



REQUEST FOR COMPETITIVE SEALED PROPOSALS (RFP)

**SCHERTZ SEGUIN LOCAL GOVERNMENT
CORPORATION**

36" PIPELINE – CONTRACT 3

PROJECT MANUAL

JUNE 2020

PROJECT NUMBER 1-03153



John Winkler
7/20/2020

**PROJECT MANUAL
as part of
the
Bidding Documents**



T.B.P.E. Registration No. 8053

Titles and Certifications

ENGINEER

Walker Partners, LLC
823 Washington Avenue
Waco, Texas 76701
Firm Registration Number: 8053

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ADVERTISEMENT FOR PROPOSALS

Schertz Seguin Local Government Corporation (SSLGC) will receive proposals from qualified General Contractors for construction of the SSLGC – 36" Pipeline (Contract 3), until 3:00 p.m. on Tuesday, November 17, 2020. Sealed competitive proposals should be submitted to the Office of the City Secretary, City of Seguin, 205 N. River, Seguin, Texas 78155, in an envelope no smaller than 8 ½" x 11" and clearly marked in the lower left-hand corner:

**SEALED BID
SSLGC - 36" Pipeline (Contract 3)
To be opened at 3:00 PM, November 17, 2020**

All responsive proposals will be publicly opened and read aloud shortly thereafter in Council Chambers at same location. Proposals are invited for furnishing all labor, equipment, and materials necessary for construction of generally the following:

Work includes construction of approximately 94,000 linear feet of 36" pipeline and associated appurtenances from Liesner School Pump Station to City of Schertz in Guadalupe County, Texas.

Copies of Proposal Documents can be obtained electronically online from Civcast at www.civcastusa.com. All questions must be submitted in writing through Civcast's Question and answer feature. For more information, contact Rachael Murphy at (254) 714-1402 or rmurphy@walkerpartners.com.

Construction services for this Project will be selected through competitive sealed proposals in accordance with Chapter 2269, of the Texas Government Code. SSLGC will evaluate and rank each Proposer based on the following selection criteria: 20% Contractor Relevant Experience and References, 60% Cost Proposal and 20% proposed schedule. SSLGC shall select a contractor that offers the best value as determined by the selection criteria and ranking evaluation. This Contract is contingent upon release of funds from Texas Water Development Board. SSLGC reserves the right to reject any or all Proposals.

Each Proposal must be accompanied by Proposal Security made payable to SSLGC in an amount of five percent (5%) of Proposer's total amount Proposal and in the form of a certified or cashier's check or a Bond issued by a surety meeting the requirements of Paragraph 6.01 of the General Conditions.

A Pre-Bid Conference will be held at 10 AM, November 5, 2020 at the SSLGC offices, 108 W. Mountain St., Seguin, Texas 78155, (830) 401-2409. All proposing General Contractors are encouraged to attend.

During the pendency of this RFP, Proposer shall not contact any Owner staff except those designated herein this RFP or subsequent addenda or correspondence. Any questions or concerns should be submitted via the Civcast website after pre-proposal conference and at least three (3) business days prior to due date of the proposal.

Contract Documents referenced in the Request for Competitive Sealed Proposals and which are subject of a Proposal submitted in response thereof, including but not limited to the form of the Agreement and the General Conditions, are forms adopted by SSLGC and are not subject to negotiation, modification or change unless SSLGC, in its sole discretion, agrees to do so.

INSTRUCTIONS TO PROPOSERS

1. Defined Terms

- 1.1 Terms used in these Instructions to Proposers are defined in Section 00 70 00 - General Conditions of Contract.
- 1.2 Certain additional terms used in these Instructions to Proposers have meanings indicated below which are applicable to both singular and plural thereof.
- 1.3 PROPOSER - one who submits a Proposal directly to OWNER as distinct from a sub-PROPOSER, who submits a Proposal to a PROPOSER.
- 1.4 Issuing Office - the office from which the Proposal Documents are to be issued and where Proposal procedures are to be administered.
- 1.5 Successful PROPOSER - PROPOSER to whom OWNER (on the basis of OWNER's evaluation as hereinafter provided) makes an award.

2. Copies of Proposal Documents

- 2.1. Complete sets of the Proposal Documents may be obtained in accordance with Advertisement for PROPOSALS.
- 2.2. Complete sets of Proposal Documents must be used in preparing PROPOSALS; neither OWNER nor ENGINEER assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Proposal Documents or otherwise associated with Proposal Documents.
- 2.3. OWNER and ENGINEER, in making copies of Proposal Documents available on above terms, do so only for purpose of obtaining PROPOSALS for Work and do not confer a license or grant for any other use. PROPOSER may not make copies of Proposal Documents. Ownership of Proposal Documents shall remain with OWNER.

3. Qualifications of PROPOSERS

- 3.1 To demonstrate qualifications to perform Work, each PROPOSER must submit with PROPOSAL, detailed written evidence such as previous experience, present commitments, any pending litigations related to construction contracts, and proof that the PROPOSER has the personnel, equipment, and material to execute the work required by Contract Documents or any other such data as may be called for below. PROPOSER is to provide a list of projects completed within the last 5 years, which are comparable to this project. Each PROPOSAL must contain evidence of PROPOSER'S qualification to do business in the area where the Project is located. Contractor must provide evidence of 5 years of successful experience of named Project Manager or Superintendent. Contractor must ensure company employee (Project Manager or Superintendent) is available on-site during all construction activities.

4. Examination of Contract Documents and Site

- 4.1. It is the sole responsibility of each PROPOSER, before submitting a PROPOSAL:
 - 4.1.1. To examine thoroughly Contract Documents and other related data identified in Proposal Documents (including "technical data" referred to below);
 - 4.1.2. To visit Site to become familiar with and satisfy PROPOSER as to general, local, and site conditions that may affect cost, progress, performance, or furnishing of Work;
 - 4.1.3. To consider federal, state, and local Laws and Regulations that may affect cost, progress, performance, or furnishing of Work;

- 4.1.4. To study and carefully correlate PROPOSER's knowledge and observations with Contract Documents and such other related data; and
- 4.1.5. To promptly notify ENGINEER and OWNER of all conflicts, errors, ambiguities or discrepancies which PROPOSER has discovered in or between Contract Documents and such other related documents.
- 4.2. Reference is made to General Conditions for identification of:
 - 4.2.1. Those reports of explorations and tests of subsurface conditions at or contiguous to Site which have been utilized by ENGINEER in preparation of Contract Documents. PROPOSER may rely upon general accuracy of "technical data" contained in such reports but not upon other data, interpretations, opinions, or information contained in such reports or otherwise relating to subsurface conditions at Site, nor upon completeness thereof for the purposes of Proposal or construction. **OWNER AND ENGINEER EXPRESSLY DISCLAIM ANY AND ALL WARRANTIES THAT ALL INFORMATION, DATA, INTERPRETATIONS, AND OPINIONS SHOWN, INDICATED, OR CONTAINED IN THOSE DEPICTIONS ARE ACCURATE, CORRECT, COMPLETE, OR FIT FOR THEIR INTENDED PURPOSES.**
 - 4.2.2. Those depictions of physical conditions in or relating to existing surface and subsurface structures (except Underground Facilities), which are at or contiguous to Site that have been utilized by ENGINEER in preparation of Contract Documents. PROPOSER may rely upon general accuracy of "technical data" contained in such depictions but not upon other data, interpretations, opinions, or information shown or indicated in such depictions or otherwise relating to such structures, nor upon completeness thereof for purposes of Proposal or construction. **OWNER AND ENGINEER EXPRESSLY DISCLAIM ANY AND ALL WARRANTIES THAT INFORMATION, DATA, INTERPRETATIONS, AND OPINIONS SHOWN, INDICATED, OR CONTAINED IN DEPICTIONS ARE ACCURATE, CORRECT, COMPLETE, OR FIT FOR THEIR INTENDED PURPOSES.**
 - 4.2.3. Copies of such reports and depictions will be made available by OWNER to any PROPOSER on request. Those reports and depictions are not part of Contract Documents, but "technical data" contained therein upon which PROPOSER is entitled to rely as provided in Paragraph 5.03 of General Conditions. PROPOSER is responsible for any interpretation or conclusion drawn from any "technical data" or any such data, interpretations, opinions, or information.
- 4.3. Information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to Site is based on information and data furnished to OWNER and ENGINEER by owners of such Underground Facilities or others, and OWNER and ENGINEER do not assume responsibility for the accuracy or completeness thereof. **OWNER AND ENGINEER EXPRESSLY DISCLAIM ANY AND ALL WARRANTIES THAT THE INFORMATION, DATA, INTERPRETATIONS, AND OPINIONS SHOWN, INDICATED, OR CONTAINED IN DEPICTIONS ARE ACCURATE, CORRECT, COMPLETE, OR FIT FOR THEIR INTENDED PURPOSES.**
- 4.4. Provisions concerning responsibilities for adequacy of data furnished to prospective PROPOSERS with respect to subsurface conditions, other physical conditions and Underground Facilities, and possible changes in Contract Documents due to differing or unanticipated conditions appear in Paragraph 5.03 through 5.06 of General Conditions.
- 4.5. Before submitting a PROPOSAL, each PROPOSER will be responsible to obtain such additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the site or otherwise, which may affect cost, progress, performance, or furnishing of Work, or which relate to

any aspect of the means, methods, techniques, sequences, or procedures of construction to be employed by PROPOSER and safety precautions and programs incident thereto or which PROPOSER deems necessary to determine its PROPOSAL for performing and furnishing Work in accordance with time, price, and other terms and conditions of the Contract Documents.

- 4.6. On request, OWNER will provide each PROPOSER access to the site to conduct such examinations, investigations, explorations, tests, and studies as each PROPOSER deems necessary for submission of a PROPOSAL. PROPOSER must fill all holes and clean up and restore the site to its former condition upon completion of such explorations, investigations, tests, and studies.
- 4.7. Reference is made to the Contract Documents for the identification of the general nature of work to be performed at the site by OWNER (if applicable) or others (such as utilities and other prime contractors) that relates to the Work for which a PROPOSAL is to be submitted. On request, OWNER will provide to each PROPOSER for examination, access to, or copies of, Contract Documents (other than portions thereof related to price) for such work.
- 4.8. Submission of a PROPOSAL will constitute an incontrovertible representation by PROPOSER that PROPOSER has complied with every requirement of this Article 4, that, without exception, the PROPOSAL is premised upon performing and furnishing the Work required by the Contract Documents, and applying the specific means, methods, techniques, sequences, or procedures of construction (if any) that may be shown or indicated or expressly required by the Contract Documents, the PROPOSER has given ENGINEER written notice of all conflicts, errors, ambiguities, and discrepancies that PROPOSER has discovered in the Contract Documents, and written resolutions thereof by ENGINEER are acceptable to PROPOSER, that the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work, that the PROPOSER has no questions regarding the Work, that the PROPOSER has all information necessary to make a fully informed PROPOSAL, and that the PROPOSER has conducted all tests at the site it deems necessary.
- 4.9. Provisions of 4.1 through 4.8, inclusive of this Article, do not apply to Asbestos, Polychlorinated biphenyls (PCBs), Petroleum, Hazardous Waste, or Radioactive Material covered by Paragraph 5.06 of the General Conditions.

5. Availability of Lands for Work, etc.

- 5.1 Lands upon which the Work is to be performed, rights-of-way and easements for access thereto and other lands designated for use by CONTRACTOR in performing Work are identified in Contract Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by CONTRACTOR. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by OWNER unless otherwise provided in the Contract Documents.

6. Interpretations and Addenda

- 6.1. All questions about the meaning or intent of Proposal Documents are to be directed to ENGINEER. Interpretations or clarifications considered necessary by ENGINEER in response to such questions will be issued by Addenda mailed, transmitted by facsimile machine, or delivered to all parties recorded by ENGINEER as having received Proposal Documents. Questions received less than seven days prior to date for opening of PROPOSALS may not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications may not be relied upon and will not be binding upon OWNER or ENGINEER or legally effective.
- 6.2. Addenda may also be issued to modify the Proposal Documents as deemed advisable by OWNER or ENGINEER.

7. Proposal Security

- 7.1. Each PROPOSAL must be accompanied by Proposal Security made payable to OWNER in an amount of five percent (5%) of PROPOSER's total amount Proposal (*Water Code §17.183*) and in the form of a certified or cashier's check or a Bond. *If a bid bond is provided, the Proposer shall utilize a surety company which is authorized to do business in Texas in accordance with Surety Bonds and Related Instruments, Chapter 3503 of the Insurance Code.*
- 7.2. Proposal Security of Successful PROPOSER will be retained until such PROPOSER has executed the Agreement, furnished required contract security, and met the other conditions of Notice of Award, whereupon Proposal Security will be returned. If Successful PROPOSER fails to execute and deliver Agreement and furnish the required contract security within ten (10) days after the Notice of Award, OWNER may annul the Notice of Award, and the Proposal Security of that PROPOSER will be forfeited. Proposal Security of other PROPOSERS whom OWNER believes to have a reasonable chance of receiving award may be retained by OWNER until earlier of seventh day after Effective Date of Agreement or thirty-sixth day after PROPOSAL opening, whereupon Proposal Security furnished by such PROPOSERS will be returned. Proposal Security with PROPOSALS which are not competitive will be returned within fourteen (14) days after PROPOSAL opening.

8. Contract Times

- 8.1 Contract Times are set forth in Agreement.

9. Liquidated Damages

- 9.1 Provisions for liquidated damages are set forth in Agreement.

