and replaced at the Contractor's expense. The cost of testing materials not meeting specifications shall be paid by the Contractor.
- b. The Landscape Architect shall be informed of the progress of the work so the work may be observed at the following key times in the construction process. The Landscape Architect shall be afforded sufficient time to schedule visit to the site. Failure of the Landscape Architect to make field observations shall not relieve the Contractor from meeting all the requirements of this specification.

SITE CONDITIONS PRIOR TO THE START OF PLANTING: review the soil and drainage conditions.

COMPLETION OF THE PLANT LAYOUT STAKING: Review of the plant layout.

PLANT QUALITY: Review of plant quality at the time of delivery and prior to installation. Review tree quality prior to unloading where possible, but in all cases prior to planting.

COMPLETION OF THE PLANTING: Review the completed planting.

9. QUALITY ASSURANCE

- a. Contractor's Quality Assurance Responsibilities: The Contractor is solely responsible for quality control of the work.
- b. Installer Qualifications: The installer shall be a firm having at least 5 years of successful experience of a scope similar to that required for the work, including the handling and planting of large specimen trees in urban areas. The same firm shall install planting soil (where applicable) and plant material.

Installer Field Supervision: When any planting work is in progress, installer shall maintain, on site, a full-time supervisor who can communicate in English with the Owner's Representative.

Installer's field supervisor shall have a minimum of five years' experience as a field supervisor installing plants and trees of the quality and scale of the proposed project, and can communicate in English with the Owner's Representative.

The installer's crew shall have a minimum of 3 years experienced in the installation of Planting Soil, Plantings, and Irrigation (where applicable) and interpretation of soil plans, planting plans and irrigation plans.

Submit references of past projects, employee training certifications that support that the Contractors meets all of the above installer qualifications and applicable licensures.

- c. Soil-Testing Laboratory Qualifications: An independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- d. Soil Analysis: Furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of the soil.

The soil-testing laboratory shall oversee soil sampling, with depth, location, and number of samples to be taken per instructions from Architect. A minimum of four (4) representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.

Report suitability of tested soil for turf growth.

Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. (92.9 sq. m) or volume per cu. yd. (0.76 cu. m)

Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.

Notify Landscape Architect of sources of planting materials minimum ten (10) days in advance of delivery to site.

10. SELECTION AND OBSERVATION OF PLANTS

- a. The Landscape Architect may review all plants subject to approval of size, health, quality, character, etc. Review or approval of any plant during the process of selection, delivery, installation and establishment period shall not prevent that plant from later rejection in the event that the plant quality changes or previously existing defects become apparent that were not observed.
- b. Plant Selection: The Landscape Architect reserves the right to select and observe all plants at the nursery prior to delivery and to reject plants that do not meet specifications as set forth in this specification. If a particular defect or substandard element can be corrected at the nursery, as determined by the Landscape Architect, the agreed upon remedy may be applied by the nursery or the Contractor provided that the correction allows the plant to meet the requirements set forth in this specification. Any work to correct plant defects shall be at the contractor's expense.

The Landscape Architect may make invasive observation of the plant's root system in the area of the root collar and the top of the root ball in general in order to determine that the plant meets the quality requirements for depth of the root collar and presence of roots above the root collar. Such observations will not harm the plant.

Corrections are to be undertaken at the nursery prior to shipping.

- c. The Contractor shall bear all cost related to plant corrections.
- d. All plants that are rejected shall be immediately removed from the site and acceptable replacement plants provided at no cost to the Owner.
- e. Submit to the Landscape Architect, for approval, plant sources including the names and locations of nurseries proposed as sources of acceptable plants, and a list of the plants they will provide. The plant list shall include the botanical and common name and the size at the time of selection. Observe all nursery materials to determine that the materials meet the requirements of this section.
- f. Trees shall be purchased from the growing nursery. Re-wholesale plant suppliers shall not be used as sources unless the Contractor can certify that the required trees are not directly available from a growing nursery. When Re-wholesale suppliers are utilized, the Contractor shall submit the name and location of the growing nursery from where the trees were obtained by the re-wholesale seller. The re-wholesale nursery shall be responsible for any required plant quality certifications.
- g. The Contractor shall require the grower or re-wholesale supplier to permit the Landscape Architect to observe the root system of all plants at the nursery or job site prior to planting including random removal of soil or substrate around the base of the plant. Observation may be as frequent and as extensive as needed to verify that the plants meet the requirements of the specifications and conform to requirements.
- h. Where requested by the Owner's Representative, submit photographs of plants or representative samples of plants. Photographs shall be legible and clearly depict the plant specimen. Each submitted image shall contain a height reference, such as a measuring stick. The approval of plants by the Landscape Architect via photograph does not preclude the Landscape Architect's right to reject material while on site.

11. PLANT SUBSTITUTIONS FOR PLANTS NOT AVAILABLE

- a. Submit all requests for substitutions of plant species, or size to the Landscape Architect, for approval, prior to purchasing the proposed substitution. Request for substitution shall be accompanied with a list of nurseries contacted in the search for the required plant and a record of other attempts to locate the required material. Requests shall also include sources of plants found that may be of a smaller or larger size, or a different shape or habit than specified, or plants of the same genus and species but different cultivar origin, or which may otherwise not meet the requirements of the specifications, but which may be available for substitution.

12. DELIVERY, STORAGE, AND HANDLING

- a. **Packaged Materials:** Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.

- b. Bulk Materials:
Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
Accompany each delivery of bulk organic fertilizers, lime and soil amendments with appropriate certificates.
- c. Deliver plants freshly dug. Do not prune trees and shrubs before delivery, except as approved by Landscape Architect. Protect bark, branches, and root systems from sunscald, drying, sweating, whipping, and other handling and tying damage. Do not bend or tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering during delivery.
- d. Handle planting stock by root ball and do not drop during delivery.
- e. Deliver plants after preparations for planting have been completed and install immediately. If planting is delayed for more than six hours after delivery, store plants as follows:

Store plants in shade, protect from weather and damage, and keep roots moist.
Set balled stock on ground and heel in with soil, mulch, or other acceptable material.
Do not remove container-grown stock from containers before time of planting.
Water roots of plants stored on-site. Water as necessary to maintain moist conditions.

13. SITE CONDITIONS

- a. It is the responsibility of the Contractor to be aware of all surface and sub-surface conditions, and to notify the Landscape Architect, in writing, of any circumstances that would negatively impact the health of plantings. Do not proceed with work until unsatisfactory conditions have been corrected.

Should subsurface drainage or soil conditions be encountered which would be detrimental to growth or survival of plant material, the Contractor shall notify the Landscape Architect in writing, stating the conditions and submit a proposal covering cost of corrections. If the Contractor fails to notify the Landscape Architect of such conditions, he/she shall remain responsible for plant material under the warranty clause of the specifications.
- b. It is the responsibility of the Contractor to be familiar with the local growing conditions, and if any specified plants will be in conflict with these conditions. Report any potential conflicts, in writing, to the Landscape Architect.
- c. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- d. Interruption of Existing Services or Utilities: Do not interrupt services or utilities to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services or utilities according to requirements indicated:

Notify Construction Manager and Owner no fewer than three days in advance of proposed interruption of each service or utility.

Do not proceed with interruption of services or utilities without Construction Manager's or Owner's written permission.

- e. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

Spring Planting: between March 15 – May 1

Fall Planting: between August 15 – November 1

- f. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.
- g. Coordination with Turf Areas (Lawns) and Seed Mix Areas: Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.

When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

14. WARRANTY

- a. Special Warranty: Warranty exterior plants and workmanship, for the warranty period indicated, against defects, poor health, unsatisfactory growth, and death, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, or incidents that are beyond Contractor's control.

Warranty Period from date of Substantial Completion.

Trees, Shrubs, Vines, and Ornamental Grasses: twelve (12) months.

Ground Covers, Biennials, Perennials, and Other Plants: twelve (12) months.

Include the following remedial actions as a minimum:

Remove dead exterior plants immediately. Replace immediately unless required to plant in the succeeding planting season.

At end of warranty period: Replace plants that are more than 25 percent dead or in an unhealthy condition.

A limit of one replacement of each plant will be required, except for losses due to failure to comply with requirements.

Provide extended warranty for period equal to original warranty period, for replaced plant material.

15. MAINTENANCE

- a. Maintain landscaping by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.

Maintenance Period: 60 days from date of substantial completion.

PART 2 – PRODUCTS

1. PLANTS: GENERAL

- a. Standards and measurement: Provide plants of quantity, size, genus, species, and variety or cultivars as shown and scheduled in contract documents.

All plants including the root ball dimensions or container size to trunk caliper ratio shall conform to ANSI Z60.1 “American Standard for Nursery Stock” latest edition, unless modified by provisions in this specification. When there is a conflict between this specification and ANSI Z60.1, this specification section shall be considered correct.

Plants larger than specified may be used if acceptable to the Owner’s Representative. Use of such plants shall not increase the contract price. If larger plants are accepted the root ball size shall be in accordance with ANSI Z-60.1. Larger plants may not be acceptable if the resulting root ball cannot be fit into the required planting space.

If a range of size is given, no plant shall be less than the minimum size and not less than 50 percent of the plants shall be as large as the maximum size specified. The measurements specified are the minimum and maximum size acceptable and are the measurements after pruning, where pruning is required.

- b. Proper Identification: All trees shall be true to name as ordered or shown on planting plans and shall be labeled individually or in groups by genus, species, variety and cultivar.
- c. Compliance: All trees shall comply with federal and state laws and regulations requiring observation for plant disease, pests, and weeds. Observation certificates required by law shall accompany each shipment of plants.
- d. Plant Quality:

General: Provide healthy stock, grown in a nursery and reasonably free of die-back, disease, insects, eggs, bores, and larvae. At the time of planting all plants shall have a root system, stem, and branch form that will not restrict normal growth, stability and health for the expected life of the plant.

Plant quality above the soil line:

Plants shall be healthy with the color, shape, size and distribution of trunk, stems, branches, buds and leaves normal to the plant type specified. Tree quality above the soil line shall comply with the project Crown Acceptance details and the following:

Crown: The form and density of the crown shall be typical for a young specimen of the species or cultivar pruned to a central and dominant leader.

Crown specifications do not apply to plants that have been specifically trained in the nursery as topiary, espalier, multi-stem, clump, or unique selections such as contorted or weeping cultivars.

Leaves: The size, color, and appearance of leaves shall be typical for the time of year and stage of growth of the species or cultivar. Trees shall not show signs of prolonged moisture stress or over watering as indicated by wilted, shriveled, or dead leaves.

Branches: Shoot growth (length and diameter) throughout the crown should be appropriate for the age and size of the species or cultivar. Trees shall not have dead, diseased, broken, distorted, or otherwise injured branches.

Main branches shall be distributed along the central leader not clustered together.

They shall form a balanced crown appropriate for the cultivar/species.

Branch diameter shall be no larger than two-thirds (one-half is preferred) the diameter of the central leader measured 1 inch above the branch union.

The attachment of the largest branches (scaffold branches) shall be free of included bark.

Trunk: The tree trunk shall be relatively straight, vertical, and free of wounds that penetrate to the wood (properly made pruning cuts, closed or not, are acceptable and are not considered wounds), sunburned areas, conks (fungal fruiting bodies), wood cracks, sap leakage, signs of boring insects, galls, cankers, girdling ties, or lesions (mechanical injury).

All graft unions, where applicable, shall be completely closed without visible sign of graft rejection. All grafts shall be visible above the soil line.

Trunk caliper and taper shall be sufficient so that the lower five feet of the trunk remains vertical without a stake. Auxiliary stake may be used to maintain a straight leader in the upper half of the tree.

Plant quality at or below the soil line:

Plant roots shall be normal to the plant type specified. Root observations shall take place without impacting tree health. Root quality at or below the soil line shall comply with the project Root Acceptance details and the following:

The roots shall be reasonably free of scrapes, broken or split wood.

The root system shall be reasonably free of injury from biotic (e.g., insects and pathogens) and abiotic (e.g., herbicide toxicity and salt injury) agents. Wounds resulting from root pruning used to produce a high quality root system are not considered injuries.

A minimum of three structural roots reasonably distributed around the trunk (not clustered on one side) shall be found in each plant. Root distribution shall be uniform throughout the root ball, and growth shall be appropriate for the species.

Plants with structural roots on only one side of the trunk (J roots) shall be rejected.

The root collar shall be exposed.

Two structural roots shall reach the side of the root ball near the top surface of the root ball. The grower may request a modification to this requirement for species with roots that rapidly descend, provided that the grower removes all stem girdling roots above the structural roots across the top of the root ball.

The root system shall be reasonably free of stem girdling roots over the root collar or kinked roots from nursery production practices.

Plant Grower Certification: The final plant grower shall be responsible to have determined that the plants have been root pruned at each step in the plant production process to remove stem girdling roots and kinked roots, or that the previous production system used practices that produce a root system throughout the root ball that meets these specifications. Regardless of the work of previous growers, the plant's root system shall be modified at the final production stage, if needed, to produce the required plant root quality. The final grower shall certify in writing that all plants are reasonably free of stem girdling and kinked roots as defined in this specification, and that the

tree has been grown and harvested to produce a plant that meets these specifications.

At time of observations and delivery, the root ball shall be moist throughout. Roots shall not show signs of excess soil moisture conditions as indicated by stunted, discolored, distorted, or dead roots.

- e. Submittals: Submit for approval the required plant quality certifications from the grower where plants are to be purchased, for each plant type. The certification must state that each plant meets all the above plant quality requirements.

The grower's certification of plant quality does not prohibit the Owner's Representative from observing any plant or rejecting the plant if it is found to not meet the specification requirements.

2. ROOT BALL PACKAGE OPTIONS:

The following root ball packages are permitted. Specific root ball packages shall be required where indicated on the plant list or in this specification. Any type of root ball packages that is not specifically defined in this specification shall not be permitted.

a. BALLED AND BURLAPPED PLANTS

All Balled and Burlapped Plants shall be field grown, and the root ball packaged in a burlap and twine and/or burlap and wire basket package.

Plants shall be harvested with the following modifications to standard nursery practices.

Prior to digging any tree that fails to meet the requirement for maximum soil and roots above the root collar, carefully removed the soil from the top of the root ball of each plant, using hand tools, water or an air spade, to locate the root collar and attain the soil depth over the structural roots requirements. Remove all stem girdling roots above the root collar. Care must be exercised not to damage the surface of the root collar and the top of the structural roots.