10. Substitute and "Or-Equal" Items

- 10.1 Contract, if awarded, will be on the basis of materials and equipment described in Drawings or specified in Specifications without consideration of possible substitute or "or-equal" items. Whenever it is indicated in Drawings or specified in Specifications that a substitute or "or-equal" item of material or equipment may be furnished or used by CONTRACTOR if acceptable to ENGINEER, application for such acceptance will not be considered by ENGINEER until after the Effective Date of the Agreement. Procedure for submission of any such application by CONTRACTOR and consideration by ENGINEER is set forth in Paragraphs 7.04 and 7.05 of General Conditions.

11. Subcontractors, Suppliers, and Others

- 11.1. If General Conditions require the identity of certain Subcontractors, Suppliers, and other persons and organizations (including those who are to furnish principal items of material and equipment) to be submitted to OWNER in advance of a specified date prior to the Effective Date of Agreement, apparent Successful PROPOSER, and any other PROPOSER so requested, shall submit with Proposal a list of all such Subcontractors, Suppliers, and other persons and organizations proposed for those portions of Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, person, or organization if requested by OWNER. An OWNER or ENGINEER who, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, other person, or organization may, before the Notice of Award is given, request the apparent Successful PROPOSER to submit an acceptable substitute without an increase in Proposal Price.

If apparent Successful PROPOSER declines to make any such substitution, OWNER may award the contract to the next lowest PROPOSER that proposes to use acceptable Subcontractors, Suppliers, and other persons and organizations. Declining to make requested substitutions will not constitute grounds for sacrificing Proposal Security of any PROPOSER. Any Subcontractor, Supplier, other person, or organization listed and to whom OWNER or ENGINEER does not make

written objection prior to giving of Notice of Award will be deemed acceptable to OWNER and ENGINEER subject to revocation of such acceptance after Effective Date of Agreement as provided in General Conditions.

- 11.2. Apparent Successful PROPOSER, prior to Notice of Award, shall identify in writing to OWNER those portions of Work that such PROPOSER proposes to subcontract and after Notice of Award may only subcontract other portions of Work with OWNER's written consent.
- 11.3. No CONTRACTOR shall be required to employ any Subcontractor, Supplier, other person, or organization against whom CONTRACTOR has reasonable objection.

12. Proposal Form

- 12.1. Proposal Form is included with Proposal Documents; additional copies may be obtained from Issuing Office(s) described in Request for Proposal.
- 12.2. All blanks on the Proposal Form must be completed by printing or typing in black ink.
- 12.3. PROPOSALS by corporations must be executed in corporate name by president or a vice-president (or other corporate officer accompanied by evidence of authority to sign) and corporate seal must be affixed and attested by secretary or an assistant secretary of corporation. Corporate address and state of incorporation must be shown below signature. **If Corporation does not have a seal, a copy of Corporate Resolution shall be attached.**
- 12.4. PROPOSALS by partnerships must be executed in partnership name and signed by a partner, whose title must appear under signature, and the official address of partnership must be shown below the signature.
- 12.5. All names must be typed or printed in black ink below signature.
- 12.6. PROPOSAL shall contain an acknowledgment of receipt of all Addenda (the numbers of which must be filled in on Proposal Form).
- 12.7. Street and/or post office box address and telephone and/or fax number for communications regarding PROPOSAL must be shown.
- 12.8. When applicable, evidence of authority to conduct business as an out-of-state corporation in the state where Work is to be performed shall be provided in accordance with Paragraph 3 above. State contractor license number, if any, must also be shown.

13. Submission of Proposals

- 13.1 Each PROPOSAL shall be submitted at time and place indicated in Request for Proposal and shall be enclosed in an opaque sealed envelope, marked with Project title and name and address of PROPOSER and accompanied by Proposal Security and other required documents. If PROPOSAL is sent through the mail or other delivery system, the sealed envelope shall be enclosed in a separate envelope with notation "PROPOSAL ENCLOSED" on the face of it.

14. Modification and Withdrawal of Proposals

- 14.1. PROPOSALS may be modified or withdrawn by an appropriate document duly executed (in the manner that a PROPOSAL must be executed) and delivered to the place where PROPOSALS are to be submitted at any time prior to the opening of PROPOSALS.
- 14.2. If, within twenty-four (24) hours after PROPOSALS are opened, any PROPOSER files a duly signed, written notice with OWNER and promptly thereafter demonstrates to reasonable satisfaction of OWNER that there was a material and substantial error in preparation of its PROPOSAL, that PROPOSER may withdraw its PROPOSAL and Proposal Security will be

returned. Thereafter, that PROPOSER will be disqualified from further Proposal on Work to be provided under Contract Documents.

15. Opening of Proposals

- 15.1 PROPOSALS will be opened and read aloud publicly (unless obviously non-responsive) at place where PROPOSALS are to be submitted. An abstract of amounts of base PROPOSALS and major alternates (if any) will be made available to PROPOSERS after opening of PROPOSALS.

16. Proposals to Remain Subject to Acceptance

- 16.1 All PROPOSALS will remain subject to acceptance for sixty (60) days after the day of the PROPOSAL opening, but OWNER may, in its sole discretion, release any PROPOSAL and return the Proposal Security prior to that date.

17. Award of Contract

- 17.1 Award of this Contract is contingent upon release of funds from Texas Water Development Board. Any contract or contracts awarded under this Competitive Sealed Proposal is expected to be funded, in part, by a loan or grant from Texas Water Development Board. Neither the State of Texas, nor any of its departments, agencies, or employees are or will be a party to this request for proposals or any resulting Contract.
- 17.2. OWNER reserves the right to reject any or all PROPOSALS, including without limitation right to reject any or all nonconforming, non-responsive, unbalanced, or conditional PROPOSALS and to reject PROPOSAL of any PROPOSER if OWNER believes that it would not be in best interest of the Project to make an award to that PROPOSER, whether because PROPOSAL is not responsive or PROPOSER is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by OWNER. OWNER also reserves right to waive all informalities not involving price, time, or changes in Work and to negotiate contract terms with Successful PROPOSER. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of price that is most advantageous to SSLGC. Discrepancies between indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.
- 17.3. In evaluating PROPOSALS, OWNER will consider qualifications of PROPOSER, whether or not, PROPOSALS comply with prescribed requirements, and such alternates, unit prices, and other data, as may be requested in Proposal Form or prior to Notice of Award.
- 17.4. OWNER may consider qualifications and experience of Subcontractors, Suppliers, and other persons and organizations proposed for those portions of Work as to which the identity of Subcontractors, Suppliers, and other persons and organizations must be submitted as provided in General Conditions. OWNER also may consider operating costs, maintenance requirements, performance data, and guarantees of major Items of materials and equipment proposed for incorporation in Work when such data is required to be submitted prior to Notice of Award.
- 17.5. OWNER may conduct such investigations as OWNER deems necessary to assist in evaluation of any PROPOSAL and to establish responsibility, qualifications and financial ability of PROPOSERS, proposed Subcontractors, Suppliers and other persons and organizations to perform and furnish Work in accordance with Contract Documents to OWNER's satisfaction within prescribed time.
- 17.6. OWNER may rank the PROPOSERS and award the Contract on the basis of any combination of base Proposal items and additive alternative Proposal items consistent with SSLGC's available budget for Project. If Contract is to be awarded, it will be awarded, in accordance with Paragraph 1.3, to highest ranked PROPOSER whose evaluation by OWNER indicates to OWNER that the award will be best value to SSLGC.

- 17.7. If Contract is to be awarded, OWNER will give Successful PROPOSER a Notice of Award within sixty (60) days after the day of PROPOSAL opening.
- 17.8. A governmental entity may not award a governmental contract to a nonresident proposer unless nonresident underbids lowest bid submitted by a responsible resident proposer by an amount that is not less than amount by which a resident proposer would be required to underbid nonresident proposer to obtain a comparable contract in state in which nonresident's principal place of business is located. A non-resident proposer is a Contractor whose corporate offices or principal place of business is outside of state of Texas (Source: Texas Government Code, Chapter 2252, Subchapter A, Nonresident Bidders, §2252.002). Proposer will complete form TWDB-0459, Vendor Compliance with Reciprocity on Non-Resident Bidders, **which must be submitted with Bid.**

18. Contract Security

- 18.1 Paragraph 5.1 of General Conditions set forth OWNER's requirements as to performance and payment Bonds. When Successful PROPOSER deliver executed Agreement to ENGINEER, required Bonds must be delivered in accordance with Paragraph 2.01 of General Conditions.

19. Signing of Agreement

- 19.1 When OWNER gives a Notice of Award to Successful PROPOSER, it will be accompanied by required number of unsigned counterparts of Agreement with all other written Contract Documents attached. Within ten (10) days thereafter, CONTRACTOR shall sign and deliver the required number of counterparts of Agreement and attached documents to ENGINEER with required Bonds.

20. Pre-Proposal Conference

- 20.1 A Pre-Proposal conference will be held for this Project. ENGINEER will transmit to all prospective PROPOSERS of record such Addenda as ENGINEER considers necessary in response to questions that arise during Proposal process. Oral statements and other interpretations or clarifications not contained in an Addenda may not be relied upon and will not be binding on OWNER or ENGINEER or legally effective.

21. Taxes

- 21.1. CONTRACTOR shall pay all applicable sales, consumer, use, and other similar taxes except as exempted.
- 21.2. Sales tax. CONTRACTOR shall obtain the necessary documentation so that any sales tax exemptions due to nature of Work performed by CONTRACTOR or Subcontractors pursuant to this Agreement shall be applied to this Agreement, and these cost savings due to Project's exempted status shall be passed on to OWNER. CONTRACTOR and each of its Subcontractors or sub-Subcontractors must obtain a Texas Limited Sales, Excise and Use Tax Permit for all materials required to be purchased in connection with Project.

22. Retainage

- 22.1 Provisions concerning retainage are set forth in Agreement.

END OF SECTION

PROPOSAL FORM**1.0 General:**

1. This Request for Proposal (“RFP”) shall be available for viewing and download on CivCast website (www.civcastusa.com) or for viewing only at offices of Engineer 823 Washington Ave., Waco, Texas 76701, from 8:00 a.m. until 5:00 p.m., Monday through Friday, and available to interested individuals and entities (“Proposers”) from Date Issued until Due Date and Time.

1. **Proposers are expected to examine all documents that make up this RFP. Proposers shall promptly notify Owner of any omission, ambiguity, inconsistency, or error that they may discover upon examination of RFP. Owner assumes no responsibility for errors or misrepresentations that result from use of incomplete proposals.**

2. All responses to this RFP (“Proposals”) shall be submitted on the attached response forms of this RFP. Proposals must be received by Schertz Seguin Local Government Corporation (Owner) at or before 3:00 PM local time on November 17, 2020 at the City of Seguin, City Hall as described in the Advertisement for Proposals. Each Proposal must be properly identified with subject title and date and time due. Proposals shall be submitted in written, hard-copy format, and delivered in a sealed envelope via mail, courier service, or hand delivery.

FAXED OR E-MAILED PROPOSALS AND/OR LATE SUBMISSIONS WILL NOT BE ACCEPTED.

3. All Proposals shall be addressed as shown below:

Request for Proposal on: SSLGC - 36" Pipeline
Due Date and Time: November 17, 2020 at 3:00 PM local time

READ THIS RFP FULLY AND CAREFULLY. PROPOSALS SHALL BE COMPLETE UPON SUBMISSION, INCLUDING ALL FORMS AND ATTACHMENTS REQUIRED HEREIN. FAILURE TO STRICTLY COMPLY WITH THESE STATED TERMS OF SUBMISSION MAY RESULT IN REJECTION OF PROPOSAL.

4. During the pendency of this RFP, Proposer shall not contact any Owner staff except those designated herein this RFP or subsequent addendums or correspondence. Any questions or concerns should be submitted via Civcast website after the Pre-proposal conference and at least five (5) business days prior to Bid Date.
5. Pre-Proposal Conference: A non-mandatory pre-proposal conference will be conducted at SSLGC Main Conference Room, located at, 108 W. Mountain at the date and time indicated on the Advertisement for Proposals. All interested parties planning to submit a Proposal are encouraged to attend this conference.
6. Receipt of an addendum to a Proposal must be acknowledged by signing and returning the addendum with Proposal. Addenda information will be posted on the CivCast website as specified in Section 1.1.
7. All information required of the proposer, unless otherwise specified, must be completed on the forms provided by Owner. Failure to manually sign Statement of Proposer’s Qualifications (Section 00 40 00) will disqualify Proposer. Persons signing Proposal shall have the authority to sign the Proposal on Proposer’s behalf and shall be an officer or person authorized to bind the entity they represent to this proposal.
8. Each and every deviation from the terms, conditions, specifications, or performance requirements of this RFP shall be listed on the Deviation Form (Article 6.0 of this RFP) upon submission of your Proposal. Listing of deviations is an integral and required part of your Proposal. Any deviations not listed on the Deviation Form (Article 6.0 of this RFP) upon submission of your Proposal will not become part of the contract awarded by the Owner pursuant to this RFP.
9. Proposals will be opened at 3:00 PM, November 17, 2020. Proposals cannot be altered or amended after deadline.
10. Owner, in its sole discretion, may negotiate changes to any submitted Proposal, including price, after submitted Proposals have been opened, in accordance with Government Code.

11. Owner reserves the right to accept and/or reject any and all submitted Proposals or any part thereof, waive immaterial errors, and award the contract in the best interest of Owner.
12. Owner shall be sole interpreter of terms, conditions, specifications, and performance requirements of this RFP.
13. In case of a discrepancy between unit price and the extended total for an item, figure that is most advantageous to Owner will apply.
14. It is not the policy of Owner to award a contract on the basis of price alone. Owner reserves right to award Contract to Proposer offering best value, and not necessarily to Proposer offering lowest price. A Proposal may be evaluated and selected on basis of reputation, experience, past performance, skill, financial capacity, product quality and features, delivery schedule, quality installation, compatibility with existing equipment, and product service warranty.
15. If, at any time, successful Proposer fails to fulfill or abide by terms, conditions, Specifications, or performance requirements of this RFP, or any contract awarded and entered pursuant thereto, Owner reserves the right to:
 1. Purchase SSLGC - 36" Pipeline Project materials/labor on open market and charge Proposer difference between its Contract Price and new Contractor's price;
 2. Deduct charges from successful Proposer's invoice at time it is due; or
 3. Cancel Contract at Owner's convenience, without penalty, by furnishing written notice of termination to Proposer, and select another Proposal and award a contract to its Proposer pursuant to terms thereof.
16. At Owner's sole discretion and convenience, Owner may terminate any awarded contract without regard to cause, without prior notice, and without penalty, and pay for authorized services provided to date of termination.
17. If it is determined that any benefit to secure favorable treatment was offered, elicited, or provided by Proposer or Proposer's employee, affiliate, representative, partner, subcontractor, or agent, to any officer or employee of Owner, Proposer will be disqualified from consideration and/or the awarded contract will be terminated.
18. All goods, raw materials, and products provided pursuant to awarded contract must be new and not used, shop worn, or reconditioned.
19. All work must be in compliance with and conform to any and all applicable state or local laws, ordinances, regulations, codes, rules, policies, and interpretations thereof.
20. Once a Proposal has been selected, items or processes may be substituted only by furnishing an equal or superior quality and/or grade product or process than originally specified at no additional cost to the Owner. Any such substitution shall be pre-approved by Owner, and the acceptance of any such substitution shall be in Owner's sole discretion.
21. Any contract awarded pursuant to this RFP is not assignable.
22. Owner is tax exempt under Tax code, Subtitle E. SALES, EXCISE, AND USE TAXES, CHAPTER 151, section 151.309.
23. Invoices for partial payment must be approved in advance by the Engineer's Project Manager.
24. Proposer shall include a Material Safety Data Sheet (MSDS), if applicable.
25. Undisputed payments will be submitted to Proposer within thirty (30) days from receipt of original invoice.
26. Any contract awarded pursuant to this RFP shall be governed by the Uniform Commercial Code. Wherever the "Uniform Commercial Code" is used, it shall be construed as meaning the Uniform Commercial Code as adopted in State of Texas effective and in force on the date of any such agreement between Owner and Proposer.
27. Any proposal and its contents is subject to Texas Public Information Act. Proposers who include information in a Proposal that is legally protected as a trade secret or confidential information must clearly indicate specific

protected information by highlighting that information and marking it “Trade Secret” or “Confidential” at appropriate place. Owner will not be responsible for any public disclosure of trade secret or confidential information. An awarded Proposal in its entirety is not confidential. If a request is made under Texas Public Information Act to inspect information designated as trade secret or confidential in a Proposal, Proposer shall, upon notification by Owner, immediately furnish sufficient written reasoning as to why information should be protected from disclosure in a timely manner to Texas Attorney General for final determination at address below:

Office of the Attorney General
Open Records Division
P.O. Box 12548
Austin, TX 78711
Fax (512) 494-8017

28. Obligations of the parties under a contract awarded through this RFP are primarily performable in Guadalupe County, Texas. Exclusive venue shall be Guadalupe County, Texas, and any contract awarded under this RFP shall be governed by laws of State of Texas.
29. Owner may, at its option, offset any amounts due and payable under a contract awarded under this RFP against any debt (including taxes) lawfully due to Owner from the successful Proposer, regardless of whether amount due arises pursuant to the terms of the contract or otherwise, and regardless of whether or not the debt due to Owner has been reduced to judgment by a court.
30. No member of Owner’s Board of Directors or any Owner employee shall have any financial interests in profits of any contract, service or other work performed by Proposer(s) or personally profit directly or indirectly from any contract, purchase, sale or service between Owner and any person or company.
31. Awarded contract is subject to appropriation of funds by Owner’s Board in Owner’s budget adopted for any fiscal year for specific purpose of making payments pursuant to awarded contract or that fiscal year. Obligation of Owner pursuant to awarded contract in any fiscal year for which awarded contract is in effect shall constitute a current expense of Owner for that fiscal year only, and shall not constitute an indebtedness of Owner of any monies other than those lawfully appropriated in any fiscal year. In the event of non-appropriation of funds in any fiscal year to make payments pursuant to the awarded contract, awarded contract may be terminated.

2.0 Special Conditions

1. Scope of Work.
 - 1.1. Proposer shall provide contractor services for construction of SSGLC - 36" Pipeline as per Drawings and Specifications, as provided with this RFP.
 - 1.2. Successful Proposer shall be and remain an independent contractor throughout term of any contract awarded pursuant to this RFP.
2. Proposal Selection Criteria:

Award of Contract resulting from this solicitation shall be under selection process described herein. A committee appointed by Owner will evaluate Proposals submitted in response to this solicitation. Three (3) divisions of selection criteria (“Divisions”) are as follows

- a. Contractor Relevant Experience and References– 20%
- b. Cost Proposal – 60%
- c. Proposed Schedule (Time) – 20%

Each of Divisions has been assigned an appropriate weight by Owner, as set forth below. Following an analysis and evaluation of the Proposals, ranking of Offerors will be made based upon selection criteria. In the event of a tie in the rankings, Owner shall break the tie based upon Owner’s determination of which Proposal will provide the best value to Owner. Subjective judgment on the part of Owner is implicit in the criteria selection process. Selection process permits placing technical considerations above total price. Therefore, Owner reserves the right to award to other than the entity with the lowest proposed price. Once the Offerors have been ranked, Owner will begin contract negotiations with the first ranked Offeror. If Owner is unable to come to terms with first ranked Offeror, discussions will be terminated and Owner will proceed to the next ranked Offeror and repeat

the process until a contract agreement is reached or all Proposals are rejected. Once a contract agreement is reached with Offeror, approval from Owner's Board is required to authorize General Manager to execute the construction contract.

After opening and ranking, an award may be made on basis of initially submitted proposal, without discussion, clarification or modification, or the Owner may discuss with the selected Offeror, offers for cost adjustment and other elements of Proposal. Any Proposal may be considered unacceptable if the committee determines it fails to provide adequate technical or pricing information in Proposals as specified in these Instructions to Offerors.

Selection Criteria

A. Contractor Relevant Experience and References – 20%

1. Experience as a general contractor with specific experience in facilities construction projects of the same or similar type, size, nature and class as Project being proposed. Consideration will be given to number of years of experience, which an Offeror has.
2. Representative projects (dollar value and/or scope/size) must be submitted as references to include the project name, engineer, and cost of the project. Provide valid contact information for the project owner and the engineer. Consideration will only be given to projects which are occupied or substantially complete.
3. References provided in Item 5.0 of this document. References may be checked from customers other than those listed.

B. Cost Proposal – 60%

1. Owner will consider the total contract cost as part of its evaluation. Owner shall have right to accept alternates in any order or combination unless otherwise specifically provided in Proposal Documents.
2. Offeror submitting lowest proposed amount shall receive the highest number of points in category, and Offeror submitting highest proposed amount shall receive the lowest number of points awarded in this category. Delivery schedule can affect this ranking.

C. Proposed Schedule – 20%

1. Time is of essence to Owner. Amount of time for construction, proposed by each Offeror, will influence number of points awarded in this category.

3.0 Proposal Form

1. The undersigned PROPOSER proposes and agrees, if this PROPOSAL is accepted, to enter into an agreement with OWNER in the form included in Contract Documents to perform and furnish all Work as specified or indicated in the Contract Documents for the Price and within the Times indicated in this FORM and in accordance with the other terms and conditions of the Contract Documents. PROPOSER accepts the terms of the form of Agreement and the Contract Documents.
2. PROPOSER accepts all of the terms and conditions of the REQUEST FOR PROPOSAL and Instructions to Proposers including without limitation those dealing with the disposition of Proposal Security. This Proposal will remain subject to acceptance for sixty (60) days after the day of opening.
3. In submitting this PROPOSAL, PROPOSER represents and warrants, as more fully set forth in Agreement, that:
 - (a) PROPOSER has examined and carefully studied the Proposal Documents and Addenda, including the Question and Answers provided on the CivCast website for the project. PROPOSER hereby acknowledges receipt of the following Addenda: (List Addenda by Addendum Number and Date).

Addendum No.: _____ Dated: _____

Addendum No.: _____ Dated: _____

Addendum No.: _____ Dated: _____

Addendum No.: _____ Dated: _____

- (b) Proposer has visited the site, has conducted all testing at the site Proposer deems necessary, has become familiar with, has taken into consideration in formulating its Proposal, and accepts the general, local and site conditions that may affect cost, progress, performance, and furnishing of the Work.
 - (c) Proposer is familiar with, has taken into consideration in formulating its proposal and accepts all federal, state, and local Laws and Regulations that may affect cost, progress, performance, and furnishing of the Work.
 - (d) PROPOSER has carefully studied all reports of explorations and tests of subsurface conditions at, or contiguous to, the site and all drawings of physical conditions in, or relating to, existing surface or subsurface structures at, or contiguous to, the site (except Underground Facilities) which have been identified as provided in Paragraph 5.03 of the General Conditions. PROPOSER accepts the determination set forth in Paragraph 5.03 of the General Conditions of the extent of the "technical data" contained in such reports and drawings upon which PROPOSER is entitled to rely as provided in Paragraph 5.03 of the General Conditions. PROPOSER understands, acknowledges, and agrees that such reports and drawings are not Contract Documents and may not be complete for PROPOSER's purposes. PROPOSER understands, acknowledges, and agrees that OWNER and ENGINEER are not responsible for and make no warranties regarding the accuracy or completeness of information and data shown or indicated in the PROPOSAL Documents with respect to surface and subsurface conditions and Underground Facilities at or contiguous to the site. PROPOSER has obtained and carefully studied and is responsible for obtaining and studying any and all such additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the site or otherwise which may affect cost, progress, performance or furnishing of the Work, or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by PROPOSER and safety precautions and programs incident thereto as may be necessary. PROPOSER does not consider that any additional examinations, investigations, explorations, tests, studies or data are necessary for the determination of this PROPOSAL for performance and furnishing of the Work in accordance with the times, price, and other terms and conditions of the Contract Documents.
 - (e) PROPOSER is aware of the general nature of work to be performed by OWNER and others at the site that relates to Work for which this PROPOSAL is submitted as indicated in the Contract Documents.
 - (f) PROPOSER has correlated the information known to PROPOSER, information and observations obtained from visits to the site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.
 - (g) PROPOSER has given ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies that PROPOSER has discovered in the Contract Documents, and the written resolution thereof by ENGINEER is acceptable to PROPOSER; PROPOSER has no questions regarding the Work; PROPOSER has all information necessary to make a fully informed PROPOSAL; and the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work for which this PROPOSAL is submitted.
 - (h) This PROPOSAL is genuine and not made in the interest of or on behalf of any undisclosed person, firm, or corporation and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; PROPOSER has not directly or indirectly induced or solicited any other PROPOSER to submit a false or sham PROPOSAL; PROPOSER has not solicited or induced any person, firm, or corporation to refrain from PROPOSAL; and PROPOSER has not sought by collusion to obtain for itself any advantage over any other PROPOSER or over OWNER.
4. PROPOSER is duly qualified to carry on business in State of Texas; possesses or has ability to possess all licenses, permits, and certificates of authority necessary to commence and to complete Work in accordance

with PROPOSAL Documents; is fully qualified and has experience in performing work of the same type as Work covered by PROPOSAL Documents; and will provide all necessary labor, superintendence, machinery, equipment, tools, materials, services, and other means of construction to complete all work upon which PROPOSER proposes and complete said work within the time stated and for maintaining same as required for the following prices:

5. PROPOSAL PRICING/SCHEDULE

CONTRACT 3 - 36" Pipeline					
BASE PROPOSAL					
Item No.	Quantity	Unit	Item Description	Unit Price	Amount
1	1	LS	Mobilization and Demobilization: Item includes project move-in and move-out of personnel and equipment, for all work required to mobilize, demobilize, bond, and insure Work, in accordance with Contract Documents, complete in place (Section 01 71 13)	\$ _____	\$ _____
2	1	LS	Allowance (Section 01 23 00)	\$200,000.00	\$200,000.00
3	1	LS	Trench Safety Plan (Section 31 23 15)	\$ _____	\$ _____
4	91,862	LF	Trench Safety Implementation Section (31 23 15)	\$ _____	\$ _____
5	1	LS	Traffic Control (Section 01 55 26)	\$ _____	\$ _____
6	91,862	LF	Preparing Alignment: Item includes removal and disposal of all obstructions from designated easements where removal of such obstructions is not otherwise provided for in Contract Documents, complete in place (Section 31 10 00)	\$ _____	\$ _____
7	54,544	LF	C200, 36" Class 150 Water Transmission Main (Section 33 11 14)	\$ _____	\$ _____
8	23,525	LF	C200, 36" Class 200 Water Transmission Main (Section 33 11 14)	\$ _____	\$ _____