Trees shall be dug for a minimum of 4 weeks and a maximum of 52 weeks prior to shipping. Trees dug 4 to 52 weeks prior to shipping are defined as hardened-off. Digging is defined as cutting all roots and lifting the tree out of the ground and either moving it to a new location in the nursery or placing it back into the same hole. Trees that are stored out of the ground shall be placed in a holding area protected from extremes of wind and sun with the root ball protected by covering with mulch or straw and irrigated sufficiently to keep moisture in the root ball above wilt point and below saturation.

Twine and burlap used for wrapping the root ball package shall be natural, biodegradable material. If the burlap decomposes after digging the tree then the root ball shall be re-wrapped prior to shipping if roots have not yet grown to keep root ball intact during shipping.

b. SPADE HARVESTED AND TRANSPLANTED

Spade Harvested and Transplanted Plants shall meet all the requirements for field grown trees. Root ball diameters shall be of similar size as the ANSI Z60.1 requirements for Balled and Burlapped

plants.

Trees shall be harvested prior to leafing out (bud break) in the spring or during the fall planting period except for plants known to be considered as fall planting hazards. Plants that are fall planting hazards shall only be harvested prior to leafing out in the spring.

Trees shall be moved and planted within 48 hours of the initial harvesting and shall remain in the spade machine until planted.

c. CONTAINER (INCLUDING ABOVE-GROUND FABRIC CONTAINERS AND BOXES) PLANTS

Container plants may be permitted only when indicated on the drawing, in this specification, or approved by the Owner's Representative.

Provide plants shall be established and well rooted in removable containers.

Container class size shall conform to ANSI Z60.1 for container plants for each size and type of plant.

3. INORGANIC SOIL AMENDMENTS

- a. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent.

Class: T, with a minimum of 99 percent passing through No. 8 (2.36-mm) sieve and a minimum of 75 percent passing through No. 60 (0.25-mm) sieve.

Class: O, with a minimum of 95 percent passing through No. 8 (2.36-mm) sieve and a minimum of 55 percent passing through No. 60 (0.25-mm) sieve.

- b. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent sulfur, with a minimum of 99 percent passing through No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through No. 40 (0.425-mm) sieve. Iron Sulfate: Granulated ferrous sulfate containing min. of 20 percent iron and 10 percent sulfur.
- c. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- d. Aluminum Sulfate: Commercial grade, unadulterated.
- e. Perlite: Horticultural perlite, soil amendment grade.
- f. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 (0.30-mm) sieve.
- g. Sand: Clean, washed, natural or manufactured, free of toxic materials.

4. ORGANIC SOIL AMENDMENTS

- a. Compost: Well-composted, weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings. Organic matter content 50 to 60 percent of dry weight.

- b. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture, free of chips, stones, sticks, soil, or toxic materials.

In lieu of decomposed wood derivatives, mix partially decomposed wood derivatives with ammonium nitrate at a minimum rate of 0.15 lb/cu. ft. (2.4 kg/cu. m) of loose sawdust or ground bark, or with ammonium sulfate at a minimum rate of 0.25 lb/cu. ft. (4 kg/cu. m) of loose sawdust or ground bark.

5. FERTILIZER

Fertilizers should only be used if the specific plant species requires it. Prior to amending the soil, Contractor shall test for deficiencies.

- a. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 10 percent phosphoric acid.
- b. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- c. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

Composition: 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.

Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

- d. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

- e. Planting Tablets: Tightly compressed chip type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.

Size: 5-gram tablets.

Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

- f. Chelated Iron: Commercial-grade FeEDDHA for dicots and woody plants, and commercial-grade FeDTPA for ornamental grasses and monocots.

6. MULCHES

- a. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of:

Type: Native Shredded hardwood mulch; and as follows:
From recycled fresh green tree and brush material.
Biological based mulch.

7. PLANTING SOILS

- a. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 6 percent organic material content. All topsoil, regardless of source, shall be fertile, friable, natural loam surface soil free of subsoil, clay lumps, brush, weeds, weed seed, litter, roots, stumps, stones larger than one (1) inch in any dimension and any other extraneous or toxic matter harmful to human, animal, or plant life. Contractor shall provide required sample and soil analysis to Landscape Architect prior to delivery of any soil materials to site.

Planting Soil: Existing, in-place surface soil. Verify suitability of existing surface soil to produce viable planting soil. Remove stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth. Mix surface soil with the following soil amendments and organic fertilizers- as applicable - in the following quantities to produce planting soil.

Ratio of Loose Compost to Surface Soil by Volume: 1:4

Ratio of Loose Wood Derivatives to Surface Soil by Volume: 1:4

Planting Soil: Imported topsoil or manufactured topsoil from off-site sources only after all existing soils for reuse has been consumed. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches (100 mm) deep and within 100 miles of the project site; soil characteristics need to match the project site; do not obtain from greenfields, agricultural land, bogs, or marshes.

Additional Properties of Imported Topsoil or Manufactured Topsoil: Screened and free of stones 1 inch (25 mm) or larger in any dimension; free of roots, plants, sod, clods, clay lumps, pockets of coarse sand, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials harmful to plant growth; free of obnoxious weeds and invasive plants including quackgrass, Johnsongrass, poison ivy, nut sedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and brome grass; not infested with nematodes; grubs; or other pests, pest eggs, or other undesirable organisms and disease-causing plant pathogens; friable and with sufficient structure to give good tilth and aeration. Continuous, air-filled pore space content on a volume/volume basis shall be at least 15 percent when moisture is present at field capacity. Soil shall have a field capacity of at least 15 percent on a dry weight basis.

Mix imported topsoil or manufactured topsoil with the following soil amendments and organic fertilizers in the following quantities to produce planting soil:

Ratio of Loose Compost to Topsoil by Volume: 1:4 or until achieved desired results

Ratio of Loose Wood Derivatives to Topsoil by Volume: 1:4

8. TREE STABILIZATION MATERIALS

- a. Stakes and Guys:

Upright and Guy Stakes: Rough-sawn, sound, new metal "T-post" stakes, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal (38-by-38-mm actual) by length indicated, pointed at one end.

Wood Deadmen: Timbers measuring 8 inches (200 mm) in diameter and 48 inches (1200 mm) long, treated with specified wood pressure-preservative treatment.

Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes or turnbuckles.

Guys and Tie Wires: ASTM A 641/A 641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch (2.7 mm) in diameter.

Tree-Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.

Guy Cables: Five-strand, 3/16-inch- (4.8-mm-) diameter, galvanized-steel cable, with zinc-coated turnbuckles, a minimum of 3 inches (75 mm) long, with two 3/8-inch (10-mm) galvanized eyebolts.

Flags: Standard surveyor's plastic flagging tape, white, 6 inches (150 mm) long.

Proprietary Staking-and-Guying Devices: Proprietary stake and adjustable tie systems to secure each new planting by plant stem; sized as indicated and per manufacturer's written recommendations.

Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

Arborbrace; ArborBrace Tree Guying System.
Or approved equal

b. Root-Ball Stabilization Materials:

Upright Stakes and Horizontal Hold-Down: Rough-sawn, sound, new hardwood or softwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal (38- by-38-mm actual) by length indicated; stakes pointed at one end.

Wood Screws: ASME B18.6.1.

Proprietary Root-Ball Stabilization Devices: Proprietary at-or below-grade stabilization systems to secure each new planting by rootball; sized per manufacturer's written recommendations unless otherwise indicated.

Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

Border Concepts, Inc.; Tomahawk Tree Stabilizers.
Foresight Products, LLC; Duckbill Rootball Fixing System.
Tree Staple, Inc.; Tree Staples.
Tree Stake Solutions, Root Anchor.
Approved equal.

9. MISCELLANEOUS PRODUCTS

a. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.

b. Burlap: Non-synthetic, biodegradable.

c. Planter Drainage Gravel: Washed, sound crushed stone or gravel complying with ASTM D 448 for Size No. 8.

- d. Planter Filter Fabric: Woven geotextile manufactured for separation applications and made of polypropylene, polyolefin, or polyester fibers or combination of them.
- e. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb (0.45 kg) of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb (0.45 kg) of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material.

10. WATERING BAGS

- a. Plastic tree watering bags holding a minimum of 15 gallons of water and with a slow drip hole(s) water release system, specifically designed to water establishing trees. Water should release over a several day period, not within a few hours
- b. Watering bags shall be:
Tregator Irrigation Bags sized to the appropriate model for the requirements of the plant, manufactured by Spectrum Products, Inc., Youngsville, NC 27596.
Or approved equal.
- c. Submit manufacturer's product data for approval.

PART 3 – EXECUTION

1. SITE EXAMINATION

- a. Examine the surface grades and soil conditions to confirm that the requirements of the Specification Section – Planting Soil - and the soil and drainage modifications indicated on the Planting Soil Plan and Details (if applicable) have been completed. Notify the Owner's Representative in writing of any unsatisfactory conditions.

2. DELIVERY, STORAGE AND HANDLING

- a. Protect materials from deterioration during delivery and storage. Adequately protect plants from drying out, exposure of roots to sun, wind or extremes of heat and cold temperatures. If planting is delayed more than 24 hours after delivery, set plants in a location protected from sun and wind. Provide adequate water to the root ball package during the shipping and storage period.

All plant materials must be available for observation prior to planting.

Using a soil moisture meter, periodically check the soil moisture in the root balls of all plants to assure that the plants are being adequately watered. Volumetric soil moisture shall be maintained above wilting point and below field capacity for the root ball substrate or soil.

- b. Do not deliver more plants to the site than there is space with adequate storage conditions. Provide a suitable remote staging area for plants and other supplies.

The Owner's Representative or Contractor shall approve the duration, method and location of storage of plants.

- c. Provide protective covering over all plants during transporting.

3. PLANTING SEASON

- a. Planting shall only be performed when weather and soil conditions are suitable for planting the materials specified in accordance with locally accepted practices.
- b. No planting shall take place during extremely hot, dry, windy or freezing weather.

4. COORDINATION WITH PROJECT WORK

- a. The Contractor shall coordinate with all other work that may impact the completion of the work.
- b. Prior to the start of work, prepare a detailed schedule of the work for coordination with other trades.
- c. Coordinate the relocation of any irrigation lines, heads or the conduits of other utility lines that are in conflict with tree locations. Root balls shall not be altered to fit around lines. Notify the Owner's Representative of any conflicts encountered.

5. LAYOUT AND PLANTING SEQUENCE

- a. Relative positions of all plants and trees are subject to approval of the Owner's Representative.
- b. Notify the Owner's Representative, one (1) week prior to layout. Layout all individual tree and shrub locations. Place plants above surface at planting location or place a labeled stake at planting location. Layout bed lines with paint for the Owner's Representative's approval. Secure the Owner's Representative's acceptance before digging and start of planting work.
- c. When applicable, plant trees before other plants are installed.
- d. It is understood that plants are not precise objects and that minor adjustments in the layout will be required as the planting plan is constructed. These adjustments may not be apparent until some or all of the plants are installed. Make adjustments as required by the Owner's Representative including relocating previously installed plants.

6. SOIL PROTECTION DURING PLANT DELIVERY AND INSTALLATION

- a. Protect soil from compaction during the delivery of plants to the planting locations, digging of planting holes and installing plants.

Where possible deliver and plant trees that require the use of heavy mechanized equipment prior to final soil preparation and tilling. Where possible, restrict the driving lanes to one area instead of driving over and compacting a large area of soil.

7. SOIL MOISTURE

- a. Volumetric soil moisture level, in both the planting soil and the root balls of all plants, prior to, during and after planting shall be above permanent wilting point and below field capacity for each type of soil texture within the following ranges.

b.

Soil type	Permanent wilting point	Field capacity
Sand, Loamy sand, Sandy loam	5-8%	12-18%
Loam, Sandy clay, Sandy clay loam	14-25%	27-36%
Clay loam, Silt loam	11-22%	31-36%
Silty clay, Silty clay loam	22-27%	38-41%

- 1.) Volumetric soil moisture shall be measured with a digital moisture meter. The meter shall be the Digital Soil Moisture Meter, DSMM500 by General Specialty Tools and Instruments, or approved equivalent.

- c. The Contractor shall confirm the soil moisture levels with a moisture meter. If the moisture is too high, suspend planting operations until the soil moisture drains to below field capacity.

8. INSTALLATION OF PLANTS: GENERAL

- a. Observe each plant after delivery and prior to installation for damage of other characteristics that may cause rejection of the plant. Notify the Owner's Representative of any condition observed.
- b. No more plants shall be distributed about the planting bed area than can be planted and watered on the same day.
- c. The root system of each plant, regardless of root ball package type, shall be observed by the Contractor, at the time of planting to confirm that the roots meet the requirements for plant root quality in Part 2 Products: Plants General: Plant Quality. The Contractor shall undertake at the time of planting, all modifications to the root system required by the Owner's Representative to meet these quality standards.

Modifications, at the time of planting, to meet the specifications for the depth of the root collar and removal of stem girdling roots and circling roots may make the plant unstable or stress the plant to the point that the Owner's Representative may choose to reject the plant rather than permitting the modification.

Any modifications required by the Owner's Representative to make the root system conform to the plant quality standards outlined in Part 2 Products: Plants General: Quality, or other requirements related to the permitted root ball package, shall not be considered as grounds to modify or void the plant warranty.

The resulting root ball may need additional staking and water after planting. The Owner's Representative may reject the plant if the root modification process makes the tree unstable or if the tree is not healthy at the end of the warranty period. Such plants shall still be covered under the warranty

The Contractor remains responsible to confirm that the grower has made all required root modifications noted during any nursery observations.

- d. Container and Boxed Root Ball Shaving: The outer surfaces of ALL plants in containers and boxes, including the top, sides and bottom of the root ball shall be shaved to remove all circling, descending, and matted roots. Shaving shall be performed using saws, knives, sharp shovels or other suitable equipment that is capable of making clean cuts on the roots. Shaving shall remove a minimum of one inch of root mat or up to 2 inches as required to remove all root segments that are not growing reasonably radial to the trunk.

- e. Exposed Stem Tissue after Modification: The required root ball modifications may result in stem tissue that has not formed trunk bark being exposed above the soil line. If such condition occurs, wrap the exposed portion of the stem in a protective wrapping with a white filter fabric. Secure the fabric with biodegradable masking tape. DO NOT USE string, twine, green nursery ties or any other material that may girdle the trunk if not removed.
- f. Excavation of the Planting Space: Using hand tools or tracked mini-excavator, excavate the planting hole into the Planting Soil to the depth of the root ball measured after any root ball modification to correct root problems, and wide enough for working room around the root ball or to the size indicated on the drawing or as noted below.