9	15,600	LF	C200, 36" Class 250 Water Transmission Main (Section 33 11 14)	\$ _____	\$ _____
10	30	LF	C200, 18" Class 150 Water Transmission Main (Section 33 11 14)	\$ _____	\$ _____
11	235	EA	54" Steel Casing Installed by Bore (Thickness 0.719") Railroad Crossing (Section 33 05 20 and Section 00 70 04)	\$ _____	\$ _____
12	1,572	LF	54" Steel Casing Installed by Bore (0.5" Thickness) (Section 33 05 20)	\$ _____	\$ _____
13	24	LF	54" Steel Casing Install by Open Cut (Section 33 05 23)	\$ _____	\$ _____
14	348	LF	54" Steel Casing (Section 33 05 23)	\$ _____	\$ _____
15	15	EA	36" Butterfly Valve, Class 150 (Section 33 12 21)	\$ _____	\$ _____
16	2	EA	36" Butterfly Valve, Class 250 (Section 33 12 21)	\$ _____	\$ _____
17	289	LF	Class 'A' (Asphalt) Surface Replacement including Flexible Base Backfill (Section 31 75 00 and Section 31 23 17)	\$ _____	\$ _____
18	1,572	LF	Class 'D' (Gravel) Surface Replacement including Flexible Base Backfill (Section 31 75 00 and Section 31 23 17)	\$ _____	\$ _____
19	904	LF	Creek Crossing	\$ _____	\$ _____
20	1,044	LF	Welded Joints (Section 05 05 23 and Section 33 11 14)	\$ _____	\$ _____
21	1,154	LF	Flowable Fill (Section 31 23 24)	\$ _____	\$ _____
22	13,800	SF	Stone Rip Rap including Woven Filter Fabric (Section 31 37 00)	\$ _____	\$ _____
23	93	LF	Encase 54" Casing in Concrete (Section 31 23 24)	\$ _____	\$ _____

24	114	EA	Concrete Thrust Blocking for Bends (Section 03 30 00)	\$ _____	\$ _____
25	11,700	LF	Remove and Replace Existing Fence (Section 31 31 26)	\$ _____	\$ _____
26	99	EA	Remove and Reinstall Gates (Section 31 31 26)	\$ _____	\$ _____
27	29	EA	4" Combination Air Valve Assembly (Section 33 12 30)	\$ _____	\$ _____
28	17	EA	6" Blow Off Assembly	\$ _____	\$ _____
29	1	EA	Remove and Replace Ex. Blow Off Assembly	\$ _____	\$ _____
30	4	EA	36" x 36" Tee (Section 33 11 14)	\$ _____	\$ _____
31	1	EA	36" x 18" Reducer (Section 33 11 14)	\$ _____	\$ _____
32	4	EA	36" - 45 Degree Bend (Section 33 11 14)	\$ _____	\$ _____
33	4	EA	36" Butt Strap (Section 05 05 23 and Section 33 11 14)	\$ _____	\$ _____
34	1	EA	Remove Existing 36" Butterfly Valve	\$ _____	\$ _____
35	1	EA	18" Gate Valve (Section 33 12 20)	\$ _____	\$ _____
36	2	EA	18" - 45 Degree Bend (Section 33 11 14)	\$ _____	\$ _____
37	73	EA	Cathodic Protection Test Station (Section 26 64 00)	\$ _____	\$ _____
38	48	EA	Casing Test Station (Section 26 64 00)	\$ _____	\$ _____
39	3	EA	AC Rectifier/Anode System, including power to Site (Section 26 64 00)	\$ _____	\$ _____
40	1	EA	36" Monolithic Insulating Joint (Section 26 64 00)	\$ _____	\$ _____
41	4	EA	Ex. Bldg. To Be Removed By Contractor	\$ _____	\$ _____

42	1	EA	Ex. Concrete Slab to be Removed	\$ _____	\$ _____
43	1	EA	Remove Ex. Plug and Tie to Ex. 36"	\$ _____	\$ _____
44	14	EA	Remove Existing Power Pole	\$ _____	\$ _____
45	3	EA	Trench Dam	\$ _____	\$ _____
46	1	EA	Aerial Crossing including concrete and rebar for 2 Bents and 4 Piers	\$ _____	\$ _____
47	1,065	SF	Concrete Channel	\$ _____	\$ _____
48	1,065	LF	Ex. Rip-Rap to be Removed and Replaced	\$ _____	\$ _____
49	2	EA	36" Field Connection	\$ _____	\$ _____
50	1	LF	18" Field Connection	\$ _____	\$ _____
51	1	EA	Exiting Tank to be Removed	\$ _____	\$ _____
52	1	LS	TPDES Permitting and SWP3 Plan (Section 01 57 00)	\$ _____	\$ _____
53	1	LS	SWP3 Controls and Implementation (Section 01 50 00)	\$ _____	\$ _____
54	10	AC	Bermuda Grass Seeding and Revegetation (Section 32 92 13)	\$ _____	\$ _____
55	58	AC	Native Grass Seeding and Revegetation (Section 32 92 15)	\$ _____	\$ _____
56	125	AC	Site Restoration including topsoil reinstallation, final grading, cleaning, rock removal, and incidentals. (Section 31 05 13 and Section 32 92 13)	\$ _____	\$ _____
57	93,669	LF	Flush, Test, and Disinfect Pipeline (Section 33 26 90)	\$ _____	\$ _____

TOTAL BASE PROPOSAL AMOUNT

\$ _____

CONTRACT 3 - 36" Pipeline					
ADD / (DEDUCT) ALTERNATE PROPOSAL					
Item No.	Quantity	Unit	Item Description	Unit Price	Amount
1	54,544	LF	C303 36" Class 150 Water Transmission Main, in lieu of C200 (Section 33 11 13)	\$ _____	\$ _____
2	23,525	LF	C303, 36" Class 200 Water Transmission Main, in lieu of C200 (Section 33 11 13)	\$ _____	\$ _____
3	15,600	LF	C303, 36" Class 250 Water Transmission Main, in lieu of C200 (Section 33 11 13)	\$ _____	\$ _____
4	30	LF	C303, 18" Class 150 Water Transmission Main, in lieu of C200 (Section 33 11 13)	\$ _____	\$ _____

ADD / (DEDUCT) PROPOSAL AMOUNT

\$ _____

TOTAL CALENDAR DAYS FOR CONSTRUCTION (not to exceed 600 calendar days). Contractor proposes a contract duration of _____ Calendar days.

ATTEST:

Very truly yours

(SEAL, if PROPOSER is Corporation)

By: _____
(Signature)

(Typed or Printed Name)

Title: _____

PROPOSER: _____
(Name of Company)

Address: _____

Telephone No.: _____

4.0 Proposer Profile

Company Name or D/B/A: _____

Telephone Numbers:

Phone: _____

Fax: _____

Corporate Contact for this Proposal:

Name: _____

Address: _____

City, State, Zip: _____

Phone: _____ Fax: _____

E-mail: _____

Website: _____

If local contact is the same as corporate contact, check here

Local Contact for this Proposal

Name: _____

Address: _____

City, State, Zip: _____

Phone: _____ Fax: _____

E-mail: _____

Other company names used with dates, from/to: _____

5.0 Deviation or Compliance Form

DEVIATIONS: In the event the undersigned Proposer intends to deviate from the general terms, conditions, special conditions or specifications contrary to those listed in the “Terms and Conditions” and other information attached hereto, all such deviations must be **LISTED ON THIS PAGE**, with complete and detailed conditions and information also being attached (attach additional pages as necessary).

NO DEVIATIONS: In the absence of any deviation entry on this page, Proposer assures the Owner of Proposer’s compliance with the Terms, Conditions, Specifications, and information contained in this RFP.

All Proposers MUST COMPLETE this page.

RETURN with Proposal or Proposal will be considered NON RESPONSIVE.

Our Proposal is submitted according to: _____ Deviations listed above

OR _____ No Deviations

6.0 Release & Indemnification

TO THE MAXIMUM EXTENT PERMITTED BY LAW, PROPOSER HEREBY AGREES AND CONSENTS FOR ITSELF, INDIVIDUALLY, AND ON BEHALF OF THE BUSINESS ENTITY, TO FULLY AND UNCONDITIONALLY RELEASE, INDEMNIFY, DEFEND, AND HOLD HARMLESS THE BRUSHY CREEK REGIONAL UTILITY AUTHORITY, TEXAS, INCLUDING ITS OFFICERS, AGENTS AND EMPLOYEES, AND TO DEFEND AND HOLD IT HARMLESS FROM AND AGAINST ANY AND ALL COSTS, EXPENSES, ATTORNEY FEES, CLAIMS, SUITS, DEMANDS, LOSSES, OR LIABILITY FOR INJURIES TO REAL OR PERSONAL PROPERTY AND INJURIES TO PERSONS INCLUDING DEATH, INCLUDING PROPOSER’S EMPLOYEES, AFFILIATES, REPRESENTATIVES, PARTNERS, AGENTS, OR THOSE WORKING ON PROPOSER’S BEHALF, FROM ANY AND ALL OTHER COSTS, EXPENSES, ATTORNEY FEES, CLAIMS, SUITS, DEMANDS, LOSSES OR LIABILITIES OF ANY AND EVERY NATURE WHATSOEVER ARISING IN ANY MANNER, DIRECTLY OR INDIRECTLY, OUT OF OR IN CONNECTION WITH ANY CONTRACT AWARDED PURSUANT TO THIS RFP AN IN THE PERFORMANCE THEREOF, REGARDLESS OF CAUSE OR OF THE SOLE, JOINT, COMPARATIVE OR CONCURRENT NEGLIGENCE OR GROSS NEGLIGENCE OF CONTRACTOR, ITS OFFICERS, AGENTS OR EMPLOYEES, SAVE AND EXCEPT THE SOLE AND EXCLUSIVE NEGLIGENCE OF SSLGC. THIS PROVISION SHALL APPLY TO ALL IMPUTED OR ACTUAL JOINT ENTERPRISE AND JOINT VENTURE LIABILITY, IF ANY.

7.0 Non-Collusion Acknowledgment

The undersigned Proposer affirms that they are duly authorized to execute this Proposal, that this company, corporation, firm, partnership or individual has not prepared this Proposal in collusion with any other Proposer, and that the contents of this Proposal as to prices, terms and conditions thereof have not been communicated by the undersigned Proposer, nor by Proposer’s employee, affiliate, representative, partner, subcontractor, or agent, to any other individual or entity engaged in this type of business prior to the official opening of this RFP.

Company Name: _____

Signature of Company Officer: _____

Company Officer Printed Name: _____

Title _____

8.0 Suspension or Debarment Certificate

Non-Federal entities are prohibited from contracting with or making subcontract awards under covered transactions to parties that are suspended or debarred or whose principals are suspended or debarred. Covered transactions include procurement for goods or services equal to or in excess of \$100,000.00. Contractors receiving individual awards for \$100,000.00 or more and all subcontract recipients must certify that the organization and its principals are not suspended or debarred.

By submitting this offer and signing this certificate, Proposer certifies that no suspension or disbarment is in place, which would preclude receiving a federally funded contract under the Federal OMB, A-102, Common Rule.

Vendor Name _____ Date _____

Signature of Company Officer: _____

Company Officer printed name: _____

E-mail Address _____

9.0 Conflicts of Interest

Texas Ethics Commission adopted the Conflict of Interest Questionnaire (Form CIQ) pursuant to Texas Local Government Code Chapter 176, as amended. For questions about these forms, please see Texas Ethics Commission at:

<https://www.ethics.state.tx.us/forms/CIQ.pdf>

Proposer shall answer each question on Form CIQ, by State of Texas, in relation to the following individuals and submit a completed form with its Proposal:

Local Government Officer	Title
Dudley Wait	President
Tim Clark	Treasurer
David Reiley	Vice President
Ken Greenwald	Secretary
Donna Dodgen	Asst. Secretary
Mayor Don Keil, Seguin	Ex-Officio
David Scagliola	Ex-Officio
Amber Briggs Beard	General Manager
Patrick Lindner	Attorney

10.0 Disclosure of Interested Parties

Prior to entering into a Contract that is over one million dollars in value, Proposer must submit a “Certificate of Interested Parties” Form, in accordance with Texas Government Code Section 2252.908, as amended. Within 30 days of receipt of the form, the Owner must submit a copy to the Texas Ethics Commission. Form will be provided.

Form **W-9**
(Rev. October 2007)
Department of the Treasury
Internal Revenue Service

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, if different from above	
Check appropriate box: <input type="checkbox"/> Individual/Sole proprietor <input type="checkbox"/> Corporation <input type="checkbox"/> Partnership <input type="checkbox"/> Limited liability company. Enter the tax classification (D=disregarded entity, C=corporation, P=partnership) ▶ <input type="checkbox"/> Exempt payee <input type="checkbox"/> Other (see instructions) ▶	
Address (number, street, and apt. or suite no.)	Requester's name and address (optional)
City, state, and ZIP code	
List account number(s) here (optional)	

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on Line 1 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.

Social security number
or
Employer identification number

Note. If the account is in more than one name, see the chart on page 4 for guidelines on whose number to enter.

Part II Certification

Under penalties of perjury, I certify that:

- 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
- 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
- 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:

- Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),
- Certify that you are not subject to backup withholding, or
- 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,

STATEMENT OF PROPOSER’S QUALIFICATIONS

- 1. By signing and submitting this Proposal, Proposer acknowledges that they have inspected Specifications, are capable and willing to perform and/or provide required services and/or products, and shall complete this project within the amount of time and dollar amount specified. Undersigned certifies that prices contained in this Proposal have been carefully checked and submitted as correct and final. All unit prices include cost of delivery. Undersigned is authorized to bind themselves or entity they represent to a contract.

_____ An individual proprietorship _____ A partnership

_____ A corporation chartered under the laws of the State of _____, acting by its officers pursuant to its by-laws or a resolution of its Board of Directors

Signature: _____

Printed Name: _____

Title: _____

Date: _____

- 2. Years in business under present business name: _____

- 3. Years of experience in construction work of the type called for in this contract as:

A General Contractor _____, A Subcontractor _____

- 4. What similar projects has your organization completed? List most recent FIRST.

PROJECT NO. 1:

Name of Project: _____

Location: _____

OWNER’s Name and Address: _____

OWNER’s Contact Person (Print): _____

Phone/Fax No.: _____ / _____

Initial Contract Price: _____

Final Contract Price: _____

Contract Start Date: _____ (Date of Notice To Proceed)

Contract Time: _____ () Calendar Days () Working Days

Contract Substantial Completion Date: _____

Actual Substantial Completion Date: _____

If contract time extensions were added to the contract as a result of Bidder’s responsibilities, provide a short explanation of each.

Project Description and why it is comparable to this Contract:

PROJECT NO. 2:

Name of Project: _____

Location: _____

OWNER’s Name and Address: _____

OWNER’s Contact Person (Print): _____

Phone/Fax No.: _____ / _____

Initial Contract Price: _____

Final Contract Price: _____

Contract Start Date: _____ (*Date of Notice To Proceed*)

Contract Time: _____ () *Calendar Days* () *Working Days*

Contract Substantial Completion Date: _____

Actual Substantial Completion Date: _____

If contract time extensions were added to the contract as a result of Bidder’s responsibilities, provide a short explanation of each.

Project Description and why it is comparable to this Contract:

5. What current projects does your organization have under way as of this date?

Contract Amount	Name of Project & Type of Work	Date to be Completed & Percentage Complete	Owner’s Name & Phone Number	Engineer’s Name & Phone Number

6. Have you ever failed to complete any work awarded to you?

Yes No. If “Yes”, state where and why. _____

7. Are you at present in litigation or lawsuits involving construction work of any type?

Yes No. If “Yes”, explain: _____

8. Explain in detail the manner in which you have inspected the work proposed in this contract:

9. Explain in detail your plan or layout for performing the work proposed in this contract:

10. If this contract is awarded to you, your company’s **administrative manager** for the work will be _____, and your **resident construction superintendent** will be _____.

_____.

11. What experience in this type of work does the individual designated as superintendent above possess? Please list 5 similar projects completed in the last 2 years.

12. What portions of work do you intend to sublet, and what percentage of entire PROPOSAL amount will be performed by subcontractors?

13. What equipment do you own that is available for the proposed work?

Quantity	Description, Size, Capacity, Etc.	Condition	Years in Service	Present Location

14. Have you received firm offers for all major items of material and/or equipment within the price used in preparing your proposal?

Yes No

If not, state what items/materials do not have firm costs.

The signatory of this questionnaire guarantees the truth and accuracy of all statements herein made and all answers herein expressed.

Dated this ____ day of _____, ____.

By: _____

Title: _____

STATE OF _____

COUNTY OF _____

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

Notary Public

My commission expires: _____

**AGREEMENT
BETWEEN OWNER AND CONTRACTOR**

This Agreement Between Owner and Contractor (“Agreement”) is made and entered into as of the ____ day of _____, _____ by and between Owner (hereinafter defined) and Contractor (hereinafter defined) for the construction of the Project (hereinafter defined):

“OWNER”:
Schertz Seguin Local Government Corporation
108 W. Mountain
Seguin, Texas 78155

“CONTRACTOR”:
[name of Contractor]
[address]
[phone and fax numbers]

“PROJECT”:

[project name]

“ENGINEER” for the Project is
Walker Partners, LLC
823 Washington Avenue
Waco, Texas 76701
254.714.1402

1.0 WORK OF THIS CONTRACT

Unless otherwise provided in Contract Documents, the CONTRACTOR shall be responsible for performing or causing to be performed all Work including labor and materials, necessary to build, construct, erect and equip the Project in accordance with Contract Documents and, at its own cost and expense, to furnish all materials, supplies, machinery, equipment, tools, superintendence, labor, insurance, and other accessories and services necessary to complete said construction, in accordance with Contract Documents and for Contract Price defined in Section 3.0 of this Agreement .

Contract Documents for this Project include this Agreement and the following documents:

- Modifications
- General Conditions
- Specifications bearing title **SSLGC Contract 3 - 36" Pipeline**, consisting of Divisions as listed in Table of Contents of Project Manual, dated June 2020.
- Drawings consisting of a cover sheet and sheets numbered G-1 through I-1, inclusive with each sheet bearing the following general title: **SSLGC Contract 3 - 36" Pipeline**
- Addenda
- Performance Bond (Section 00 61 00)
- Payment Bond (Section 00 62 00)
- Proposal Form (Section 00 30 00)
- Conflict of Interest Questionnaire (Section 00 30 00-A)
- Statement of Proposers Experience (Section 00 40 00)
- Vendor Compliance with Reciprocity of Non-Resident Bidders (TWDB-0459) (Section 00 50 03)

- Contractor’s Act of Assurance (ED-103) (Section 00 50 01)
- Contractor’s Act of Assurance Resolution (ED-104) (Section 00 50 02)
- TWDB-0552 Supplementary Conditions (Section 00 70 03)
- Notice of Award (Section 00 51 00)
- Notice to Proceed (Section 00 52 00)
- Contractor’s Certificate of Insurance
- All other documents listed in Project Manual dated June 2020 not listed above

In addition to the provisions set forth in other Contract Documents, including but not limited to Section 3.03 of General Conditions, in the event that a conflict between any of provisions within Contract Documents exist, OWNER shall determine which provision controls. If CONTRACTOR identifies conflict, CONTRACTOR shall notify Owner’s representative of conflict, in writing.

2.0 CONTRACT TIME AND COMPLETION

§ 2.1 Date of commencement of the Work shall be stated in a Notice to Proceed issued by OWNER.

§ 2.2 Contract Time

§2.2.1 Contract Time shall be measured from date of commencement.

§2.2.2 Time is of the essence in all phases of Work. Additionally, time limits and periods of time stated in Contract Documents are of the essence. It is specifically understood and agreed to by and between OWNER and CONTRACTOR that time is of the essence in the substantial and final completion of the Work, and that failure to substantially complete or finally complete the Work within designated period, or as it may be extended, shall be construed as a breach of this Agreement.

§ 2.3 Substantial Completion

CONTRACTOR shall achieve Substantial Completion, as that term is defined in the Contract Documents, of the entire Work not later than 540 calendar days from date of commencement, subject to any adjustments of this Contract Time as provided in Contract Documents.

§ 2.4 Liquidated Damages

CONTRACTOR acknowledges and recognizes that OWNER is entitled to full and beneficial occupancy and use of completed Work following expiration of Contract Time. CONTRACTOR further acknowledges and agrees that, if CONTRACTOR fails to achieve Substantial Completion of any portion of the Work within Contract time, the OWNER will sustain actual damages as a result of such failure. OWNER and CONTRACTOR agree that exact amount of such damages will be difficult, if not impossible, to ascertain. Therefore, OWNER and CONTRACTOR agree that, if CONTRACTOR should fail, or refuse to achieve Substantial Completion of Work by date of Substantial Completion, subject to extensions of Contract Time granted by OWNER, then CONTRACTOR agrees to pay OWNER sum of one thousand dollars (\$1,000) for each day in which such Work is not Substantially Complete, not as penalty, but as a reasonable estimation of the damages (“Liquidated Damages”) that would be suffered by OWNER as a result of delay for each and every calendar day that CONTRACTOR shall have failed to achieve Substantial Completion of Work as required herein. Liquidated Damages shall be in lieu of any and all other damages which may be incurred by OWNER as a result of failure of CONTRACTOR to achieve Substantial Completion of Work within Contract Time.

§ 2.5 Final Completion

§ 2.5.1 Timely Final Completion is an essential condition of this Agreement. CONTRACTOR agrees to achieve Final Completion of the Work within 60 days of the designated or extended date of Substantial Completion.

§ 2.5.2 Final Completion means actual completion of the Work, including any extras or Change Orders reasonably required or contemplated under the Contract Documents other than warranty work that may be required pursuant to the Contract Documents.

3.0 CONTRACT PRICE

§ 3.1 OWNER shall pay the CONTRACTOR the Contract Price in current funds for the CONTRACTOR’s proper and complete performance of the Work and all of CONTRACTOR’s obligations under the Contract Documents. Contract Price shall be [insert written total] ([insert numerical total]), subject to additions and deductions as provided in the Contract Documents.

§ 3.2 Contract Price is based upon the following alternates, if any, which are described in Contract Documents and are hereby accepted by OWNER:

[alternate __, if any]
 [alternate __, if any]

§ 3.3 Unit prices, if any:

Item	Units and Limitations	Price Per Unit (\$0.00)
[unit price item]	[unit]	[price]

4.0 PAYMENT

§ 4.1 APPLICATIONS FOR PAYMENT

§ 4.1.1 Subject to any applicable provisions set forth in other Contract Documents, each Application for Payment shall be based on the most recent schedule of values (“Schedule of Values”) submitted by the CONTRACTOR in accordance with the Contract Documents. The Schedule of Values shall allocate the entire Contract Price among the various portions of the Work. The Schedule of Values shall be prepared in such form and supported by such data to substantiate its accuracy as the ENGINEER and OWNER may require. The Schedule of Values, as approved by the ENGINEER or OWNER, shall be used as a basis for reviewing the CONTRACTOR’s Applications for Payment. As the Work progresses the Schedule of Values may be revised as the OWNER and ENGINEER, in their sole discretion, may deem appropriate to reflect the sequencing of the Work and the values to be assigned to each portion of the Work included in the Schedule of Values.

§ 4.1.2 Applications for Payment shall show the percentage of completion of each portion of Work as of end of period covered by the Application for Payment. Subject to the provisions of General Conditions, CONTRACTOR shall prepare its Application for Payment for a progress payment as of last day of each calendar month and submit it, with the required number of copies, to Engineer for review. Total value of work completed to date shall be based on actual or estimated quantities of Work completed and, if applicable, on the unit prices contained in the Agreement (or approved schedule of values relating to lump sum bids) and adjusted by approved Change Orders. Value of materials properly stored on the site shall be based upon the estimated quantities of such materials and the invoice prices. Copies of all invoices shall be available for inspection by ENGINEER.

§ 4.1.3 Subject to other provisions of Contract Documents, the amount of each progress payment shall be computed as follows:

- .1 Take that portion of Contract Price properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of Contract Price allocated to that portion of Work in Schedule of Values, less retainage of

five percent (5.00%). Pending final determination of cost to OWNER of changes in Work, amounts not in dispute shall be included;

- .2 Add that portion of Contract Price properly allocable to materials and equipment delivered and suitably stored at Site for subsequent incorporation in the completed construction (or, if approved in advance by OWNER, suitably stored off Site at a location agreed upon in writing), less retainage of five percent (5.00%);
- .3 Subtract the aggregate of previous payments made by OWNER; and
- .4 Subtract amounts, if any, for which ENGINEER has withheld or nullified an Application for Payment.

§ 4.1.4 Contractor shall be responsible for the care and protection of all materials and Work upon which payments have been made until final acceptance of such Work and materials by the Owner. Such payments shall not constitute a waiver of the right of the OWNER to require the fulfillment of all terms of Contract Documents and the delivery of all improvements embraced in Contract Documents complete and satisfactory to OWNER in all respects.

§ 4.1.5 Reduction or limitation of retainage, if any, shall be as follows: Reduction or limitation of retainage shall be at OWNER's sole discretion.

§ 4.1.6 Except with the OWNER'S prior approval, the CONTRACTOR shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 4.2 FINAL PAYMENT

§ 4.2.1 Final payment, constituting entire unpaid balance of Contract Price, shall be made by OWNER to CONTRACTOR when:

- .1 CONTRACTOR has fully performed its obligations under Contract Documents, except for CONTRACTOR'S responsibility to correct Work as provided in General Conditions, and to satisfy other requirements, if any, which extend beyond Final Payment; and
- .2 a letter of Final Acceptance has been issued by ENGINEER and accepted by OWNER.
- .3 CONTRACTOR has satisfied all of conditions to receipt of Final Payment as set forth in General Conditions.

§ 4.2.2 OWNER's final payment to CONTRACTOR shall be made no later than 30 days after the Work has been completed and accepted by OWNER, in writing, following issuance of ENGINEER'S final Certificate for Payment:

This Agreement is entered into as of day and year written above ("Date of Execution" or "Effective Date of Agreement"):

OWNER
SCHERTZ SEGUIN LOCAL GOVERNMENT
CORPORATION

CONTRACTOR
(NAME OF CONTRACTOR)

By: _____

By: _____

Name: _____

Name: _____

Title: _____

Title: _____

CONTRACTOR'S ACT OF ASSURANCE RESOLUTION

I hereby certify that it was RESOLVED by a quorum of the directors of the _____ (Name of Corporation), meeting on the _____ day of _____, 20____, that:

Authorized Representative(s):

be, and hereby is/are authorized to act on behalf of _____ (Name of Corporation), as its representative in all business transactions conducted in the State of Texas, and;

That all above resolution was unanimously ratified by the Board of Directors at said meeting and that the resolution has not been rescinded or amended and is now in full forces and effect; and;

In authentication of the adoption of this resolution, I subscribe my name and affix the seal of the Corporation this _____ day of _____, 20____.

_____(Secretary)

[SEAL]

VENDOR COMPLIANCE WITH RECIPROCITY ON NON- RESIDENT BIDDERS

Texas Government Code Section 2252.002 provides that in order for nonresident bidders to be awarded a governmental contract, the bidder must bid projects for construction, improvements, supplies, or services in Texas at an amount lower than the lowest Texas resident bidder by the same amount that a Texas resident bidder would be required to underbid the nonresident bidder in order to obtain a comparable contract in the nonresident bidder's state. A nonresident bidder is a person, including a contractor, whose principal place of business or corporate office is outside of the state of Texas. This requirement does not apply to a contract involving Federal funds. The appropriate blanks in Section A must be filled out by all nonresident bidders in order for your bid to meet specifications. The failure of a nonresident bidder to do so will automatically disqualify that bidder. Resident bidders must check the blank in Section B.

A. Non-resident vendors in _____ (give state), our principal place of business, are required to be _____ percent lower than resident bidders by state law. A copy of the statute is attached.

Non-resident vendors in _____ (give state), our principal place of business, are not required to underbid resident bidders.