For trees and shrubs planted in soil areas that are NOT tilled or otherwise modified to a depth of at least 12 inches over a distance of more than 10 feet radius from each tree, or 5 feet radius from each shrub, the soil around the root ball shall be loosened as defined below or as indicated on the drawings.

The area of loosening shall be a minimum of 3 times the diameter of the root ball at the surface sloping to 2 times the diameter of the root ball at the depth of the root ball.

Loosening is defined as digging into the soil and turning the soil to reduce the compaction. The soil does not have to be removed from the hole, just dug, lifted and turned. Lifting and turning may be accomplished with a tracked mini excavator, or hand shovels.

The measuring point for root ball depth shall be the average height of the outer edge of the root ball after any required root ball modification.

If motorized equipment is used to deliver plants to the planting area over exposed planting beds, or used to loosen the soil or dig the planting holes, all soil that has been driven over shall be tilled to a depth of 6 inches.

- g. For trees to be planted in prepared Planting Soil that is deeper than the root ball depth, compact the soil under the root ball using a mechanical tamper to assure a firm bedding for the root ball. If there is more than 12 inches of planting soil under the root ball excavate and tamp the planting soil in lifts not to exceed 12 inches.
- h. Set top outer edge of the root ball at the average elevation of the proposed finish. Set the plant plumb and upright in the center of the planting hole. The tree graft, if applicable, shall be visible above the grade. Do not place soil on top of the root ball.
- i. The Owner's Representative may request that plants orientation be rotated when planted based on the form of the plant.
- j. Backfill the space around the root ball with the same planting soil or existing soil that was excavated for the planting space. See Specification Section Planting Soil, for requirements to modify the soil within the planting bed.
- k. Brace root ball by tamping Planting Soil around the lower portion of the root ball. Place additional Planting Soil around base and sides of ball in six-inch (6") lifts. Lightly tamp each lift using foot pressure or hand tools to settle backfill, support the tree and eliminate voids. DO NOT over compact the backfill or use mechanical or pneumatic tamping equipment. Over compaction shall be defined as greater than 85% of maximum dry density, standard proctor or greater than 250 psi as measured by a

cone penetrometer when the volumetric soil moisture is lower than field capacity.

When the planting hole has been backfilled to three quarters of its depth, water shall be poured around the root ball and allowed to soak into the soil to settle the soil. Do not flood the planting space. If the soil is above field capacity, allow the soil to drain to below field capacity before finishing the planting. Air pockets shall be eliminated and backfill continued until the planting soil is brought to grade level.

- l. Where indicated on the drawings, build a 2 inch high, level berm of Planting Soil around the outside of the root ball to retain water. Tamp the berm to reduce leaking and erosion of the saucer.
- m. Thoroughly water the Planting Soil and root ball immediately after planting.
- n. Remove all nursery plant identification tags and ribbons as per Owner's Representative instructions. The Owner's Representative's seals are to remain on plants until the end of the warranty period.
- o. Remove corrugated cardboard trunk protection after planting.
- p. Follow additional requirements for the permitted root ball packages.

9. PERMITTED ROOT BALL PACKAGES AND SPECIAL PLANTING REQUIREMENTS

- a. The following are permitted root ball packages and special planting requirements that shall be followed during the planting process in addition to the above General planting requirements.
- b. **BALLED AND BURLAPPED PLANTS**
After the root ball has been backfilled, remove all twine and burlap from the top of the root ball. Cut the burlap away and remove; do not fold down onto the Planting Soil.
Earth root balls shall be kept intact except for any modifications required by the Owner's Representative to make root package comply with the requirement in Part 2 Products.
- c. **SPADE HARVESTED AND TRANSPLANTED PLANTS**
After installing the tree, loosen the soil along the seam between the root ball and the surrounding soil out to a radius from the root ball edge equal to the diameter of the root ball to a depth of 8 - 10 inches by hand digging to disturb the soil interface.
Fill any gaps below this level with loose soil.
- d. **CONTAINER (INCLUDES BOXED AND ABOVE-GROUND FABRIC CONTAINERS) PLANTS**
This specification assumes that most container plants have significant stem girdling and circling roots, and that the root collar is too low in the root ball.
Remove the container.
Perform root ball shaving as defined in Installation of Plants: General above.
Remove all roots and substrate above the root collar and the main structural roots according to root correction details so root system conforms to root observations detail.
Remove all substrate at the bottom of the root ball that does not contain roots.
Using a hose, power washer or air excavation device, wash out the substrate from around the trunk and top of the remaining root ball and find and remove all stem girdling roots within the root ball above the top of the structural roots.

10. GROUND COVER, PERENNIAL AND ANNUAL PLANTS

- a. Assure that soil moisture is within the required levels prior to planting. Irrigation, if required, shall be applied at least 12 hours prior to planting to avoid planting in muddy soils.
- b. Assure that soil grades in the beds are smooth and as shown on the plans.
- c. Plants shall be planted in even, triangularly spaced rows, at the intervals called out for on the drawings, unless otherwise noted. The first row of Annual flower plants shall be 6 inches from the bed edge unless otherwise directed.
- d. Dig planting holes sufficiently large enough to insert the root system without deforming the roots. Set the top of the root system at the grade of the soil.
- e. Schedule the planting to occur prior to application of the mulch. If the bed is already mulched, pull the mulch from around the hole and plant into the soil. Do not plant the root system in the mulch. Pull mulch back so it is not on the root ball surface.
- f. Press soil to bring the root system in contact with the soil.
- g. Spread any excess soil around in the spaces between plants.
- h. Apply mulch to the bed being sure not to cover the tops of the plants with or the tops of the root ball with mulch.
- i. Water each planting area as soon as the planting is completed. Apply additional water to keep the soil moisture at the required levels. Do not over water.

11. STAKING AND GUYING

- a. Trees that are guyed shall have their guys and stakes removed after one full growing season or at other times as required by the Owner's Representative.
- b. Tree guying shall utilize the tree staking and guying materials specified. Guying to be tied in such a manner as to create a minimum 12-inch loop to prevent girdling. Refer to manufacturer's recommendations and the planting detail for installation. Plants shall stand plumb after staking or guying. Stakes shall be driven to sufficient depth to hold the tree rigid.
- c. For trees planted in planting mix over waterproofed membrane, use dead men buried 24 inches to the top of the dead man, in the soil. Tie the guy to the dead man with a double wrap of line around the dead man followed by a double half hitch. When guys are removed, leave the dead men in place and cut the guy tape 12 inches above the ground, leaving the tape end covered in mulch.

12. STRAIGHTENING PLANTS

- a. Maintain all plants in a plumb position throughout the warranty period. Straighten all trees that move out of plumb including those not staked. Plants to be straightened shall be excavated and the root ball moved to a plumb position, and then re-backfilled.
- b. Do not straighten plants by pulling the trunk with guys.

13. INSTALLATION OF FERTILIZER AND OTHER CHEMICAL ADDITIVES

- a. Do not apply any soluble fertilizer to plantings during the first year after transplanting unless soil test determines that fertilizer or other chemical additives is required. Apply chemical additives only upon the approval of the Owner's Representative.
- b. Controlled release fertilizers shall be applied according to the manufacturer's instructions and standard horticultural practices.

14. PRUNING OF TREES AND SHRUBS

- a. Prune plants as directed by the Owner's Representative. Pruning trees shall be limited to addressing structural defects as shown in details; follow recommendations in "Structural Pruning: A Guide For The Green Industry" published by Urban Tree Foundation, Visalia CA.
- b. All pruning shall be performed by a person experienced in structural tree pruning.
- c. Except for plants specified as multi-stemmed or as otherwise instructed by the Owner's Representative, preserve or create a central leader.
- d. Pruning of large trees shall be done using pole pruners or if needed, from a ladder or hydraulic lift to gain access to the top of the tree. Do not climb in newly planted trees. Small trees can be structurally pruned by laying them over before planting. Pruning may also be performed at the nursery prior to shipping.
- e. Remove and replace excessively pruned or malformed stock resulting from improper pruning that occurred in the nursery or after.
- f. Pruning shall be done with clean, sharp tools.
- g. No tree paint or sealants shall be used.

15. MULCHING OF PLANTS

- a. Apply 2 inches of mulch before settlement, covering the entire planting bed area. Install no more than 1 inch of mulch over the top of the root balls of all plants. Taper to 2 inches when abutting pavement.
- b. For trees planted in lawn areas the mulch shall extend to a 5 foot radius around the tree or to the extent indicated on the plans.
- c. Lift all leaves, low hanging stems and other green portions of small plants out of the mulch if covered.

16. PLANTING BED FINISHING

- a. After planting, smooth out all grades between plants before mulching.
- b. Separate the edges of planting beds and lawn areas with a smooth, formed edge cut into the turf with the bed mulch level slightly lower, 1 and 2 inches, than the adjacent turf sod or as directed by the Owner's Representative. Bed edge lines shall be depicted on the drawings.

17. WATERING

- a. The Contractor shall be fully responsible to ensure that adequate water is provided to all plants from the point of installation until the date of Substantial Completion Acceptance. The Contractor shall adjust the automatic irrigation system, if available, and apply additional or adjust for less water using hoses as required.
- b. Hand water root balls of all plants to assure that the root balls have moisture above wilt point and below field capacity. Test the moisture content in each root ball and the soil outside the root ball to determine the water content.
- c. The Contractor shall install 25 gallon watering bag for each tree to be maintained and used for tree watering during the warranty period.

The watering bags shall remain the property of the Owner at the completion of the work.
Contractor shall be responsible for re-filling watering bags during construction and maintenance period.

18. CLEAN-UP

- a. During installation, keep the site free of trash, pavements reasonably clean and work area in an orderly condition at the end of each day. Remove trash and debris in containers from the site no less than once a week.

Immediately clean up any spilled or tracked soil, fuel, oil, trash or debris deposited by the Contractor from all surfaces within the project or on public right of ways and neighboring property.

- b. Once installation is complete, wash all soil from pavements and other structures. Ensure that mulch is confined to planting beds and that all tags and flagging tape are removed from the site. The Owner's Representative's seals are to remain on the trees and removed at the end of the warranty period.
- c. Make all repairs to grades, ruts, and damage by the plant installer to the work or other work at the site.
- d. Remove and dispose of all excess planting soil, subsoil, mulch, plants, packaging, and other material brought to the site by the Contractor.

19. PROTECTION DURING CONSTRUCTION

- a. The Contractor shall protect planting and related work and other site work from damage due to planting operations, operations by other Contractors or trespassers. Maintain protection during installation until Substantial Completion Acceptance. Treat, repair or replace damaged work immediately.
- b. Damage done by the Contractor, or any of their sub-contractors to existing or installed plants, or any other parts of the work or existing features to remain, including roots, trunk or branches of large existing trees, soil, paving, utilities, lighting, irrigation, other finished work and surfaces including those on adjacent property, shall be cleaned, repaired or replaced by the Contractor at no expense to the Owner. The Owner's Representative shall determine when such cleaning, replacement or repair is satisfactory.

20. PLANT MAINTENANCE PRIOR TO SUBSTANTIAL COMPLETION ACCEPTANCE

- a. During the project work period and prior to Substantial Completion Acceptance, the Contractor shall maintain all plants.
- b. Maintenance during the period prior to Substantial Completion Acceptance shall consist of pruning, watering, cultivating, weeding, mulching, removal of dead material, repairing and replacing of tree stakes, tightening and repairing of guys, repairing and replacing of damaged tree wrap material, resetting plants to proper grades and upright position, and furnishing and applying such sprays as are necessary to keep plantings reasonably free of damaging insects and disease, and in healthy condition. The threshold for applying insecticides and herbicide shall follow established Integrated Pest Management (IPM) procedures. Mulch areas shall be kept reasonably free of weeds, grass.

21. SUBSTANTIAL COMPLETION ACCEPTANCE

- a. Upon written notice from the Contractor, the Owners Representative shall review the work and make a determination if the work is substantially complete.

Notification shall be at least 7 days prior to the date the contractor is requesting the review.
- b. The date of substantial completion of the planting shall be the date when the Owner's Representative accepts that all work in Planting, Planting Soil, and Irrigation installation sections is complete.
- c. The Plant Warranty period begins at date of written notification of substantial completion from the Owner's Representative. The date of substantial completion may be different than the date of substantial completion for the other sections of the project.

22. CLEANUP AND PROTECTION

- a. During planting operations, keep adjacent pavings and construction clean and work area in an orderly condition on a daily basis. Thoroughly clean any surface marred or stained by installation activities. Protect plants from damage due to landscape operations. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged planting. Remove excess materials, debris, and equipment from site.

23. DISPOSAL

- a. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

24. MAINTENANCE DURING THE WARRANTY PERIOD

- a. During the warranty period, provide all maintenance for all plantings to keep the plants in a healthy state and the planting areas clean and neat.
- b. General requirements:
All work shall be undertaken by trained , uniformed landscape maintenance crews under the supervision of a foreman with a minimum of 5 years experience supervising commercial plant maintenance

crews.

All chemical and fertilizer applications shall be made by licensed applicators for the type of chemicals to be used. All work and chemical use shall comply with all applicable local, provincial and federal requirements.

Assure that hoses and watering equipment and other maintenance equipment does not block paths or be placed in a manner that may create tripping hazards. Use standard safety warning barriers and other procedures to maintain the site in a safe manner for visitors at all times.

All workers shall wear required safety equipment and apparel appropriate for the tasks being undertaken.

The Contractor shall not store maintenance equipment at the site at times when they are not in use unless authorized in writing by the Owner's Representative.

Maintenance vehicles shall not park on the site including walks and lawn areas at any time without the Owner's Representative's written permission.

Maintain a detailed log of all maintenance activities including types of tasks, date of task, types and quantities of materials and products used, watering times and amounts, and number of each crew. Periodically review the logs with the Owner's Representative, and submit a copy of the logs at the end of each year of the maintenance agreement.

Meet with the Owner's Representative a minimum of three times a year to review the progress and discuss any changes that are needed in the maintenance program. At the end of the warranty period attend a hand over meeting to formally transfer the responsibilities of maintenance to the Owner's Representative. Provide all information on past maintenance activities and provide a list of critical tasks that will be needed over the next 12 months. Provide all maintenance logs and soil test data. Make the Contractor's supervisor available for a minimum of one year after the end of the warranty period to answer questions about past maintenance.

c. Provide the following maintenance tasks:

Watering; Owner will provide all water required. Contractor is to manage the distribution of water to keep soil within and around the root balls at optimum moisture content for plant growth.

Maintain all watering systems and equipment and keep them operational.