B. Our principal place of business or corporate office is in the state of Texas: _____.

BIDDER:

Company

City

State

Zip

By (print name)

Signature

Title (print)

THIS FORM MUST BE RETURNED WITH THE BID

NOTICE OF AWARD

Dated: _____, _____

TO: _____

ADDRESS: _____

PROJECT:

OWNER'S CONTRACT NO:

CONTRACT FOR:

You are notified that your Proposal dated _____, 2020 for above contract has been considered. You are apparent Successful Bidder and have been awarded a contract for 36" Pipeline including the following:

See attached Proposal.

Contract Price is: \$ _____ .

3 copies and 1 electronic file (pdf) of the proposed Contract Documents (except Drawings) accompany this Notice of Award.

3 copies and 1 electronic file (pdf) of the conformed construction drawings will be delivered or otherwise made available to you immediately.

You must comply with the following conditions precedent within 10 calendar days of date of this Notice of Award.

1. You must deliver to Owner a fully executed version of Agreement including all Contract Documents. Each of Contract Documents must bear your original signature.
2. You must deliver with executed Agreement Contract Security (Bonds) as specified in RFP, General Conditions, and Supplementary Conditions.
3. You must deliver to Owner Certificates of Insurance with executed Contract. Within Five days of Contract execution, you must deliver a designation of work to be performed by your own forces and a list of subcontractors in accordance with RFP.

Failure to comply with these conditions within time specified will entitle Owner to consider your bid in default, to annul this Notice of Award and to declare your Proposal Security forfeited.

Within 10 days after you comply with above conditions, Owner will return to you one fully signed counterpart of Agreement with Contract Documents attached.

SCHERTZ SEGUIN LOCAL GOVERNMENT CORPORATION
(OWNER)

By: _____
(AUTHORIZED SIGNATURE)

(TITLE)

(DATE)

CONCURRENCE OF AWARD
(CONTRACTOR)

By: _____
(AUTHORIZED SIGNATURE)

(DATE)

NOTICE TO PROCEED

Dated: _____,

TO: _____

ADDRESS: _____

PROJECT:

You are notified that Contract Times under the above Contract will commence to run _____.

By that date, you are to start performing your obligations under Contract Documents. In accordance with Agreement, dates of Substantial Completion and Completion and readiness for final payment are:

_____ for substantial completeness of entire project; and

_____ for Completion and Acceptance of entire project.

Before you may start and Work at Site, General Conditions provide that you deliver to Owner (with copies to Engineer and other identified additional insureds) certificates of insurance which is required to be purchased and maintained in accordance with Contract Documents.

**SCHERTZ SEGUIN LOCAL GOVERNMENT CORPORATION
(OWNER)**

By: _____
(AUTHORIZED SIGNATURE)

(TITLE)

(DATE)

**CONCURRENCE OF NOTICE TO PROCEED
(CONTRACTOR)**

By: _____
(AUTHORIZED SIGNATURE)

(DATE)

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

That we, _____, as Principal herein, and [Surety], a corporation organized and existing under the laws of the State of [Surety's state of incorporation] and who is authorized and admitted to issue surety bonds in the State of Texas, as surety, are held and firmly bound unto Schertz Seguin Local Government Corporation, a local government corporation in the State of Texas with its principal location of 108 W. Mountain., Seguin, Texas 78155, Obligee herein, in the sum of [printed amount of bond] Dollars (\$[numeric amount of bond]) for the payment of which sum we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has entered into a certain written contract with Obligee dated the ____ day of _____, 20____, herein referred to as "Contract" and incorporated herein and made a part hereof for all purposes, for the construction of the following project:

SSLGC - 36" Pipeline.

NOW, THEREFORE, the condition of this obligation is such, if the said Principal shall faithfully perform the work in accordance with the plans, specifications, and other Contract Documents and shall fully indemnify and hold harmless Obligee from all costs and damages which Obligee may suffer by reason of Principal's failure to perform the Work in conformity with the Contract Documents, and reimburse and repay Obligee for all outlay and expense that Obligee may incur in making good such default, then this obligation shall be void; otherwise, to remain in full force and effect. Whenever Contractor shall be declared by Obligee to be in default under Contract, Surety shall, upon request of Obligee and within seven (7) calendar days from receipt of Obligee's notice of Contractor's default, commence and thereafter complete performance of Contractor's obligations under Contract. This Bond covers all contractual obligations of Contractor under Contract, including, without limitation, the indemnity, warranty and guaranty obligations. Surety stipulates and agrees that no change, extension of time, alteration, omission, addition or other modification to terms of any of Contract will affect its obligations on this bond, and it hereby waives notice of any such changes, extensions of time, alterations, omissions, additions, or other modifications, to Contract or to related subcontracts, purchase orders or other obligations, and any notices provided in such regard shall not create as to any party a duty related thereto. The penal limit of this bond shall automatically be increased by the amount of any change order, supplemental agreement or amendment which increases the price of Contract.

Performance Bond shall be in a penal sum of not less than 100% of the Contract Price and remain in effect for one year beyond the date of approval by Engineer of the political subdivision. Without limitation Performance Bond guarantees that work done under Contract will be completed and performed according to approved Drawings and Specifications and in accordance with sound construction principles and practices.

PROVIDED, HOWEVER, that this bond is executed pursuant to Chapter 2253 of Texas Government Code, as amended, and all rights and liabilities on this bond shall be determined in accordance with provisions of such statute, to the same extent as if it were copied at length herein. All notices shall be delivered in writing to the addresses shown below or to addresses provided in Contract Documents. Contractor shall utilize a surety company that is authorized to do business in Texas in accordance with Surety Bonds and Related Instruments, Chapter 3503 of the Insurance Code and provide proof thereof.

IN WITNESS WHEREOF, the duly authorized representatives of Principal and Surety have executed this instrument.

SIGNED and SEALED this _____ day of _____, 20____.

The date of bond shall not be prior to date of Contract.

PRINCIPAL

ATTEST:

By: _____

(Principal) Secretary

Name: _____

(S E A L)

Title: _____

Address: _____

Witness as to Principal

Telephone Number: _____

SURETY

ATTEST:

By: _____

Secretary

Name: _____

Attorney in Fact

(S E A L)

Address: _____

Witness as to Surety

Telephone Number: _____

An original copy of Power of Attorney shall be attached to Bond by the Attorney-in-Fact.

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS:

That we, _____, as Principal herein, and [Surety], a corporation organized and existing under the laws of the State of [Surety's state of incorporation] and who is authorized and admitted to issue surety bonds in the State of Texas, as surety, are held and firmly bound unto Schertz Seguin Local Government Corporation, a local government corporation in the State of Texas with its principal location of 108 W. Mountain, Seguin, Texas 78155, Obligee herein, in sum of [printed amount of bond] Dollars (\$[numeric amount of bond]) for payment of which sum we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents:

WHEREAS, Principal has entered into a certain written contract with Obligee dated _____ day of _____, 20____, which Contract is hereby referred to herein as "Contract" and is incorporated herein to same extent as if copied at length, for the following project:

SSLGC - 36" Pipeline

NOW, THEREFORE, condition of this obligation is such, that if the said Principal shall directly or indirectly timely make payment to each and every claimant (as defined in Chapter 2253, Texas Government Code, as amended) supplying labor or materials in the prosecution of the work under the Contract, then this obligation shall be void; otherwise, to remain in full force and effect. *This obligation may be enforced by Obligee in the event of bankruptcy or default by Principal in payments to suppliers of labor or materials in the prosecution of work under Contract, in either of which events the Surety shall make such payments as Principal has failed to pay and as may be required to complete the work under Contract.* Surety stipulates and agrees that no change, extension of time, alteration, omission, addition or other modification to the terms of Contract will affect its obligations on this bond, and it hereby waives notice of any such changes, extensions of time, alterations, omissions, additions, or other modifications, to Contract or to related subcontracts, purchase orders or other obligations, and any notices provided in such regard shall not create as to any party a duty related thereto.

Payment bonds shall be in a penal sum of not less than 100% of Contract Price and remain in effect for one year beyond the date of approval by the Engineer of political subdivision.

PROVIDED, HOWEVER, that this bond is executed pursuant to Chapter 2253 of Texas Government Code, as amended, and all rights and liabilities on this bond shall be determined in accordance with the provisions of said statute, to same extent as if it were copied at length herein. All notices shall be delivered in writing to addresses shown below or to addresses provided in Contract Documents. Contractor shall utilize a surety company that is authorized to do business in Texas in accordance with Surety Bonds and Related Instruments, Chapter 3503 of the Insurance Code and provide proof thereof.

IN WITNESS WHEREOF, the duly authorized representatives of the Principal and the Surety have executed this instrument.

SIGNED and SEALED this _____ day of _____, 20_____.

The date of bond shall not be prior to date of Contract.

ATTEST:

(Principal) Secretary

(S E A L)

Witness as to Principal

PRINCIPAL

By: _____

Name: _____

Title: _____

Address: _____

Telephone Number: _____

SURETY

By: _____

Name: _____

Attorney in Fact

Address: _____

Telephone Number: _____

ATTEST:

Secretary

(S E A L)

Witness as to Surety

An original copy of Power of Attorney shall be attached to Bond by the Attorney-in-Fact.

**STANDARD GENERAL CONDITIONS
OF CONSTRUCTION CONTRACT**

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1. DEFINITIONS AND TERMINOLOGY

1.1. *Defined Terms*

- A. Wherever used in Bidding Requirements or Contract Documents, a term printed with initial capital letters, including term's singular and plural forms, will have meaning indicated in definitions below or as defined in Contract Documents. In addition to terms specifically defined, terms with initial capital letters in Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to opening of Bids which clarify, correct, or change Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—Written instrument, entitled Agreement Between Owner and Contractor, executed by Owner and Contractor, that sets forth Contract Price and Contract Times, identifies parties, and designates the specific items that are Contract Documents.
 3. *Application for Payment*—Form acceptable to Owner which is to be used by Contractor during the course of Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by Contract Documents, and as reasonably required by Owner and Engineer.
 4. *Bid*--Offer or proposal of a Bidder submitted on the prescribed form setting forth prices for Work to be performed.
 5. *Bidder*--Individual or entity who submits a Bid directly to Owner.
 6. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in Work or an adjustment in Contract Price or Contract Time, or other revision to Contract Documents, issued on or after Effective Date of Agreement.
 7. *Change Proposal*—A written request by Contractor, duly submitted in compliance with procedural requirements set forth in Contract Documents, seeking an adjustment in Contract Price or Contract Time, or both.
 8. *Claim*—A demand or assertion duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Time, or both; contesting an initial decision by Engineer concerning the requirements of Contract Documents or acceptability of Work under Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to terms of Contract. A demand for money or services by a third party is not a Claim.
 9. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. ("CERCLA"); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5501 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. ("RCRA"); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
 10. *Contract*--Entire and integrated written agreement between Owner and Contractor concerning Work. Contract supersedes prior negotiations, representations, or agreements, whether written or oral.
 11. *Contract Documents*-- Those items so designated in Agreement. Only printed or hard copies of items listed in Agreement are Contract Documents. Approved Shop Drawings, other Contractor's submittals, and any reports of subsurface and physical conditions are not Contract Documents.
 12. *Contractor*--Individual or entity with whom Owner has entered into Agreement.

13. *Drawings*--That part of 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.
14. *Effective Date of the Agreement*—Date, indicated in Agreement, on which Agreement becomes effective.
15. *Engineer*—Project Engineer retained by Owner as identified on page 1 of Agreement.
16. *Field Order*—A written order issued by Engineer which requires minor changes in Work but does not change Contract Price or Contract Time.
17. *Hazardous Environmental Condition*—Presence at Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. Presence at Site of materials that are necessary for execution of Work, or that are to be incorporated in Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and requirements of Contract, does not establish a Hazardous Environmental Condition.
18. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
19. *Milestone*—A principal event in performance of Work that Contract Documents require Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all Work.
20. *Modification*-A Modification is (1) a written amendment to Agreement signed by both parties (2) a Change Order (3) a Work Change Directive or (4) a Field Order.
21. *Owner* – Local entity contracting for construction services as identified on page 1 of Agreement.
22. *Project*--Total construction of which Work to be performed under Contract Documents may be whole, or a part.
23. *Project Manual*—Written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplemental General Conditions, and Specifications. Contents of Project Manual may be bound in one or more volumes.
24. *Resident Project Representative*—Authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, term Resident Project Representative or “RPR” includes any assistants or field staff of Resident Project Representative.
25. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of Work and that establish standards by which such portion of Work will be judged.
26. *Site*—Lands or areas indicated in Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for use of Contractor.
27. *Specifications*--That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
28. *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.
29. *Substantial Completion*—Time at which Work (or a specified part thereof) has progressed to point where, in opinion of Engineer and Owner, Work (or a specified part thereof) is sufficiently complete, in accordance with Contract Documents, so that Work (or a specified part thereof) can be utilized for purposes for which it is intended. Terms “Substantially Complete” and “Substantially Completed” as applied to all or part of Work refer to Substantial Completion thereof.
30. *Successful Bidder*—Bidder whose Bid the Owner accepts, and to which Owner makes an award of contract, subject to stated conditions. *Supplementary Conditions*--That part of the Contract Documents which amends or supplements these General Conditions.

31. *Technical Data*—Those items expressly identified as Technical Data in Contract Documents, with respect to either (a) subsurface conditions at Site, or physical conditions relating to existing surface or subsurface structures at Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at Site. If no such express identifications of Technical Data have been made with respect to conditions at Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at Site that are set forth in any geotechnical or environmental report prepared for Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at Site under Paragraphs 5.03, 5.04, and 5.06.
32. *TWDB* – Executive Administrator of Texas Water Development Board, or other person who may be at time acting in capacity or authorized to perform functions of such Executive Administrator, or the authorized representative thereof.
33. *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 but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
34. *Work*—Entire construction or various separately identifiable parts thereof required to be provided under Contract Documents. Work includes and is result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by Contract Documents.
35. *Work Change Directive*—A written directive to Contractor issued on or after Effective Date of Agreement, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in Work.