Monitor soil moisture to provide sufficient water. Check soil moisture and root ball moisture with a soil moisture meter on a regular basis and record moisture readings. Do not over water. Make seasonal adjustments to irrigation program as necessary to maintain healthy plants.

Soil nutrient levels: Take a minimum of 4 soil samples from around the site in the spring and fall and have them tested by an accredited agricultural soil testing lab for chemical composition of plant required nutrients, pH, salt and % organic matter. Test results shall include laboratory recommendations for nutrient applications. Apply fertilizers at rates recommended by the soil test.

Make any other soil test and/or plant tissue test that may be indicated by plant conditions that may not be related to soil nutrient levels such as soil contaminated by other chemicals or lack of chemical uptake by the plant.

Plant pruning: Remove cross over branching, shorten or remove developing co dominant leaders, dead wood and winter-damaged branches. Unless directed by the Owner's Representative, do not shear plants or make heading cuts.

Restore plants: Reset any plants that have settled or are leaning as soon as the condition is noticed.

Guying and staking: Maintain plant guys in a taught position. Remove tree guys and staking after the first full growing season unless directed by Owner's Representative.

Weed control: Keep all beds free of weeds. Hand-remove all weeds and any plants that do not appear on the planting plan. Chemical weed control is permitted only with the approval of the Owner's Representative. Schedule weeding as needed but not less 12 times per year.

Trash removal: Remove all trash and debris from all planting beds and maintain the beds in a neat and tidy appearance. The number of trash and debris removal visits shall be no less than 12 times per year and may coincide with other maintenance visits.

Plant pest control: Maintain disease, insects and other pests at manageable levels. Manageable levels shall be defined as damage to plants that may be noticeable to a professional but not to the average person. Use least invasive methods to control plant disease and insect outbreaks. Submit product information and recommendations to Owners Representative for approval at least 48 hours in advance.
Contractor to use a licensed chemical applicator.

Plant replacement: Replace all plants that are defective as defined in the warranty provisions, as soon as the plant decline is obvious and in suitable weather and season for planting as outlined in above sections. Plants that become defective during the maintenance period shall be covered and replaced under the warranty provisions.

Mulch: Refresh mulch once a year to maintain complete coverage but do not over mulch. At no time shall the overall mulch thickness be greater than 2 inches. Do not apply mulch within 6 inches of the trunks or stems of any plants. Replacement mulch shall meet the requirements of the original approved material. Mulch shall be no more than one inch on top of the root ball surface.

Leaf, fruit and other plant debris removal: Remove fall leaf, spent flowers, fruit and plant part accumulations from beds and paved surfaces. Maintain all surface water drains free of debris. Debris removal shall be undertaken at each visit to weed or pick up trash in beds.

Damage from site use: Repair of damage by site visitors and events, beyond normal wear, are not part of this maintenance. The Owner's Representative may request that the Contractor repair damage beds or plantings for an additional cost. All additional work shall be approved in advance by the Owner's Representative.

25. END OF WARRANTY FINAL ACCEPTANCE / MAINTENANCE OBSERVATION

- a. At the end of the Warranty and Maintenance period the Owner's Representative shall observe the work and establish that all provisions of the contract are complete and the work is satisfactory.

If the work is satisfactory, the maintenance period will end on the date of the final observation.

If the work is deemed unsatisfactory, the maintenance period will continue at no additional expense to the Owner until the work has been completed, observed, and approved by the Owner's Representative.

- b. **FAILURE TO PASS OBSERVATION:** If the work fails to pass final observation, any subsequent observations must be rescheduled as per above. The cost to the Owner for additional observations will be charged to the Contractor at the prevailing hourly rate of the Owners Representative.

END OF SECTION 329300

SECTION 334000

STORM SEWAGE

PART 1 - GENERAL

1.1 SECTION INCLUDES:

- A. Material and installation of storm sewer culverts and appurtenances, including headwalls.

1.2 RELATED SECTIONS:

- A. Trenching, Excavation, Backfill, and Compaction Section 312200.
- B. Cast-in-place concrete - Section 323000.

1.3 REFERENCES:

- A. ASTM C76 - Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
- B. ASTM D1784 - Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
- C. ASTM A377- Ductile Iron Pipe
- D. Texas Department of Transportation (TxDOT) Most Recent Edition Standard Specifications for Construction of Highways, Streets and Bridges.

1.4 SUBMITTALS:

- A. Procedures for Submittals: Section 01 33 00.
- B. Pipe Certification: Manufacturer's certification that pipe meets the requirements of these specifications.

PART 2 - PRODUCTS

2.1 STORM SEWER PIPE:

- A. Reinforced Concrete Pipe: Provide reinforced concrete pipe which conforms with ASTM C76, class as shown on the Drawings.
- B. Schedule 40 PVC and Schedule 80 PVC Pipe Culverts: Provide Schedule 40 PVC or Schedule 80 PVC pipe fabricated in conformance with ASTM D1784.
- C. Class 52 Ductile Iron Pipe for storm sewerage. (See section 02665 Water Systems)

2.2 CONCRETE PIPE JOINT MATERIAL:

- A. Cold Compound Joints: For concrete pipe sections carrying rainfall runoff, furnish pipe joint material (Talcote No. 0.52, Gulf States No. GS 702, or Ram-Nek flexible plastic gasket manufactured by the K. T. Snyder Company, Inc.) meeting the requirements of the SDHPT Standard Specification for Construction of Highways, Streets and Bridges, Item 464.2 paragraph 13b and 13d. Apply a primer of the type recommended by the manufacturer of the compound used.

PART 3 - EXECUTION

3.1 EXCAVATION, BACKFILLING AND COMPACTION:

- A. Excavation, backfill, and compaction of the trench shall be in accordance with Section 31 21 00.

3.2 PIPE INSTALLATION:

- A. Pipe Sewers and Culverts: Do not place pipe until the excavation has been completed, the bottom of the trench shaped, proper bedding material placed, and the line and grade have been obtained. Lay pipe accurately to line and grade in a straight line with spigot or tongue end of the pipe pointing in the direction of flow. Fit pipes together and match them so that when laid, the pipe will form a sewer or culvert with a smooth and uniform invert except where there is a pipe size change, in which case, the crowns of the larger and smaller pipes shall be at the same elevation and a concrete collar used to make the connection, unless otherwise shown.
- B. PVC culvert pipe joints shall be solvent welded with appropriate solvent weld compound as recommended by the PVC pipe manufacturer.

3.3 CONCRETE PIPE CULVERT JOINT INSTALLATION:

- A. Cold Compound Joints:
 - 1. Tongue and Groove Pipe. Completely coat both ends of the pipe with primer on all surfaces that will be in contact. Coat pipe only when the pipe is clean and dry. Allow the primer to dry before the pipe is laid. Pipe 24 inches and larger must be primed at the factory. After pipe has been set to proper line and grade in the trench, trowel or otherwise apply to the groove end of the pipe a 1/2-inch-thick layer of compound. Cover two-thirds of the joint face around the entire circumference. Next, shove home the tongue end of the next pipe with sufficient pressure to make a tight joint. Take care to avoid leaving ridges of compound projecting into the pipe. Make necessary adjustments in the quality and consistency of the compound, as directed by the Owner.
 - 2. Positioning. Joints made with cold compound may be pulled home by means of a suitable winch or other suitable power equipment or a come-along. Do not use a bar stuck into the ground for positioning joints on pipe larger than 10 inches. A bar may be used to push home the joints in pipe 10 inches and smaller, provided the joints are pushed all the way home. Positioning joints multiplied by the laying length per joint must equal the actual length of sewer in any given section. Pull pipe home in a straight

line with all parts of the pipe on line and grade. Do not permit horizontal or vertical movement of the pipe during or after the pulling operation. Pull or push home rubber gasket joints by any suitable means that will provide adequate pressure to ensure proper assembly of the joint. Use special care to ensure that the joints are positioned in accordance with the published instructions of the manufacturer. Do not mortar the outside of joints. Do not use backhoe to drive pipe to make-up pipe joints.

3.4 HEADWALL, MANHOLE AND INLET INSTALLATION:

- A. Construct all headwalls to line and grade and at locations shown. Construct in accordance with Section 32 30 00, Cast-in-Place Concrete, and as required in TxDOT Most Recent Edition Standard Specifications for Construction of Highways, Streets, and Bridges. Neatly cut off all pipe leads at the appropriate face of the headwall, manhole or inlet wall and finish with mortar.

END OF SECTION 334000

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**Certification
Regarding Debarment, Suspension and Ineligibility**

As is required by the Federal Regulations Implementing Executive Order 12549, Debarment and Suspension, 45 CFR Part 76, Government-wide Debarment and Suspension, the applicant certifies, to the best of his or her knowledge and belief, that both it and its principals:

- a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any federal department or agency;
- b. Have not within a three-year period preceding this bid proposal and/or application been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (federal, state, or local) transaction or contract under a public 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;
- c. Are not presently indicted for or otherwise criminally or civilly charged by a government entity with commission of any of the offenses enumerated herein; and
- d. Have not within a three-year period preceding this bid proposal and/or application had one or more public transactions terminated for cause or default.

Signature: _____
Print Name: _____
Title: _____
Telephone Number: _____
Date: _____

If the bidder is unable to certify to all of the statements in this Certification, such bidder should attach an explanation to this proposal.

Request for Taxpayer Identification Number and Certification

Give Form to the
requester. Do not
send to the IRS.

Print or type See Specific Instructions on page 2.	Name (as shown on your income tax return)	
	Business name/disregarded entity name, if different from above	
	Check appropriate box for federal tax classification (required): ☐ Individual/sole proprietor ☐ C Corporation ☐ S Corporation ☐ Partnership ☐ Trust/estate ☐ Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=partnership) ▶ _____ ☐ Other (see instructions) ▶ _____	
	☐ Exempt payee	
	Address (number, street, and apt. or suite no.) City, state, and ZIP code List account number(s) here (optional)	
Requester's name and address (optional)		

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on the "Name" line to avoid backup withholding. For individuals, this is your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the Part I instructions on page 3. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN* on page 3.

Note. If the account is in more than one name, see the chart on page 4 for guidelines on whose number to enter.

Social security number									
				-			-		
Employer identification number									
				-					

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me), and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding, and
3. I am a U.S. citizen or other U.S. person (defined below).

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions on page 4.

Sign Here	Signature of U.S. person ▶	Date ▶

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Purpose of Form

A person who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) to report, for example, income paid to you, real estate transactions, mortgage interest you paid, acquisition or abandonment of secured property, cancellation of debt, or contributions you made to an IRA.

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN to the person requesting it (the requester) and, when applicable, to:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),
2. Certify that you are not subject to backup withholding, or
3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income.

Note. If a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

Definition of a U.S. person. For federal tax purposes, you are considered a U.S. person if you are:

- An individual who is a U.S. citizen or U.S. resident alien,
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States,
- An estate (other than a foreign estate), or
- A domestic trust (as defined in Regulations section 301.7701-7).

Special rules for partnerships. Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax on any foreign partners' share of income from such business. Further, in certain cases where a Form W-9 has not been received, a partnership is required to presume that a partner is a foreign person, and pay the withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid withholding on your share of partnership income.

The person who gives Form W-9 to the partnership for purposes of establishing its U.S. status and avoiding withholding on its allocable share of net income from the partnership conducting a trade or business in the United States is in the following cases:

- The U.S. owner of a disregarded entity and not the entity,
- The U.S. grantor or other owner of a grantor trust and not the trust, and
- The U.S. trust (other than a grantor trust) and not the beneficiaries of the trust.

Foreign person. If you are a foreign person, do not use Form W-9. Instead, use the appropriate Form W-8 (see Publication 515, *Withholding of Tax on Nonresident Aliens and Foreign Entities*).

Nonresident alien who becomes a resident alien. Generally, only a nonresident alien individual may use the terms of a tax treaty to reduce or eliminate U.S. tax on certain types of income. However, most tax treaties contain a provision known as a "saving clause." Exceptions specified in the saving clause may permit an exemption from tax to continue for certain types of income even after the payee has otherwise become a U.S. resident alien for tax purposes.

If you are a U.S. resident alien who is relying on an exception contained in the saving clause of a tax treaty to claim an exemption from U.S. tax on certain types of income, you must attach a statement to Form W-9 that specifies the following five items:

1. The treaty country. Generally, this must be the same treaty under which you claimed exemption from tax as a nonresident alien.
2. The treaty article addressing the income.
3. The article number (or location) in the tax treaty that contains the saving clause and its exceptions.
4. The type and amount of income that qualifies for the exemption from tax.
5. Sufficient facts to justify the exemption from tax under the terms of the treaty article.

Example. Article 20 of the U.S.-China income tax treaty allows an exemption from tax for scholarship income received by a Chinese student temporarily present in the United States. Under U.S. law, this student will become a resident alien for tax purposes if his or her stay in the United States exceeds 5 calendar years. However, paragraph 2 of the first Protocol to the U.S.-China treaty (dated April 30, 1984) allows the provisions of Article 20 to continue to apply even after the Chinese student becomes a resident alien of the United States. A Chinese student who qualifies for this exception (under paragraph 2 of the first protocol) and is relying on this exception to claim an exemption from tax on his or her scholarship or fellowship income would attach to Form W-9 a statement that includes the information described above to support that exemption.

If you are a nonresident alien or a foreign entity not subject to backup withholding, give the requester the appropriate completed Form W-8.

What is backup withholding? Persons making certain payments to you must under certain conditions withhold and pay to the IRS a percentage of such payments. This is called "backup withholding." Payments that may be subject to backup withholding include interest, tax-exempt interest, dividends, broker and barter exchange transactions, rents, royalties, nonemployee pay, and certain payments from fishing boat operators. Real estate transactions are not subject to backup withholding.

You will not be subject to backup withholding on payments you receive if you give the requester your correct TIN, make the proper certifications, and report all your taxable interest and dividends on your tax return.

Payments you receive will be subject to backup withholding if:

1. You do not furnish your TIN to the requester,
2. You do not certify your TIN when required (see the Part II instructions on page 3 for details),
3. The IRS tells the requester that you furnished an incorrect TIN,
4. The IRS tells you that you are subject to backup withholding because you did not report all your interest and dividends on your tax return (for reportable interest and dividends only), or
5. You do not certify to the requester that you are not subject to backup withholding under 4 above (for reportable interest and dividend accounts opened after 1983 only).

Certain payees and payments are exempt from backup withholding. See the instructions below and the separate instructions for the Requester of Form W-9.

Also see *Special rules for partnerships* on page 1.

Updating Your Information

You must provide updated information to any person to whom you claimed to be an exempt payee if you are no longer an exempt payee and anticipate receiving reportable payments in the future from this person. For example, you may need to provide updated information if you are a C corporation that elects to be an S corporation, or if you no longer are tax exempt. In addition, you must furnish a new Form W-9 if the name or TIN changes for the account, for example, if the grantor of a grantor trust dies.

Penalties

Failure to furnish TIN. If you fail to furnish your correct TIN to a requester, you are subject to a penalty of \$50 for each such failure unless your failure is due to reasonable cause and not to willful neglect.

Civil penalty for false information with respect to withholding. If you make a false statement with no reasonable basis that results in no backup withholding, you are subject to a \$500 penalty.

Criminal penalty for falsifying information. Willfully falsifying certifications or affirmations may subject you to criminal penalties including fines and/or imprisonment.

Misuse of TINs. If the requester discloses or uses TINs in violation of federal law, the requester may be subject to civil and criminal penalties.

Specific Instructions

Name

If you are an individual, you must generally enter the name shown on your income tax return. However, if you have changed your last name, for instance, due to marriage without informing the Social Security Administration of the name change, enter your first name, the last name shown on your social security card, and your new last name.

If the account is in joint names, list first, and then circle, the name of the person or entity whose number you entered in Part I of the form.

Sole proprietor. Enter your individual name as shown on your income tax return on the "Name" line. You may enter your business, trade, or "doing business as (DBA)" name on the "Business name/disregarded entity name" line.

Partnership, C Corporation, or S Corporation. Enter the entity's name on the "Name" line and any business, trade, or "doing business as (DBA) name" on the "Business name/disregarded entity name" line.

Disregarded entity. Enter the owner's name on the "Name" line. The name of the entity entered on the "Name" line should never be a disregarded entity. The name on the "Name" line must be the name shown on the income tax return on which the income will be reported. For example, if a foreign LLC that is treated as a disregarded entity for U.S. federal tax purposes has a domestic owner, the domestic owner's name is required to be provided on the "Name" line. If the direct owner of the entity is also a disregarded entity, enter the first owner that is not disregarded for federal tax purposes. Enter the disregarded entity's name on the "Business name/disregarded entity name" line. If the owner of the disregarded entity is a foreign person, you must complete an appropriate Form W-8.

Note. Check the appropriate box for the federal tax classification of the person whose name is entered on the "Name" line (Individual/sole proprietor, Partnership, C Corporation, S Corporation, Trust/estate).

Limited Liability Company (LLC). If the person identified on the "Name" line is an LLC, check the "Limited liability company" box only and enter the appropriate code for the tax classification in the space provided. If you are an LLC that is treated as a partnership for federal tax purposes, enter "P" for partnership. If you are an LLC that has filed a Form 8832 or a Form 2553 to be taxed as a corporation, enter "C" for C corporation or "S" for S corporation. If you are an LLC that is disregarded as an entity separate from its owner under Regulation section 301.7701-3 (except for employment and excise tax), do not check the LLC box unless the owner of the LLC (required to be identified on the "Name" line) is another LLC that is not disregarded for federal tax purposes. If the LLC is disregarded as an entity separate from its owner, enter the appropriate tax classification of the owner identified on the "Name" line.

Other entities. Enter your business name as shown on required federal tax documents on the "Name" line. This name should match the name shown on the charter or other legal document creating the entity. You may enter any business, trade, or DBA name on the "Business name/disregarded entity name" line.

Exempt Payee

If you are exempt from backup withholding, enter your name as described above and check the appropriate box for your status, then check the "Exempt payee" box in the line following the "Business name/disregarded entity name," sign and date the form.

Generally, individuals (including sole proprietors) are not exempt from backup withholding. Corporations are exempt from backup withholding for certain payments, such as interest and dividends.

Note. If you are exempt from backup withholding, you should still complete this form to avoid possible erroneous backup withholding.

The following payees are exempt from backup withholding:

1. An organization exempt from tax under section 501(a), any IRA, or a custodial account under section 403(b)(7) if the account satisfies the requirements of section 401(f)(2),
2. The United States or any of its agencies or instrumentalities,
3. A state, the District of Columbia, a possession of the United States, or any of their political subdivisions or instrumentalities,
4. A foreign government or any of its political subdivisions, agencies, or instrumentalities, or
5. An international organization or any of its agencies or instrumentalities.

Other payees that may be exempt from backup withholding include:

6. A corporation,
7. A foreign central bank of issue,
8. A dealer in securities or commodities required to register in the United States, the District of Columbia, or a possession of the United States,
9. A futures commission merchant registered with the Commodity Futures Trading Commission,
10. A real estate investment trust,
11. An entity registered at all times during the tax year under the Investment Company Act of 1940,
12. A common trust fund operated by a bank under section 584(a),
13. A financial institution,
14. A middleman known in the investment community as a nominee or custodian, or
15. A trust exempt from tax under section 664 or described in section 4947.

The following chart shows types of payments that may be exempt from backup withholding. The chart applies to the exempt payees listed above, 1 through 15.

IF the payment is for . . .	THEN the payment is exempt for . . .
Interest and dividend payments	All exempt payees except for 9
Broker transactions	Exempt payees 1 through 5 and 7 through 13. Also, C corporations.
Barter exchange transactions and patronage dividends	Exempt payees 1 through 5
Payments over \$600 required to be reported and direct sales over \$5,000 ¹	Generally, exempt payees 1 through 7 ²

¹ See Form 1099-MISC, Miscellaneous Income, and its instructions.

² However, the following payments made to a corporation and reportable on Form 1099-MISC are not exempt from backup withholding: medical and health care payments, attorneys' fees, gross proceeds paid to an attorney, and payments for services paid by a federal executive agency.

Part I. Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. If you are a resident alien and you do not have and are not eligible to get an SSN, your TIN is your IRS individual taxpayer identification number (ITIN). Enter it in the social security number box. If you do not have an ITIN, see *How to get a TIN* below.

If you are a sole proprietor and you have an EIN, you may enter either your SSN or EIN. However, the IRS prefers that you use your SSN.

If you are a single-member LLC that is disregarded as an entity separate from its owner (see *Limited Liability Company (LLC)* on page 2), enter the owner's SSN (or EIN, if the owner has one). Do not enter the disregarded entity's EIN. If the LLC is classified as a corporation or partnership, enter the entity's EIN.

Note. See the chart on page 4 for further clarification of name and TIN combinations.

How to get a TIN. If you do not have a TIN, apply for one immediately. To apply for an SSN, get Form SS-5, Application for a Social Security Card, from your local Social Security Administration office or get this form online at www.ssa.gov. You may also get this form by calling 1-800-772-1213. Use Form W-7, Application for IRS Individual Taxpayer Identification Number, to apply for an ITIN, or Form SS-4, Application for Employer Identification Number, to apply for an EIN. You can apply for an EIN online by accessing the IRS website at www.irs.gov/businesses and clicking on Employer Identification Number (EIN) under Starting a Business. You can get Forms W-7 and SS-4 from the IRS by visiting IRS.gov or by calling 1-800-TAX-FORM (1-800-829-3676).

If you are asked to complete Form W-9 but do not have a TIN, write "Applied For" in the space for the TIN, sign and date the form, and give it to the requester. For interest and dividend payments, and certain payments made with respect to readily tradable instruments, generally you will have 60 days to get a TIN and give it to the requester before you are subject to backup withholding on payments. The 60-day rule does not apply to other types of payments. You will be subject to backup withholding on all such payments until you provide your TIN to the requester.

Note. Entering "Applied For" means that you have already applied for a TIN or that you intend to apply for one soon.

Caution: A disregarded domestic entity that has a foreign owner must use the appropriate Form W-8.

Part II. Certification

To establish to the withholding agent that you are a U.S. person, or resident alien, sign Form W-9. You may be requested to sign by the withholding agent even if item 1, below, and items 4 and 5 on page 4 indicate otherwise.

For a joint account, only the person whose TIN is shown in Part I should sign (when required). In the case of a disregarded entity, the person identified on the "Name" line must sign. Exempt payees, see *Exempt Payee* on page 3.

Signature requirements. Complete the certification as indicated in items 1 through 3, below, and items 4 and 5 on page 4.

1. Interest, dividend, and barter exchange accounts opened before 1984 and broker accounts considered active during 1983. You must give your correct TIN, but you do not have to sign the certification.

2. Interest, dividend, broker, and barter exchange accounts opened after 1983 and broker accounts considered inactive during 1983. You must sign the certification or backup withholding will apply. If you are subject to backup withholding and you are merely providing your correct TIN to the requester, you must cross out item 2 in the certification before signing the form.

3. Real estate transactions. You must sign the certification. You may cross out item 2 of the certification.

4. Other payments. You must give your correct TIN, but you do not have to sign the certification unless you have been notified that you have previously given an incorrect TIN. "Other payments" include payments made in the course of the requester's trade or business for rents, royalties, goods (other than bills for merchandise), medical and health care services (including payments to corporations), payments to a nonemployee for services, payments to certain fishing boat crew members and fishermen, and gross proceeds paid to attorneys (including payments to corporations).

5. Mortgage interest paid by you, acquisition or abandonment of secured property, cancellation of debt, qualified tuition program payments (under section 529), IRA, Coverdell ESA, Archer MSA or HSA contributions or distributions, and pension distributions. You must give your correct TIN, but you do not have to sign the certification.

What Name and Number To Give the Requester

For this type of account:	Give name and SSN of:
1. Individual	The individual
2. Two or more individuals (joint account)	The actual owner of the account or, if combined funds, the first individual on the account ¹
3. Custodian account of a minor (Uniform Gift to Minors Act)	The minor ²
4. a. The usual revocable savings trust (grantor is also trustee)	The grantor-trustee ³
b. So-called trust account that is not a legal or valid trust under state law	The actual owner ⁴
5. Sole proprietorship or disregarded entity owned by an individual	The owner ³
6. Grantor trust filing under Optional Form 1099 Filing Method 1 (see Regulation section 1.671-4(b)(2)(i)(A))	The grantor*
For this type of account:	Give name and EIN of:
7. Disregarded entity not owned by an individual	The owner
8. A valid trust, estate, or pension trust	Legal entity ⁴
9. Corporation or LLC electing corporate status on Form 8832 or Form 2553	The corporation
10. Association, club, religious, charitable, educational, or other tax-exempt organization	The organization
11. Partnership or multi-member LLC	The partnership
12. A broker or registered nominee	The broker or nominee
13. Account with the Department of Agriculture in the name of a public entity (such as a state or local government, school district, or prison) that receives agricultural program payments	The public entity
14. Grantor trust filing under the Form 1041 Filing Method or the Optional Form 1099 Filing Method 2 (see Regulation section 1.671-4(b)(2)(i)(B))	The trust

¹ List first and circle the name of the person whose number you furnish. If only one person on a joint account has an SSN, that person's number must be furnished.

² Circle the minor's name and furnish the minor's SSN.

³ You must show your individual name and you may also enter your business or "DBA" name on the "Business name/disregarded entity" name line. You may use either your SSN or EIN (if you have one), but the IRS encourages you to use your SSN.

⁴ List first and circle the name of the trust, estate, or pension trust. (Do not furnish the TIN of the personal representative or trustee unless the legal entity itself is not designated in the account title.) Also see *Special rules for partnerships* on page 1.

*Note. Grantor also must provide a Form W-9 to trustee of trust.

Note. If no name is circled when more than one name is listed, the number will be considered to be that of the first name listed.

Secure Your Tax Records from Identity Theft

Identity theft occurs when someone uses your personal information, such as your name, social security number (SSN), or other identifying information, without your permission, to commit fraud or other crimes. An identity thief may use your SSN to get a job or may file a tax return using your SSN to receive a refund.

To reduce your risk:

- Protect your SSN,
- Ensure your employer is protecting your SSN, and
- Be careful when choosing a tax preparer.

If your tax records are affected by identity theft and you receive a notice from the IRS, respond right away to the name and phone number printed on the IRS notice or letter.

If your tax records are not currently affected by identity theft but you think you are at risk due to a lost or stolen purse or wallet, questionable credit card activity or credit report, contact the IRS Identity Theft Hotline at 1-800-908-4490 or submit Form 14039.

For more information, see Publication 4535, Identity Theft Prevention and Victim Assistance.

Victims of identity theft who are experiencing economic harm or a system problem, or are seeking help in resolving tax problems that have not been resolved through normal channels, may be eligible for Taxpayer Advocate Service (TAS) assistance. You can reach TAS by calling the TAS toll-free case intake line at 1-877-777-4778 or TTY/TDD 1-800-829-4059.

Protect yourself from suspicious emails or phishing schemes.

Phishing is the creation and use of email and websites designed to mimic legitimate business emails and websites. The most common act is sending an email to a user falsely claiming to be an established legitimate enterprise in an attempt to scam the user into surrendering private information that will be used for identity theft.

The IRS does not initiate contacts with taxpayers via emails. Also, the IRS does not request personal detailed information through email or ask taxpayers for the PIN numbers, passwords, or similar secret access information for their credit card, bank, or other financial accounts.

If you receive an unsolicited email claiming to be from the IRS, forward this message to phishing@irs.gov. You may also report misuse of the IRS name, logo, or other IRS property to the Treasury Inspector General for Tax Administration at 1-800-366-4484. You can forward suspicious emails to the Federal Trade Commission at: spam@uce.gov or contact them at www.ftc.gov/idtheft or 1-877-IDTHEFT (1-877-438-4338).

Visit IRS.gov to learn more about identity theft and how to reduce your risk.

Privacy Act Notice

Section 6109 of the Internal Revenue Code requires you to provide your correct TIN to persons (including federal agencies) who are required to file information returns with the IRS to report interest, dividends, or certain other income paid to you; mortgage interest you paid; the acquisition or abandonment of secured property; the cancellation of debt; or contributions you made to an IRA, Archer MSA, or HSA. The person collecting this form uses the information on the form to file information returns with the IRS, reporting the above information. Routine uses of this information include giving it to the Department of Justice for civil and criminal litigation and to cities, states, the District of Columbia, and U.S. possessions for use in administering their laws. The information also may be disclosed to other countries under a treaty, to federal and state agencies to enforce civil and criminal laws, or to federal law enforcement and intelligence agencies to combat terrorism. You must provide your TIN whether or not you are required to file a tax return. Under section 3406, payers must generally withhold a percentage of taxable interest, dividend, and certain other payments to a payee who does not give a TIN to the payer. Certain penalties may also apply for providing false or fraudulent information.

**HIDALGO COUNTY
PURCHASING DEPARTMENT
Bidder/Vendor Application**

**Complete in print or type. Please return this application to the Hidalgo County Purchasing Department
thru Facsimile: (956) 318-2629 or (956) 292-7612
in person or regular mail to: 2812 S. Business Hwy. 281 , Edinburg, Texas 78539
or e-mail: purchasing@co.hidalgo.tx.us**

[illegible]

HISTORICALLY UNDERUTILIZED BUSINESS (HUB) DECLARATION

The primary objective of the Hidalgo County HUB Program is to ensure Historically Underutilized Businesses receive a fair and equal opportunity for participation in the County's procurement process. This fact holds true for Services (Professional & Non-Professional), Commodities, and Construction contracts and any subcontracts thereto. The program strongly encourages Prime Contractors to provide subcontracting opportunities to Certified Hub Contractors/Vendors. Our goal for HUB contractor/vendor participation, as well as HUB subcontractor participation is 30%. To be considered as a "Certified HUB Contractor/Vendor" the contractor/vendor must have been certified by, and hold a current and valid certification with any of the three agencies listed below.

Have you been Certified as a HUB or an MBE/WBE source?: ☐ Yes ☐ No

If yes, by whom?: ☐ Texas Building & Procurement Commission ☐ Other _____

Indicate Certification No(s): _____ or Are Certificate(s) Attached?: ☐ Yes ☐ No

LIST OF CERTIFIED HUB SUBCONTRACTORS

(Attach additional pages if necessary)

What percentage of the Bid, RFP, or RFQ is to be subcontracted with Certified HUB sources?: _____%
(List HUB Subcontractor information below).

HUB Subcontractor Name: _____ HUB Status:
Certifying Agency (Check all applicable): ☐ Texas Building & Procurement Commission ☐ Other
Address: _____ City: _____ State: _____ Zip:
Contact Person: _____ Title: _____ Phone No.: ()
Subcontract Amount: \$ _____ Description of Work to be Performed:

HUB Subcontractor Name: _____ HUB Status:
Certifying Agency (Check all applicable): ☐ Texas Building & Procurement Commission ☐ Other
Address: _____ City: _____ State: _____ Zip:
Contact Person: _____ Title: _____ Phone No.: ()
Subcontract Amount: \$ _____ Description of Work to be Performed:

HUB Subcontractor Name: _____ HUB Status:
Certifying Agency (Check all applicable): ☐ Texas Building & Procurement Commission ☐ Other
Address: _____ City: _____ State: _____ Zip:
Contact Person: _____ Title: _____ Phone No.: ()
Subcontract Amount: \$ _____ Description of Work to be Performed:

CONFLICT OF INTEREST QUESTIONNAIRE

FORM CIQ**For vendor doing business with local governmental entity**

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.

SALES TAX AND LOCAL SALES TAX EXEMPTION CERTIFICATE FOR CONTRACTORS

This Contract is to be performed for an exempt organization as defined by Article 20.04 (H) (4) of the Texas Limited Sales, Excise, and Use Tax Act and the undersigned hereby claims an exemption from payment of taxes under Chapter 20, title 122A, revised hereby claims an exemption from payment of taxes under Chapter 20, title 122A, revised civil statutes of Texas, and Article 1066 ©, entitle Local Sales and Use Tax, revised civil statutes of Texas.

The Contractor performing this Contract may purchase, rent, or lease all materials, supplies, equipment used for consumed in the performance of this Contract by issuing to his retailer an exemption certificate in lieu of the tax, said exemption certificate complying with State Comptroller's Ruling No 95-9.07. Any such exemption certificate issue by the Contractor in lieu of the tax shall be subject to the provisions of the State Comptroller's Ruling No. 95.0.09 as amended to be effective October 2, 1968.

EXECUTED this the _____ day of _____, 20_____.

Contractor

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GOVERNMENT CODE

CHAPTER 2258. PREVAILING WAGE RATES

SUBCHAPTER A. GENERAL PROVISIONS

§Sec. 2258.001. DEFINITIONS. In this chapter:

(1) "Locality in which the work is performed" means:

(A) for a contract for a public work awarded by the state, the political subdivision of the state in which the public work is located:

(i) which may include a county, municipality, county and municipality, or district, except as provided by Subparagraph (ii); and

(ii) which, in a municipality with a population of 500,000 or more, may only include the geographic limits of the municipality; or

(B) for a contract for a public work awarded by a political subdivision of the state, the geographical limits of the political subdivision.

(2) "Public body" means a public body awarding a contract for a public work on behalf of the state or a political subdivision of the state.

(3) "Worker" includes a laborer or mechanic.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995. Amended by Acts 2001, 77th Leg., ch. 1422, Sec. 14.04, eff. Sept. 1, 2001.

§Sec. 2258.002. APPLICABILITY OF CHAPTER TO PUBLIC WORKS. (a) This chapter applies only to the construction of a public work, including a building, highway, road, excavation, and repair work or other project development or improvement, paid for in whole or in part from public funds, without regard to whether the work is done under public supervision or direction.

(b) This chapter does not apply to work done directly by a public utility company under an order of a public authority.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995.

§Sec. 2258.003. LIABILITY. An officer, agent, or employee of a public body is not liable in a civil action for any act or omission implementing or enforcing this chapter unless the action was made in bad faith.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995.

SUBCHAPTER B. PAYMENT OF PREVAILING WAGE RATES

§Sec. 2258.021. RIGHT TO BE PAID PREVAILING WAGE RATES. (a) A worker employed on a public work by or on behalf of the state or a political subdivision of the state shall be

paid:

(1) not less than the general prevailing rate of per diem wages for work of a similar character in the locality in which the work is performed; and

(2) not less than the general prevailing rate of per diem wages for legal holiday and overtime work.

(b) Subsection (a) does not apply to maintenance work.

(c) A worker is employed on a public work for the purposes of this section if the worker is employed by a contractor or subcontractor in the execution of a contract for the public work with the state, a political subdivision of the state, or any officer or public body of the state or a political subdivision of the state.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995. Amended by Acts 1997, 75th Leg., ch. 165, Sec. 18.01, eff. Sept. 1, 1997.

§Sec. 2258.022. DETERMINATION OF PREVAILING WAGE RATES.

(a) For a contract for a public work awarded by a political subdivision of the state, the public body shall determine the general prevailing rate of per diem wages in the locality in which the public work is to be performed for each craft or type of worker needed to execute the contract and the prevailing rate for legal holiday and overtime work by:

(1) conducting a survey of the wages received by classes of workers employed on projects of a character similar to the contract work in the political subdivision of the state in which the public work is to be performed; or

(2) using the prevailing wage rate as determined by the United States Department of Labor in accordance with the Davis-Bacon Act (40 U.S.C. Section 276a et seq.), and its subsequent amendments.

(b) This subsection applies only to a public work located in a county bordering the United Mexican States or in a county adjacent to a county bordering the United Mexican States. For a contract for a public work awarded by the state, the public body shall determine the general prevailing rate of per diem wages in the locality in which the public work is to be performed for each craft or type of worker needed to execute the contract and the prevailing rate for legal holiday and overtime work as follows. The public body shall conduct a survey of the wages received by classes of workers employed on projects of a character similar to the contract work both statewide and in the political subdivision of the state in which the public work is to be performed. The public body shall also consider the prevailing wage rate as determined by the United States Department of Labor in accordance with the Davis-Bacon Act (40 U.S.C. Section 276a et seq.), and its subsequent amendments, but only if the survey used to determine that rate was conducted within a three-year period preceding the date the public body calls for bids for the public work. The public body shall determine the general prevailing rate of per diem wages in the locality based on the higher of:

(1) the rate determined from the survey conducted in the political subdivision;

(2) the arithmetic mean between the rate determined from the survey conducted in the political subdivision and the rate determined from the statewide survey; and

(3) if applicable, the arithmetic mean between the rate determined from the survey conducted in the political subdivision and the rate determined by the United States Department of Labor.

(c) The public body shall determine the general prevailing rate of per diem wages as a sum certain, expressed in dollars and cents.

(d) A public body shall specify in the call for bids for the contract and in the contract itself the wage rates determined under this section.

(e) The public body's determination of the general prevailing rate of per diem wages is final.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995. Amended by Acts 1997, 75th Leg., ch. 165, Sec. 18.02, eff. Sept. 1, 1997; Acts 2001, 77th Leg., ch. 1422, Sec. 14.05, eff. Sept. 1, 2001.

Amended by: Acts 2007, 80th Leg., R.S., Ch. 728, Sec. 1, eff. September 1, 2007.

§Sec. 2258.023. PREVAILING WAGE RATES TO BE PAID BY CONTRACTOR AND SUBCONTRACTOR; PENALTY.

(a) The contractor who is awarded a contract by a public body or a subcontractor of the contractor shall pay not less than the rates determined under Section 2258.022 to a worker employed by it in the execution of the contract.

(b) A contractor or subcontractor who violates this section shall pay to the state or a political subdivision of the state on whose behalf the contract is made, \$60 for each worker employed for each calendar day or part of the day that the worker is paid less than the wage rates stipulated in the contract. A public body awarding a contract shall specify this penalty in the contract.

(c) A contractor or subcontractor does not violate this section if a public body awarding a contract does not determine the prevailing wage rates and specify the rates in the contract as provided by Section 2258.022.

(d) The public body shall use any money collected under this section to offset the costs incurred in the administration of this chapter.

(e) A municipality is entitled to collect a penalty under this section only if the municipality has a population of more than 10,000.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995.

§Sec. 2258.024. RECORDS.

(a) A contractor and subcontractor shall keep a record showing:

(1) the name and occupation of each worker employed by the contractor or subcontractor in the construction of the public work; and

(2) the actual per diem wages paid to each worker.

(b) The record shall be open at all reasonable hours to inspection by the officers and agents of the public body.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995.

§Sec. 2258.025. PAYMENT GREATER THAN PREVAILING RATE NOT PROHIBITED. This chapter does not prohibit the payment to a worker employed on a public work an amount greater than the general prevailing rate of per diem wages.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995.

§Sec. 2258.026. RELIANCE ON CERTIFICATE OF SUBCONTRACTOR. A contractor is entitled to rely on a certificate by a subcontractor regarding the payment of all sums due those working for the subcontractor until the contrary has been determined.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995.

SUBCHAPTER C. ENFORCEMENT; CIVIL AND CRIMINAL PENALTIES

§Sec. 2258.051. DUTY OF PUBLIC BODY TO HEAR COMPLAINTS AND WITHHOLD PAYMENT. A public body awarding a contract, and an agent or officer of the public body, shall:

(1) take cognizance of complaints of all violations of this chapter committed in the execution of the contract; and

(2) withhold money forfeited or required to be withheld under this chapter from the payments to the contractor under the contract, except that the public body may not withhold money from other than the final payment without a determination by the public body that there is good cause to believe that the contractor has violated this chapter.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995.

§Sec. 2258.052. COMPLAINT; INITIAL DETERMINATION.

(a) On receipt of information, including a complaint by a worker, concerning an alleged violation of Section 2258.023 by a contractor or subcontractor, a public body shall make an initial determination as to whether good cause exists to believe that the violation occurred.

(b) A public body must make its determination under Subsection (a) before the 31st day after the date the public body receives the information.

(c) A public body shall notify in writing the contractor or subcontractor and any affected worker of its initial determination.

(d) A public body shall retain any amount due under the contract pending a final determination of the violation.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995.

§Sec. 2258.053. ARBITRATION REQUIRED FOR UNRESOLVED ISSUE.

(a) An issue relating to an alleged violation of Section 2258.023, including a penalty owed to a public body or an affected worker, shall be submitted to binding arbitration in accordance with

the Texas General Arbitration Act (Article 224 et seq., Revised Statutes) if the contractor or subcontractor and any affected worker do not resolve the issue by agreement before the 15th day after the date the public body makes its initial determination under Section 2258.052.

(b) If the persons required to arbitrate under this section do not agree on an arbitrator before the 11th day after the date that arbitration is required under Subsection (a), a district court shall appoint an arbitrator on the petition of any of the persons.

(c) A public body is not a party in the arbitration.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995.

§Sec. 2258.054. ARBITRATION AWARD; COSTS. (a) If an arbitrator determines that Section 2258.023 has been violated, the arbitrator shall assess and award against the contractor or subcontractor:

- (1) penalties as provided by Section 2258.023 and this section; and
- (2) all amounts owed to the affected worker.

(b) An arbitrator shall assess and award all reasonable costs, including the arbitrator's fee, against the party who does not prevail. Costs may be assessed against the worker only if the arbitrator finds that the claim is frivolous. If the arbitrator does not find that the claim is frivolous and does not make an award to the worker, costs are shared equally by the parties.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995.

§Sec. 2258.055. ARBITRATION DECISION AND AWARD FINAL. The decision and award of the arbitrator is final and binding on all parties and may be enforced in any court of competent jurisdiction.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995.

§Sec. 2258.056. PAYMENT BY PUBLIC BODY TO WORKER; ACTION TO RECOVER PAYMENT.

(a) A public body shall use any amounts retained under this chapter to pay the worker the difference between the amount the worker received in wages for labor on the public work at the rate paid by the contractor or subcontractor and the amount the worker would have received at the general prevailing wage rate as provided in the arbitrator's award.

(b) The public body may adopt rules, orders, or ordinances relating to the manner in which a reimbursement is made.

(c) If the amounts retained by a public body under this chapter are not sufficient for the public body to pay the worker the full amount owed, the worker has a right of action against the contractor or subcontractor and the surety of the contractor or subcontractor to recover the amount owed, reasonable attorney's fees, and court costs.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995.

§Sec. 2258.057. WITHHOLDING BY CONTRACTOR.

(a) A contractor may withhold from a subcontractor sufficient money to cover an amount withheld from the contractor by a public body because the subcontractor violated this chapter.

(b) If the contractor has made a payment to the subcontractor, the contractor may withhold money from any future payments owed to the subcontractor or sue the subcontractor or the subcontractor's surety for the amount withheld from the contractor by a public body because of the subcontractor's violation.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995.

§Sec. 2258.058. CRIMINAL OFFENSE.

(a) An officer, agent, or representative of the state or of a political subdivision of the state commits an offense if the person wilfully violates or does not comply with a provision of this chapter.

(b) A contractor or subcontractor of a public work under this chapter, or an agent or representative of the contractor or subcontractor, commits an offense if the person violates Section 2258.024.

(c) An offense under this section is punishable by:

- (1) a fine not to exceed \$500;
- (2) confinement in jail for a term not to exceed six months; or
- (3) both a fine and confinement.

Added by Acts 1995, 74th Leg., ch. 76, Sec. 5.49(a), eff. Sept. 1, 1995.

**Prevailing Wage Rates
Certification Statement**

Date _____

Project Name _____

CSJ# _____

Contractor _____

Application# _____

I, _____ do hereby state:
(Name of Project Director)

1. That a payroll (form WH-347 or similar form) was submitted for contract work Performed for the period covered by the attached application.
2. That a statement of compliance(form WH-347 or similar form) was submitted with the payroll.
3. The certified payroll complies with the classifications and minimum wage rates Stipulated in the contract.
4. That a minimum of one interview was conducted with laborers using Form HUD-11 or similar.

Signature

PAYROLL
See: See Instr

(For Contractor's Optional Use: See Instructions, Form WH-347 Inst.)

Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number

ADDRESS

OMB No.: 1215-0149
Expires: 03/31/2006

Expires: 03/31/2006

PROJECT OR CONTRACT NO.

[illegible]

We estimate that it will take an average of 56 minutes to complete this collection of information, including time for reviewing instructions searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. If you have any comments regarding these estimates or any other aspect of this collection of information, including suggestions for reducing this burden, send them to the Administrator, Wage and Hour Division, ESA, U. S. Department of Labor, Room S3502, 200 Constitution Avenue, N. W., Washington, D. C. 20210.

Date _____

(Name of Signatory Party) _____ (Title) _____
no hereby state

(1) That I pay or supervise the payment of the persons employed by _____

(Contractor or Subcontractor) _____ on the _____

(Building or Work) _____ that during the payroll period commencing on the _____

day of _____ and ending the _____ day of _____
all persons employed on said project have been paid the full weekly wages earned, that no rebates have been or will be made either directly or indirectly to or on behalf of said _____

(Contractor or Subcontractor) _____ from the full _____

weekly wages earned by any person and that no deductions have been made either directly or indirectly from the full wages earned by any person, other than permissible deductions as defined in Regulations, Part 3 (29 CFR Subtitle A) issued by the Secretary of Labor under the Copeland Act, as amended (40 Stat. 948, 63 Stat. 108, 72 Stat. 967, 76 Stat. 357, 40 U.S.C. 276c), and described below _____

(2) That any payrolls otherwise under this contract required to be submitted for the above period are correct and complete, that the wage rates for laborers or mechanics contained therein are not less than the applicable wage rates contained in any wage determination incorporated into the contract, that the classifications set forth therein for each laborer or mechanic conform with the work he performed _____

(3) That any apprentices employed in the above period are duly registered in a bona fide apprenticeship program registered with a State apprenticeship agency recognized by the Bureau of Apprenticeship and Training, United States Department of Labor, or if no such recognized agency exists in a State are registered with the Bureau of Apprenticeship and Training, United States Department of Labor. _____

(4) That _____

(a) WHERE FRINGE BENEFITS ARE PAID TO APPROVED PLANS, FUNDS, OR PROGRAMS _____

☐ In addition to the basic hourly wage rates paid to each laborer or mechanic listed in the above referenced payroll, payments of fringe benefits as listed in the contract have been or will be made to appropriate programs for the benefit of such employees, except as noted in Section 4(c) below _____

(b) WHERE FRINGE BENEFITS ARE PAID IN CASH _____

☐ Each laborer or mechanic listed in the above referenced payroll has been paid, as indicated on the payroll, an amount not less than the sum of the applicable basic hourly wage rate plus the amount of the required fringe benefits as listed in the contract, except as noted in Section 4(c) below _____

(c) EXCEPTIONS

EXCEPTION (CRAFT)	EXPLANATION

REMARKS

NAME AND TITLE

SIGNATURE

THE WILLFUL FALSIFICATION OF ANY OF THE ABOVE STATEMENTS MAY SUBJECT THE CONTRACTOR OR SUBCONTRACTOR TO CIVIL OR CRIMINAL PROSECUTION SEE SECTION 120 OF TITLE 18 AND SECTION 1001 OF TITLE 18 OF THE UNITED STATES CODE

General Decision Number: TX160305 01/08/2016 TX305

Superseded General Decision Number: TX20150305

State: Texas

Construction Type: Building

County: Hidalgo County in Texas.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.15 for calendar year 2016 applies to all contracts subject to the Davis-Bacon Act for which the solicitation was issued on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.15 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2016. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/08/2016

BOIL0074-003 01/01/2014

	Rates	Fringes
BOILERMAKER.....	\$ 23.14	21.55

ENGI0178-005 06/01/2014

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
(1) Tower Crane.....	\$ 29.00	10.60
(2) Cranes with Pile Driving or Caisson Attachment and Hydraulic		
Crane 60 tons and above.....	\$ 28.75	10.60
(3) Hydraulic cranes 59 Tons and under.....	\$ 27.50	10.60

* IRON0084-011 06/01/2015

	Rates	Fringes
IRONWORKER, ORNAMENTAL.....	\$ 23.02	6.35

PLUM0412-004 04/01/2013

Rates	Fringes

PLUMBER.....	\$ 31.14	12.43

SUTX2014-031 07/21/2014

	Rates	Fringes
BRICKLAYER.....	\$ 16.17	0.00
CARPENTER.....	\$ 14.21	2.22
CEMENT MASON/CONCRETE FINISHER...	\$ 12.46	0.00
ELECTRICIAN.....	\$ 18.44	4.53
INSULATOR - MECHANICAL (Duct, Pipe & Mechanical System Insulation).....	\$ 11.54	2.17
IRONWORKER, REINFORCING.....	\$ 12.01	0.00
IRONWORKER, STRUCTURAL.....	\$ 15.04	4.34
LABORER: Common or General.....	\$ 8.00	0.00
LABORER: Mason Tender - Brick...	\$ 10.00	0.00
LABORER: Mason Tender - Cement/Concrete.....	\$ 10.89	0.96
LABORER: Pipelayer.....	\$ 11.00	3.47
LABORER: Roof Tearoff.....	\$ 10.06	0.00
OPERATOR: Backhoe/Excavator/Trackhoe.....	\$ 14.04	1.01
OPERATOR: Bobcat/Skid Steer/Skid Loader.....	\$ 13.93	0.00
OPERATOR: Bulldozer.....	\$ 18.29	1.31
OPERATOR: Drill.....	\$ 16.22	0.34
OPERATOR: Forklift.....	\$ 14.83	0.00
OPERATOR: Grader/Blade.....	\$ 10.00	0.00
OPERATOR: Loader.....	\$ 12.87	0.70
OPERATOR: Mechanic.....	\$ 17.00	0.00
OPERATOR: Paver (Asphalt, Aggregate, and Concrete).....	\$ 16.03	0.00
OPERATOR: Roller.....	\$ 12.70	0.00
PAINTER (Brush, Roller, and Spray).....	\$ 11.27	0.00
PIPEFITTER.....	\$ 15.22	3.16

ROOFER.....	\$ 11.42	0.00
SHEET METAL WORKER (HVAC Duct Installation Only).....	\$ 18.40	2.12
SHEET METAL WORKER, Excludes HVAC Duct Installation.....	\$ 21.13	6.53
TILE FINISHER.....	\$ 11.22	0.00
TILE SETTER.....	\$ 12.15	0.00
TRUCK DRIVER: Dump Truck.....	\$ 12.39	1.18
TRUCK DRIVER: Flatbed Truck.....	\$ 19.65	8.57
TRUCK DRIVER: Semi-Trailer Truck.....	\$ 12.50	0.00
TRUCK DRIVER: Water Truck.....	\$ 12.00	4.11

WELDERS - Receive rate prescribed for craft performing
operation to which welding is incidental.

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) (ii)).

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 Regional Office for the area in which the survey was conducted because those Regional Offices have 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.

=====

END OF GENERAL DECISION

□

CHANGE ORDER NUMBER ONE (1)

Project: _____

DATE OF ISSUANCE: _____ EFFECTIVE DATE: _____

OWNER: _____

OWNER'S CONTRACT NO: _____

CONTRACTOR: _____ ENGINEER: _____

You are directed to make the following changes in the Contract Documents.

Description: 1.
2.
3.
4.
5.
6.

Reason for Change Order: 1.
2.
3.
4.
5.
6.

Attachments:

CHANGE IN CONTRACT PRICE:		CHANGE IN CONTRACT TIME:	
Original Contract Price		Original Contract Time for	
\$ 0.00		Substantial Completion: 0 calendar days or dates	
Net Changes from previous Change Order		Net Change from previous Change Orders	
\$ 0.00		0 calendar days	
Contract Price prior to this Change Order		Contract Time prior to this Change Order	
\$ 0.00		Substantial Completion: 0 calendar days or dates	
Net Increase(decrease) of this Change Order		Net Increase(decrease) of this Change Order	
\$ 0.00		0 calendar days	
Contract Price with all approved Change Orders	Net % increase(decrease) from original contract price.	Contract Time with all approved Change Orders	
\$ 0.00	#DIV/O! %	Substantial Completion: 0 calendar days or dates	

RECOMMENDED:

APPROVED:

ACCEPTED:

By: _____
Engineer (Authorized Signature)

By: _____
Owner (Authorized Signature)

By: _____
Contractor (Authorized Signature)

Date: _____

Date: _____

Date: _____

Exhibit E-B

APPLICATION FOR PAYMENT NO.

To: _____ (OWNER)
From: _____ (CONTRACTOR)
Contract: _____
Project: _____
Owner's Contract No. _____ Engineer's Project No. _____
For Work accomplished through the date of: _____

-
1. Original Contract Price:	_____
2. Net change by Change Order and Written Agreements(+or-):	_____
3. Current Contract Price (1 plus 2):	_____
4. Total completed and stored to date:	_____
5. Retainage (per Agreement):	_____
<u>10%</u> of completed Work:	_____
_____ of stored material	_____
Total Retainage:	_____
6. Total completed and stored to date less retainage (4 minus 5)	_____
7. Less previous Application for Payments:	_____
8. AMOUNT DUE THIS APPLICATION (6 MINUS 7)	_____
-

Accompanying Documentation: _____

CONTRACTOR'S CERTIFICATION:

The undersigned CONTRACTOR certifies that (1) all previous progress payments received from OWNER on account of Work done under the Contract referred to above have been applied on account to discharge CONTRACTOR'S legitimate obligations incurred in connection with Work covered by prior Applications for Payment numbered 1 through 2 inclusive; (2) title of all Work, materials and equipment incorporated in said Work or otherwise listed in or covered by this Application for Payment will pass to OWNER at time of payment free and clear of all Liens, security interests and encumbrances (except such as are covered by a Bond acceptable to OWNER indemnifying OWNER against any such Lien, security interest or encumbrance); and (3) all Work covered by this Application for Payments is in accordance with the Contract Documents and not defective.

Date _____

CONTRACTOR

State of _____
County of _____
Subscribed and sworn to before me this _____
day of _____

By: _____

Notary Public
My Commission expires: _____

Payment of the above AMOUNT DUE THIS APPLICATION is recommended.

Date _____

ENGINEER

By: _____

Exhibit E-C

Retainage Percent:

Engineer Firm:

[illegible]

PARTIAL/FINAL WAIVER OF LEIN

THE STATE OF TEXAS

COUNTY OF _____

The undersigned contracted with _____
_____ to furnish
in connection with certain improvements to real property located in _____
County, Texas, and owned by _____
Which improvements are described as follows:

In consideration of Pay Estimate No _____ in the amount of _____
_____ DOLLAR(\$ _____) and other good and
valuable consideration, the receipt and sufficiency of which is hereby acknowledged and
confessed, the undersigned does hereby waive and release any mechanic's lien or materialmen's
lien or claims of lien that the undersigned has or hereafter has on the above mentioned real
property on account of any labor performed or materials furnished or to be furnished or labor
performed and materials furnished by the undersigned pursuant to the above-mentioned contract
or any constitutional lien that the undersigned may have.

Undersigned hereby guarantees that all bids for labor performed and/or materials furnished in the
erection and construction of such improvements on the Property have been fully paid and
satisfied and Undersigned does further guarantee that if for any reason a lien or liens are filed for
material or labor against said Property arising out of any bills for material or labor in connection
with the erection or construction of said improvements thereon, Undersigned will obtain a
settlement of such lien or liens and a proper release thereof shall be obtained.

CONTRACTOR

BY: _____
TITLE

SWORN TO AND SUBSCRIBED BEFORE ME, on this the _____ day of _____, 20__ to
certify which witness my hand and seal of office.

NOTARY PUBLIC in and for the State of Texas
My Commission Expires: _____

Exhibit E-I

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**CONTRACTOR'S AFFIDAVIT OF
PAYMENTS OF DEBTS AND CLAIMS**

PROJECT: OWNER: CONTRACTOR: ENGINEER:	PROJECT NO.
The Contactor in accordance with the Contract Documents, hereby certifies that, except as listed below, all obligations for all materials and equipment furnished, for all work labor, and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Contract referenced above for which the Owner or his property might in any way be held responsible have been paid in full or have otherwise been satisfied in full.	
EXCEPTIONS: (If none, write "NONE". The Contractor shall furnish a bond acceptable to the Owner for each exception.)	
CONTRACTOR: By Title Subscribed and sworn to before me this day of Notary Public: My Commission Expires:	

**Prevailing Wage Rates
Certification Statement**

Date _____

Project Name _____

CSJ# _____

Contractor _____

Application# _____

I, _____ do hereby state:
(Name of Project Director)

1. That a payroll (form WH-347 or similar form) was submitted for contract work Performed for the period covered by the attached application.
2. That a statement of compliance (form WH-347 or similar form) was submitted with the payroll.
3. The certified payroll complies with the classifications and minimum wage rates Stipulated in the contract.
4. That a minimum of one interview was conducted with laborers using Form HUD-11 or similar.

Signature

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CERTIFICATE OF CONSTRUCTION COMPETION

THIS IS TO CERTIFY THAT ON _____ DAY OF _____, 20____ A
FINAL INSPECTION was made of the project herein described.

CONTRACT

CONTRACT DATE: _____
OWNER: _____
CONSTRUCTION CONTRACTOR: _____
OF THE CITY OF _____ STATE OF _____

PROJECT DESCRIPTION

CONSTRUCTION OF _____

CONTRACT NO: _____
Located in or near the City/Precinct Of _____

THIS IS TO CERTIFY”

1. That the work has been completed in accordance with the plans and specifications and all addenda, change orders, supplemental agreements thereto, and with the following exceptions:

2. That the sum of _____, deducted from the final payment of the Contractor is a fair and equitable settlement for the foregoing except work.
3. That the contractor has presented a “Certificate of Release” starting under oath, that all claims arising out of the performance of work have been fulfilled, and the Owner is released from all claims arising under or by virtue of said contract.
4. That the CONTRACTOR has presented in behalf of itself and its sureties, satisfactory evidence that it is bound to repair, replace, and make good any faulty workmanship and/or materials discovered in the work within a period of one year from this date, as provided in said contract.
5. Amount of Original Contract _____
Present Amount of Contract _____
Total Amount of earned to Date _____
Less: previous payments _____
Balance _____
Authorized deductions _____
AMOUNTY OF FINAL PAYMENT _____

6. That the final payment in the amount of _____
_____ is now due and payable.

Engineer's Signature & License #

CONCURRED BY:

Contractor's Name

By: _____

Title: _____

CONCURRED BY:

City/Precinct

By: _____

Title: _____

CONTRACTOR'S AFFIDAVIT OF RELEASE OF LIENS

PROJECT:	PROJECT NO.
OWNER:	
CONTRACTOR:	
ENGINEER:	
The Contractor, in accordance with the Contract Documents, and in consideration for the full and final payment to the Contractor for all services in connection with the project, does hereby waive and release any and all liens, or any and all claims to liens which the Contractor may have on or affecting the project as a result of its contract(s) for the Project or for performing labor and/or furnishing materials in any way connected with the construction of any aspect of the project. The Contractor further certifies and warrants that all subcontractors of labor and/or materials for the Project, except as listed below, have been paid in full for all labor and/or materials supplied to, for through or at the direct or indirect request of the Contractor prior to, through and including the date of this affidavit.	
EXCEPTIONS: (If none, write "NONE". The Contractor shall furnish a bond acceptable to the Owner for each exception.)	
CONTRACTOR By _____ Title _____ Subscribed and sworn to before me this _____ day of _____ Notary Public: _____ My Commission Expires: _____	

Contractor Name
Starting Date
Project Ending Date
Engineer's / County Project Description

Application No.:
Application Date:
Period To:
Engineer's / County Project No.:

					Original Schedule Value			Value		First Month			Second Month			Third Month				Balance To Finish	
No.	Item Code	Description	Unit	Original Rates	Quan	Dollars	Revised Rates	Quan	Dollars	Monthly Quan	QTY to Date	Item Cost (Monthly)	Monthly Quan	QTY to Date	Item Cost (Monthly)	Monthly Quan	QTY to Date	Item Cost (Monthly)	Total to Date	Quan	Dollars
(905) ROADWAY																					
1	100	Preparation of Right-of-Way	Sta	\$ -	0.0	-	\$ -	0.0	-	0	0	-	0	0	-	-	-	-	-	0.0	0.0
2	152	6" road Grader Work(Dens Cont.) Subgrade	SY	\$ -	0.0	-	\$ -	0.0	-	0	0	-	0	0	-	-	-	-	-	0.0	0.0
3	247	6" FL BS(Compl in Plac)	S.Y.	\$ -	0.0	-	\$ -	0.0	-	0	0	-	0	0	-	-	-	-	-	0.0	0.0
4	310	Asph. Matrl. (MC-30)	Gal	\$ -	0.0	-	\$ -	0.0	-	0	0	-	0	0	-	-	-	-	-	0.0	0.0
5	340	Asph. Conc. Ty D	S.Y.	\$ -	0.0	-	\$ -	0.0	-	0	0	-	0	0	-	-	-	-	-	0.0	0.0
6	500	Mobilization	L.S.	\$ -	0.0	-	\$ -	0.0	-	0	0	-	0	0	-	-	-	-	-	0.0	0.0
7	502	Barricades, Signs and Traffic Handling	Mo	\$ -	0.0	-	\$ -	0.0	-	0	0	-	0	0	-	-	-	-	-	0.0	0.0
8	530	Turnouts	Ea	\$ -	0.0	-	\$ -	0.0	-	0	0	-	0	0	-	-	-	-	-	0.0	0.0
9	5249	Tem Sedmt Cont Fence (Installed)	L.F.	\$ -	0.0	-	\$ -	0.0	-	0	0	-	0	0	-	-	-	-	-	0.0	0.0
10	5249	Tem Sedmt Cont Fence Handling (Removed)	L.F.	\$ -	0.0	-	\$ -	0.0	-	0	0	-		0	-	-	-	-	-	0.0	0.0
		Total Roadway				-			-			-			-			-	-	0.0	0.0
(906) DRAINAGE																					
11	530	Drvwys (Asph Conc Pav) (PRB)	S.Y.	\$ -	0.0	-	\$ -	0.0	-	0	0	-	0	0	-	-	-	-	-	0.0	0.0
12	247	Drvwys Flexible Base	S.Y.	\$ -	0.0	-	\$ -	0.0	-	0	0	-	0	0	-	-	-	-	-	0.0	0.0
13	556	8" Storm Drain	L.F.	\$ -	0.0	-	\$ -	0.0	-	0	0	-	0	0	-	-	-	-	-	0.0	0.0
14	556	18" RCP Storm Drain	L.F.	\$ -	0.0	-	\$ -	0.0	-	0	0	-	0	0	-	-	-	-	-	0.0	0.0
15	465	Ty "A" Inlets	Ea.	\$ -	0.0	-	\$ -	0.0	-	0	0	-	0	0	-	-	-	-	-	0.0	0.0
16	465	Concrete Manhole	Ea.	\$ -	0.0	-	\$ -	0.0	-	0	0	-	0	0	-	-	-	-	-	0.0	0.0
17		15" R.C.P.	L.F.	\$ -	0.0	-	\$ -	0.0	-	0	0	-	0	0	-	-	-	-	-	0.0	0.0
18		Ty "A" Inlets	Ea.	\$ -	0.0	-	\$ -	0.0	-	0	0	-	0	0	-	-	-	-	-	0.0	0.0
19		Manhole	Ea	\$ -	0.0	-	\$ -	0.0	-	0	0	-	0	0	-	-	-	-	-	0.0	0.0
20		6.0" Valley Gutter	L.F.	\$ -	0.0	-	\$ -	0.0	-	0	0	-	0	0	-	-	-	-	-	0.0	0.0
		Total Drainage				-						-			-			-	-		
		TOTAL BASE AMOUNTS:				-			-			-			-			-	-	0.0	0.0

Print Name

Date

Signature

EXHIBIT "G"
APPENDICES

APPENDIX A

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

1. **Compliance with Regulations:** The contractor (hereinafter includes consultants) will comply with the Acts and the Regulations relative to Nondiscrimination in Federally-assisted programs of the U.S. Department of Transportation, the Federal Highway Administration, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.
2. **Nondiscrimination:** The contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor will not participate directly or indirectly in the discrimination prohibited by the Acts and the Regulations, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR Part 21.
3. **Solicitations for Subcontracts, Including Procurements of Materials and Equipment:** In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the contractor of the contractor's obligations under this contract and the Acts and the Regulations relative to Nondiscrimination on the grounds of race, color, or national origin.
4. **Information and Reports:** The contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Recipient or the Federal Highway Administration to be pertinent to ascertain compliance with such Acts, Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the contractor will so certify to the Recipient or the Federal Highway Administration, as appropriate, and will set forth what efforts it has made to obtain the information.
5. **Sanctions for Noncompliance:** In the event of a contractor's noncompliance with the Nondiscrimination provisions of this contract, the Recipient will impose such contract sanctions as it or the Federal Highway Administration may determine to be appropriate, including, but not limited to:
 - a. withholding payments to the contractor under the contract until the contractor complies; and/or
 - b. cancelling, terminating, or suspending contract, in whole or in part.
6. **Incorporation of Provisions:** The contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. The contractor will take action with respect to any subcontract or procurement as the Recipient or the Federal Highway Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request the Recipient to enter into any litigation to protect the interests of the Recipient. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

APPENDIX B

CLAUSES FOR DEEDS TRANSFERRING UNITED STATES PROPERTY

The following clauses will be included in deeds effecting or recording the transfer of real property, structures, or improvements thereon, or granting interest therein from the United States pursuant to the provisions of Assurance 4:

NOW, THEREFORE, the U.S. Department of Transportation as authorized by law and upon the condition that the **COUNTY OF HIDALGO** will accept title to the lands and maintain the project constructed thereon in accordance with all applicable federal statutes, the Regulations for the Administration of all Department of Transportation programs, and the policies and procedures prescribed by the Federal Highway Administration of the U.S. Department of Transportation in accordance and in compliance with all requirements imposed by Title 49, Code of Federal Regulations, U.S. Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Nondiscrimination in Federally-assisted programs of the U.S. Department of Transportation pertaining to and effectuating the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252; 42 U.S.C. § 2000d to 2000d-4), does hereby remise, release, quitclaim and convey unto the **COUNTY OF HIDALGO** all the right, title and interest of the U.S. Department of Transportation in and to said lands described in Exhibit 1 attached hereto and made a part hereof.

(HABENDUM CLAUSE)

TO HAVE AND TO HOLD said lands and interests therein unto **COUNTY OF HIDALGO** and its successors forever, subject, however, to the covenants, conditions, restrictions and reservations herein contained as follows, which will remain in effect for the period during which the real property or structures are used for a purpose for which Federal financial assistance is extended or for another purpose involving the provision of similar services or benefits and will be binding on the **COUNTY OF HIDALGO**, its successors and assigns.

The **COUNTY OF HIDALGO**, in consideration of the conveyance of said lands and interests in lands, does hereby covenant and agree as a covenant running with the land for itself, its successors and assigns, that (1) no person will on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination with regard to any facility located wholly or in part on, over, or under such lands hereby conveyed [,] [and]* (2) that the **COUNTY OF HIDALGO** will use the lands and interests in lands and interests in lands so conveyed, in compliance with all requirements imposed by or pursuant to Title 49, Code of Federal Regulations, U.S. Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Nondiscrimination in Federally-assisted programs of the U.S. Department of Transportation, Effectuation of Title VI of the Civil Rights Act of 1964, and as said Regulations and Acts may be amended[, and (3) that in the event of breach of any of the above-mentioned nondiscrimination conditions, the Department will have a right to enter or re-enter said lands and facilities on said land, and that above described land and facilities will thereon revert to and vest in and become the absolute property of the U.S. Department of Transportation and its assigns as such interest existed prior to this instruction].*

(*Reverted clause and related language to be used only when it is determined that such a clause is necessary in order to make clear the purpose of Title VI.)

APPENDIX C

CLAUSES FOR TRANSFER OF REAL PROPERTY ACQUIRED OR IMPROVED UNDER THE ACTIVITY, FACILITY, OR PROGRAM

The following clauses will be included in deeds, licenses, leases, permits, or similar instruments entered into by the **COUNTY OF HIDALGO** pursuant to the provisions of Assurance 7(a):

- A. The (grantee, lessee, permittee, etc. as appropriate) for himself/herself, his/her heirs, personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant and agree [in the case of deeds and leases add "as a covenant running with the land"] that:
 - 1. In the event facilities are constructed, maintained, or otherwise operated on the property described in this (deed, license, lease, permit, etc.) for a purpose for which a U.S. Department of Transportation activity, facility, or program is extended or for another purpose involving the provision of similar services or benefits, the (grantee, licensee, lessee, permitted, etc.) will maintain and operate such facilities and services in compliance with all requirements imposed by the Acts and Regulations (as may be amended) such that no person on the grounds of race, color, or national origin, will be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities.
- B. With respect to licenses, leases, permits, etc., in the event of breach of any of the above Nondiscrimination covenants, **COUNTY OF HIDALGO** will have the right to terminate the (lease, license, permit, etc.) and to enter, re-enter, and repossess said lands and facilities thereon, and hold the same as if the (lease, license, permit, etc.) had never been made or issued.*
- C. With respect to a deed, in the event of breach of any of the above Nondiscrimination covenants, the **COUNTY OF HIDALGO** will have the right to enter or re-enter the lands and facilities thereon, and the above described lands and facilities will there upon revert to and vest in and become the absolute property of the **COUNTY OF HIDALGO** and its assigns.*

(*Reverted clause and related language to be used only when it is determined that such a clause is necessary in order to make clear the purpose of Title VI.)

APPENDIX D

CLAUSES FOR CONSTRUCTION/USE/ACCESS TO REAL PROPERTY ACQUIRED UNDER THE ACTIVITY, FACILITY OR PROGRAM

The following clauses will be included in deeds, licenses, permits, or similar instruments/agreements entered into by **COUNTY OF HIDALGO** pursuant to the provisions of Assurance 7(b):

- A. The (grantee, licensee, permittee, etc., as appropriate) for himself/herself, his/her heirs, personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant and agree (in the case of deeds and leases add, "as a covenant running with the land") that (1) no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities, (2) that in the construction of any improvements on, over, or under such land, and the furnishing of services thereon, no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or otherwise be subjected to discrimination, (3) that the (grantee, licensee, lessee, permittee, etc.) will use the premises in compliance with all other requirements imposed by or pursuant to the Acts and Regulations, as amended, set forth in this Assurance.
- B. With respect to (licenses, leases, permits, etc.), in the event of breach of any of the above Nondiscrimination covenants, **COUNTY OF HIDALGO** will have the right to terminate the (license, permit, etc., as appropriate) and to enter or re-enter and repossess said land and the facilities thereon, and hold the same as if said (license, permit, etc., as appropriate) had never been made or issued.*
- C. With respect to deeds, in the event of breach of any of the above Nondiscrimination covenants, **COUNTY OF HIDALGO** will there upon revert to and vest in and become the absolute property of **COUNTY OF HIDALGO** and its assigns.*

(*Reverted clause and related language to be used only when it is determined that such a clause is necessary in order to make clear the purpose of Title VI.)

APPENDIX E

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees to comply with the following nondiscrimination statutes and authorities; including but not limited to:

Pertinent Nondiscrimination Authorities:

- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d et seq., 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin); and 49CFR Part 21.
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42U.S.C. § 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Federal-Aid Highway Act of 1973, (23U.S.C. § 324et seq.), (prohibits discrimination on the basis of sex);
- Section 504 of the Rehabilitation Act of 1973, (29U.S.C. § 794 et seq.), as amended, (prohibits discrimination on the basis of disability); and 49CFRPart 27;
- The Age Discrimination Act of 1975, as amended,(42U.S.C. § 6101 et seq.), (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982, (49U.S.C. § 4 71, Section 4 7123),as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987,(PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, sub recipients and contractors, whether such programs or activities are Federally funded or not);
- Titles II and III of the Americans with Disabilities Act, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131-12189)as implemented by Department of Transportation regulations at 49C.F.R. parts 37 and 38;
- The Federal Aviation Administration's Nondiscrimination statute (49U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures discrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);
- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U .S.C. 1681 et seq).