1.2. *Terminology*

- A. Words and terms discussed in the following paragraphs are not defined but, when used in Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Defective*:
 1. Word “defective,” when modifying word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to Contract Documents; or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in Contract Documents; or
 - c. has been damaged prior to Engineer’s recommendation of final payment unless responsibility for the protection thereof has been assumed by Owner, in writing, at Substantial Completion.
- C. *Furnish, Install, Perform, Provide*:
 1. 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. 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. 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. If Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,”

“perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment in compliance with Contract Documents, complete and ready for intended use.

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

2. PRELIMINARY MATTERS

2.1. Delivery of Bonds and Evidence of Insurance

- A. *Bonds:* Contractor shall deliver to Owner such bonds as Contractor may be required to furnish within 10 days of date on which Contractor signs Agreement. Contractor shall not be permitted to commence performance until bonds have been delivered even though Contract Time may have commenced.
- B. *Evidence of Contractor's Insurance:* When Contractor delivers executed counterparts of Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in Supplementary Conditions or elsewhere in Contract Documents), certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.

2.2. Copies of Documents

- A. Owner shall furnish to Contractor three printed copies of the Agreement (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at cost of reproduction.
- B. Owner shall maintain and safeguard at least one original printed record version of the Agreement, including Drawings and Specifications signed and sealed by Engineer and other design professionals.

2.3. Before Starting Construction

- A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (or as otherwise specifically required by the Contract Documents), Contractor shall submit to the Owner and Engineer:
 - 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing various stages of Work, including any Milestones specified in Contract Documents;
 - 2. a preliminary Schedule of Submittals; and
 - 3. a preliminary Schedule of Values (“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. The preliminary Schedule of Values submitted by the Contractor shall include a reasonable estimation of the value of each item included and shall not contain disproportionate values assigned to any item or items.

2.4. Pre-construction Conference

- A. Before any Work at the Site is started and after the schedules described in Paragraph 2.03 A above have been submitted, a pre-construction conference attended by Owner, 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 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.

2.5. Initial Acceptance of Schedules

- A. At pre-construction conference, schedules submitted in accordance with Paragraph 2.03.A will be reviewed. Contractor shall have an additional 10 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. Progress Schedule shall provide for an orderly progression of Work to completion within Contract Time and must be acceptable to Owner and Engineer.
 - 2. Contractor's Schedule of Submittals shall provide for a workable arrangement for reviewing and processing the required submittals and must be acceptable to Owner and Engineer. Progress

Schedule shall not exceed time limits current under Contract Documents, shall be revised at appropriate intervals as required by conditions of Work and Project, and shall provide for expeditious and practical execution of Work. Progress Schedule shall be in a detailed critical path method or other format satisfactory to Owner and Engineer and shall provide a graphic representation of all the significant activities and events that will occur during the performance of Work, identify each phase of construction in occupancy and set forth dates that are critical in insuring timely and orderly completion of Work in accordance with the requirements of Contract Documents.

3. Contractor's Schedule of Values shall provide for a reasonable allocation of Contract Price to the component parts of Work and shall be acceptable in form and substance to Owner and Engineer.

2.6. *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in Contract Documents, Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.
- B. When transmitting items in electronic media or digital format, transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from recipient's use of software application packages, operating systems, or computer hardware differing from those used in drafting or transmittal of the items.

2.7. *Designation of Authorized Representatives*

- A. Prior to or within three (3) days of the Notice to Proceed, the Owner and Contractor shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract Documents. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract Documents, and otherwise act on behalf of each respective party.

3. DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.1. *Intent*

- A. Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in Contract Documents, if there is a discrepancy between the electronic or digital versions of Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.
- D. Contract Documents supersedes prior negotiations, representations, and agreements, whether written or oral.

3.2. *Reference Standards*

- A. Standards Specifications, Codes, Laws and Regulations
 1. Reference in Contract Documents to standard specifications, manuals, reference standards, 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, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in Contract Documents.
 2. No provision of any such standard specification, manual, reference standard, 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 part of Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of Work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of Contract Documents prepared by or for Engineer.

3.3. *Reporting and Resolving Discrepancies*

A. *Review of Contract Document:*

1. Prior to commencing Work, Contractor shall review Contract Documents for the purpose of discovering any conflict, error, ambiguity or discrepancy in Contract Documents.

B. *Reporting Discrepancies:*

1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.
2. *Discovery of Discrepancies in Contract Documents:* If, before or during the performance of Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within Contract Documents, or between Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to Contract Documents issued pursuant to Paragraph 11.01.
3. Should Contractor perform the Work after discovery of such a conflict without reporting the conflict or before receipt of a clarification or interpretation by Engineer or if, using Contractor's reasonable expertise and experience, Contractor should have reasonably discovered any conflict, error, ambiguity or discrepancy that might exist in Contract Documents, Contractor will be solely liable for any correction or other measures that may be required to overcome the conflict or bring the Work into compliance with Contract Documents.

C. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in Contract Documents, the provisions of the part of Contract Documents prepared by or for Engineer shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of Contract Documents and:
 - a. provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
2. provisions of any Laws or Regulations applicable to performance of Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation). Subject to provisions of Section 3.03 C.1 above, any discrepancies or conflicts within each of Contract Documents themselves or with each other shall be resolved by applying the following order of precedence to each of Contract Documents.
 - a. Modifications
 - b. Agreement
 - c. General Conditions
 - d. Specifications
 - e. Drawings
 - f. Any other Contract Documents.
3. In regard to Drawings and Specifications, figures shall govern over scaled measurements; large scale drawings shall govern over small scale drawings; descriptive writing shall govern over legends indicating material or condition; and the provision or interpretation that results in the greater quantity and/or quality of Work or material shall prevail.

3.4. *Requirements of the Contract Documents*

- A. During performance of Work and until final payment, Contractor shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents, or relating to the acceptability of the Work under Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents.
- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding, unless Contractor appeals by submitting a Change Proposal.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.
- D. Owner and the Contractor agree that the TWDB Conditions as required in TWDB-0552 apply to the work eligible for Texas Water Development Board assistance to be performed under the Contract Documents and these clauses supersede any conflicting provisions of the Contract Documents.
- E. Funding for this Project is expected to be provided in part by Texas Water Development Board. Neither the State of Texas, nor any of its departments, agencies or employees is, or will be, a party to the Agreement or any lower tier contract. Agreement is subject to applicable provisions 31 TAC Chapter 371 (DWSRF) or 375 (CWSRF) in effect on the date of assistance award for this Project.

4. **COMMENCEMENT AND PROGRESS OF WORK**

4.1. *Commencement of Contract Times; Notice to Proceed*

- A. Contract Times will commence upon issuance of a Notice to Proceed by Owner.

4.2. *Commencement of Performance*

- A. Subject to the provisions of Paragraphs 3.02 and 3.03 above, Contractor may commence performance upon receipt of the Notice to Proceed and in accordance with any terms and dates contained therein. No Work shall be done at the Site prior to such date.
- B. Contractor to visually record all areas of proposed construction, to depict existing surroundings of the proposed construction site prior to beginning work. Recording to be in DVD format, recorded with date, time, and locations, and two copies are to be given to the Owner. Contractor is not allowed to proceed with the work in any area until the required DVD is submitted and accepted by the Owner. No direct payment shall be allotted for visually recording proposed construction site. Cost of visual recording is incidental to cost of job. Visually recording shall be in accordance with 01380, except in DVD format, or as follows, if 01380 is not present:
 - 1. Video and Project Photographs - Contractor shall videotape all areas of proposed construction and all areas in the limits of work to be performed, to depict existing surroundings of the proposed construction site, prior to beginning the Work. The only work that may proceed prior to the video is work that may be necessary for the video/photographs (staking, clearing with hand-tools, pruning, mowing, etc.) The video shall be narrated indicating the Station Number and/or site address being observed. When appropriate, the address of the Project should be noted on the photo and in the video. Damage to private property caused prior to the video shall be further detailed. Special attention shall be made to previously damaged driveways, sidewalks, mailboxes, landscaping, lighting, fencing, gates, and roads. The Contractor shall also videotape the gravity sanitary sewer line segments after testing is completed.
 - 2. Tapes to be color DVD digital format, recorded with date, time, and locations, and two (2) copies to be given to Owner. Contractor is not allowed to proceed with the Work in any area until the required DVDs are submitted and accepted by the Owner. Cost of visually documenting of all areas of proposed construction is to be incidental to the cost of the Project unless specifically identified on the bid form. If the Owner or Engineer is not satisfied with the quality or quantity of the photographs or video, no additional amount will be paid to Contractor

to provide photographs or videos acceptable to the Owner or Engineer. No additional time will be granted for delay in construction activities due to unsatisfactory photographs or video.

3. Contractor shall keep a copy of all pre-construction photos in Job Office (if included in Project) or in superintendent's vehicle (if no job office is required) for duration of Project.
4. Construction progress photographs shall be taken by the Contractor as follows:
 - a. Contractor shall provide a minimum of twenty-four (24) photographs per month to depict progress of construction. Time and content of the photographs may be directed by Owner or Engineer. Attention shall be placed on items of interest to the Project (connections to existing utilities, fittings, bends, borings, taps, etc.). Monthly progress photos will be delivered to the Engineer at the monthly progress meetings or submitted with the monthly pay application, whichever is more appropriate. Owner will not approve monthly pay applications without delivery of the monthly progress photos.
 - b. All photographic work shall be done by a qualified photographer acceptable to the Owner and Engineer. Three (3) prints of each photograph shall be furnished promptly to the Engineer, and each print shall have a color glossy finish mounted on a substantial backing. The overall dimensions of each mounted print shall be a minimum of 3"X5" and presented to the engineer using plastic photo sleeves included in a 3-ring binder or printed on glossy photograph paper (for digital images). The outside of the binder shall be clearly labeled on the spine to include the Project name, addresses and/or station numbers included inside, and the date range the photographs were taken. Alternately, a DVD-ROM of the photographs in JPG format can be provided, if an index of the photographs on the DVD-ROM is provided. The resolution of digital images shall not be less than 1024 X 768 pixels.
 - c. The film negatives (or digital files) shall be retained in the files of the photographer until the completion of the Project and then be turned over to the Owner.
 - d. Each photograph shall have attached to the backing or underneath the photo a label, approximately 2-1/4" wide by 1-3/4" high containing thereon in neat lettering: Contractor's name, short description of view, station number, photo number, date and time taken, address (when appropriate) and photographer's firm name. Alternately, a DVD-ROM of the photographs in JPG format can be provided, if an index of the photographs on the DVD-ROM is provided that includes the Contractor's name, short description of view, station number, photo number, date and time taken, address (when appropriate) and photographer's firm name.
 - e. Post-construction photos shall also be taken after restoration of the construction site and repair/replacement of any private property damaged by the Contractor. Post-construction photos shall be taken every 150-200 feet of station, in both directions. Post-construction photos shall be delivered to the Engineer, in accordance with item (b), prior to application for final payment.

4.3. *Reference Points*

- A. If applicable, Owner shall provide engineering surveys, or GPS control points to establish reference points for construction which, in Engineer's judgment, are necessary 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 and Engineer. Contractor shall notify the Engineer, in writing, 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.
- B. Contractor shall note the location of all reference points and controls on a set of red-lined drawings or exhibits to be maintained at all time on Site.

4.4. *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
 1. Contractor shall submit to Engineer for Owner's acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Time.

2. Proposed adjustments in the Progress Schedule that will change the Contract Time shall be submitted in accordance with the requirements of Article 11.
- B. 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, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.
- C. A monthly construction status meeting shall be held at a location selected by the Owner. The recurrence schedule of this meeting shall be established at the Pre-Construction Conference. Contractor shall be responsible to provide a current Progress Schedule at each construction status meeting.

4.5. *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work and such delay, disruption or interference is indisputably proven by Contractor to adversely affect the critical path of the Progress Schedule, then Contractor shall be entitled to an equitable adjustment of the Contract Time. Contractor's entitlement to an adjustment of the Contract Time is also conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Time.
- B. Contractor shall not be entitled to an adjustment in Contract Time for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes listed below not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible and such delay, disruption or interference is indisputably proven by Contractor to adversely affect the critical path of the Progress Schedule, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Time is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Time. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Time under this paragraph include the following:
 1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
 2. Unusual inclement weather;
 3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8);
 4. acts of war or terrorism; or
 5. acts of any governmental entity or courts having jurisdiction over the Project.
- D. Unusual Inclement Weather is defined as a rain event or other related event which occurs at the site in excess of Normal Rainfall during a particular calendar month and is of sufficient magnitude to prevent Contractor from performing units of Work critical to maintaining the Progress Schedule. "Normal Rainfall" compiled by the State climatologist, based on U.S. Weather Bureau Records for Austin, Texas, is considered a part of the calendar day contract, and is not a justification for an extension of time. Listed below are the number of days in each calendar month which constitute Normal Rainfall for such month and for which no compensatory days for rainfall events ("Rain Days") in such months may be claimed:

January	8 days
February	8 days
March	7 days
April	7 days
May	9 days

June	6 days
July	5 days
August	5 days
September	7 days
October	7 days
November	7 days
December	7 days

Rain Days in addition to the baseline rain day determination described above will be measured with the Owner's or Owner's Representative's approval at the nearest operational public weather data collection facility to the site.

- E. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.
- F. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.
- G. Contractor shall not be entitled to an adjustment in Contract Price or Contract Time for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.
- H. Contractor must submit any Change Proposal seeking an adjustment in Contract Time under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.
- I. Contractor expressly waives any right to an adjustment in Contract Price for any event of delay. Contractor's sole remedy for any delay shall be limited to an adjustment in Contract Time.

5. AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.1. *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.
- B. Owner shall provide any easements for ingress and egress necessary for access to the Site.
- C. Contractor, at Contractor's sole cost and expense, shall provide for any additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment for which the Site and any Owner provided easements do not provide.

5.2. *Use of Site and Other Areas*

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

- 1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Owner or Contractor have arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of Contractor's obligations under the Contract Documents or from other actions or conduct of the Contractor or those for which Contractor is responsible.

2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of Contractor's obligations under the Contract Documents, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) **TO THE FULLEST EXTENT PERMITTED BY LAWS AND REGULATIONS, INDEMNIFY AND HOLD HARMLESS OWNER, ITS OFFICERS, DIRECTORS, MEMBERS, PARTNERS, EMPLOYEES, AGENTS, AND CONSULTANTS FROM AND AGAINST ANY SUCH CLAIM, AND AGAINST ALL 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 OR ANY OTHER PARTY INDEMNIFIED HEREUNDER TO THE EXTENT CAUSED DIRECTLY OR INDIRECTLY, IN WHOLE OR IN PART BY, OR BASED UPON, CONTRACTOR'S PERFORMANCE OF CONTRACTOR'S OBLIGATIONS UNDER THE CONTRACT DOCUMENTS, OR BECAUSE OF OTHER ACTIONS OR CONDUCT OF THE CONTRACTOR OR THOSE FOR WHICH CONTRACTOR IS RESPONSIBLE.**

- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent 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 the Work and make it ready for utilization by Owner. At the completion of the Work, Contractor shall remove from the Site and adjacent areas 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 of 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 structures or land to stresses or pressures that will endanger them.

5.3. *Subsurface and Physical Conditions*

- A. Contractor accepts the responsibility to satisfy itself as to the soil conditions and nature and type of geological formations in and through which this Project will be constructed. Such information as may be obtained from the test borings and accompanying notations shown on the plans is merely for the guidance of the Contractor and is not to be construed in any manner as a guarantee by the Owner that such conditions of sub-surface strata are infallible.
- B. Contractor waives any and all rights to make a claim against Owner relating to representations related to geotechnical data provided in the Contract Documents. If a Geotechnical Report ("Geotechnical Report") is provided by the Owner, the locations of the test holes, if applicable, are shown in the Geotechnical Report. Logs of these test holes are included in the Geotechnical Report. Test holes information represents subsurface characteristics to the extent indicated and only for the point location of the test hole. Contractor shall make its own interpretation of the character and condition of the materials, which will be encountered. Contractor may, at its own expense, make additional surveys and investigations as it may deem necessary to determine conditions, which will affect performance of the Work.
- C. *Reports and Drawings:* Owner will identify to the Contractor:
 1. any reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site; and
 2. any drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).
- D. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data contained in such reports and drawings, but such reports and drawings are not

Contract Documents. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner 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.
- E. Where excavation or demolition endangers adjacent structures and utilities, the Contractor shall at its own expense carefully support and protect all such structures and/or utilities so that there will be no failure or settlement. Where it is necessary to move services, poles, guy wires, pipelines, or other obstructions, the Contractor shall notify and cooperate with the utility owner. In cases where damage to an existing structure or utility occurs, the Contractor shall restore the structure or utility to its original condition and position without compensation from the Owner. Contractor shall repair or replace all damage to street surfaces, driveways, sidewalks, curb and gutter, fences, drainage structures, or other structures, to the satisfaction of the Owner, the Engineer and the respective utility Owner or authority. Structures shall be restored to a condition equal to or better than the original condition and of a similar material and design. The costs of such repair or replacement shall be borne by the Contractor and shall be included in the Proposal. Contractor shall maintain access to all driveways at all times. Contractor shall notify residents 48 hours prior to construction adjacent to their property. The Engineer has shown the approximate location of all existing piping (proposed and existing), valves, electrical conduits, fiber optic, telephone, utility poles, et al., as best as can be determined from available records. The Contractor shall verify the type, size, and location of all existing utilities in the construction area. All piping, valves, electrical conduit, etc. in the construction area shall be relocated and/or removed as necessary in a manner acceptable to the Engineer, and no additional compensation will be considered for relocating any of these items whether shown on the plans or not.
- F. All private property along and adjacent to the Contractor's operation, including lawns, yards, shrubs, trees, structures, trails, paths, livestock, fences, and mailboxes shall be adequately protected, and when damaged or removed, shall be repaired, replaced, renewed, or otherwise put in a condition equal to or better than that which existed before the Contractor caused the damage or removal. Contractor shall make provisions for continued mail delivery during construction. All mailboxes and fences affected by construction shall be repaired or replaced immediately. Where livestock are present, Contractor shall take all necessary precautions to assure that no construction or construction related activity will allow livestock to leave their confine. Where existing fences are being crossed, Contractor shall maintain the integrity of the fence during construction through placement of guards, temporary fences, or other adequate measures as approved by the Engineer. All construction activities, including ingress and egress shall occur within the boundaries and contract constraints of the temporary and permanent construction easements.

5.4. *Differing Subsurface or Physical Conditions*

- A. *Notice by Contractor:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site 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 5.03 is materially inaccurate; or
 2. is of such a nature as to require a change in the Drawings or Specifications; 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, 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 7.15), shall notify Owner and Engineer in writing about such condition within three (3)

business days after Contractor becomes aware of such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

- B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Possible Time Adjustments:*
 - 1. Contractor shall be entitled to an equitable adjustment in the Contract Time to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's time required for performance of the Work; subject, however, to the following:
 - a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
 - b. Contractor's entitlement to an adjustment of the Contract Time is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Time and adversely impacts the critical path as shown in the Progress Schedule.
 - 2. Contractor shall not be entitled to any adjustment in the Contract Time with respect to a subsurface or physical condition if:
 - a. Contractor knew of the existence of such condition at the time Contractor submitted its Bid or entered into the Agreement with Owner for the Project; or
 - b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
 - c. Contractor failed to give the written notice as required by Paragraph 5.04.A.
 - 3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Time, then any such adjustment shall be set forth in a Change Order.
 - 4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Time, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

5.5. *Underground Facilities*

- A. *Contractor's Responsibilities:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent 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 Contract Documents:
 - 1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; 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 information and data regarding existing Underground Facilities at the Site;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;
 - c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 - d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor, 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 7.15), shall identify the owner of such Underground Facility and, within three (3) business days after Contractor becomes aware of such condition, give written notice to that owner and to Owner and Engineer.
- C. *Engineer's Review:* Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Possible Time Adjustments:*
 1. Contractor shall be entitled to an equitable adjustment in the Contract Time, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's time required for performance of the Work; subject, however, to the following:
 - a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;
 - b. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and
 - c. Contractor gave the notice required in Paragraph 5.05.B.
 2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Time, then any such adjustment shall be set forth in a Change Order.
 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Time no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

5.6. *Hazardous Environmental Conditions at Site*

- A. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- B. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- C. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer in writing within twenty-four (24) hours of the discovery of such condition. 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. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition and deduct all costs incurred from the Contract balance or if the Contract balance is insufficient to cover the costs incurred, Owner may file a claim for such costs.
- D. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- E. 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 Time, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.
- 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, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.
- G. **TO THE FULLEST EXTENT PERMITTED BY LAWS AND REGULATIONS, CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS OWNER AND ITS OFFICERS, DIRECTORS, MEMBERS, PARTNERS, EMPLOYEES, AGENTS, AND CONSULTANTS 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 FAILURE TO CONTROL, CONTAIN, OR REMOVE A CONSTITUENT OF CONCERN BROUGHT TO THE SITE BY CONTRACTOR OR BY ANYONE FOR WHOM CONTRACTOR IS RESPONSIBLE, OR TO A HAZARDOUS ENVIRONMENTAL CONDITION CREATED BY CONTRACTOR OR BY ANYONE FOR WHOM CONTRACTOR IS RESPONSIBLE.**
- H. Provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at Site.
- I. Materials utilized in the project shall be free of any hazardous materials, except as may be specifically provided for in Contract Documents.

5.7. *Endangered Species*

- A. No activity is authorized that is likely to jeopardize the continued existence of a threatened or endangered species as listed or proposed for listing under Federal Endangered Species Act (ESA), and/or State of Texas Parks and Wildlife Code on Endangered Species, or to destroy or adversely modify the habitat of such species.
- B. If a threatened or endangered species is encountered during construction, Contractor shall immediately cease work in the area of the encounter and notify Owner who will immediately implement actions in accordance with applicable statutes. These actions shall include reporting the encounter to TWDB, U.S. Fish and Wildlife Service, and Texas Parks and Wildlife Department, obtaining any necessary approvals or permits to enable Work to continue, or implement other mitigation actions. Contractor shall not resume construction in the area of encounter until authorized to do so by Owner.

5.8. *Archaeological Discoveries and Cultural Resources*

- A. No activity which may affect properties listed or eligible for designation as a State Archeological Landmark is authorized until the Owner has complied with the provisions of the National Historic Preservation Act and the Antiquities Code of Texas. The Owner has previously coordinated with the appropriate agencies, and impacts to known cultural or archeological deposits have been avoided or mitigated. However, the Contractor may encounter unanticipated cultural or archeological deposits during construction.
- B. If archeological sites or historic structures which may qualify for designation as a State Archeological Landmark according to the criteria in 13 TAC Chapter 26, or that may be eligible for listing on the National Register of Historic Places in accordance with 36 CFR Part 800, are discovered after construction operations are begun, the Contractor shall immediately cease operations in that particular area and notify the Owner, the TWDB, and the Texas Historical Commission, 1511 N. Colorado St. , P. O. Box 12276, Capitol Station, Austin, Texas 78711-2276. The Contractor shall take reasonable steps to protect TWDB-0552 Page 16 of 19 Rev 02/17 and preserve the discoveries until they have been inspected by the Owner's representative and the TWDB. The Owner will promptly coordinate with the State Historic Preservation Officer and any other appropriate agencies to obtain any necessary approvals or permits to enable the work to continue. The Contractor shall not resume work in the area of the discovery until authorized to do so by the Owner.

5.9. *Control of Water*

- A. Should work to be performed require draining, pumping, dewatering or routing of water for construction, testing, cleaning, or restoration purposes, it shall be obligation of Contractor to perform same, while maintaining any additional erosion control or filtration systems as may be required by Owner, Guadalupe County, Texas Department of Transportation, Texas Commission on Environmental Quality (TCEQ), or Engineer to assure clean water control, at no extra compensation. Dewatering a contractor cost and is subsidiary to bid items for excavation and/or pipe installation.

5.10. *Site Preservation*

- A. Contractor shall exercise care to preserve the natural landscape within Site and shall conduct his construction operations so as to prevent any unnecessary destruction, scarification, or defacing of natural surroundings in vicinity of Work. Except where clearing is required for permanent construction, trees and vegetation shall be preserved and protected from damages which may be caused by equipment and construction operations. Where unnecessary destruction or damage to trees occurs as a result of Contractor's operations, replacement or corrections shall be made at the Contractor's expense as directed by the Engineer. Prevention of noise pollution shall be a responsibility of Contractor. Garbage, trash, and material debris shall be picked up daily and deposited in a suitable receptacle provided and maintained by Contractor. Measures shall also be implemented to prevent the escape of mud and concrete.

6. BONDS AND INSURANCE

6.1. *Performance and Payment Bonds*

- A. Contractor shall furnish a performance bond and a payment bond in accordance with chapter 2253 of Texas Government Code. Contractor shall also furnish such other bonds, if any, as are required by other specific provisions of Contract Documents.

- B. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind surety. Evidence of authority shall show that it is effective on date agent or attorney-in-fact signed accompanying bond.
- C. Contractor shall obtain the required bonds in a form acceptable to Owner. Surety on bonds must be duly licensed or authorized in jurisdiction in which Project is located to issue bonds and in required amounts.
- D. If surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in Texas, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide bonds from another surety, all of which shall comply with all requirements above.
- E. If Contractor has failed to obtain a required bond, Owner may exclude Contractor from Site and exercise Owner's suspension and/or termination rights under Article 16.
- F. Performance bond shall include without limitation guarantees that work done under Contract Documents will be completed and performed according to Contract Documents and in accordance with sound construction principles and practices;
- G. Performance and payment bonds shall be in a penal sum of not less than 100 percent (%) of Contract Price and remain in effect as required by applicable laws.
- H. Contractor shall utilize a surety company that is authorized to do business in Texas in accordance with Surety Bonds and Related Instruments, Chapter 3503 of the Insurance Code.

6.2. *Insurance—General Provisions*

- A. Owner is self-insured as a Local Government Corporation formed under laws of State of Texas.
- B. Contractor shall provide all insurance required by Exhibit A to these General Conditions ("Owner's Insurance Requirements").

6.3. *Workers' Compensation Insurance Coverage*

- A. Contractor shall certify in writing that they provide workers' compensation insurance coverage for each employee of Contractor employed on Project.
- B. Each Subcontractor on Project shall provide such a certificate relating to coverage of Subcontractor's employees to General Contractor, who shall provide Subcontractor's certificate to the governmental entity.
- C. A Contractor who has a contract that requires workers' compensation insurance coverage may provide coverage through a group plan or other method satisfactory to governing body of governmental entity.
- D. Employment of a maintenance employee by an employer who is not engaging in building or construction as employer's primary business does not constitute engaging in building or construction.
- E. In this section:
 - 1. "Building or construction" includes:
 - a. erecting or preparing to erect a structure, including a building, bridge, roadway, public utility facility, or related appurtenance;
 - b. remodeling, extending, repairing, or demolishing a structure; or iii. otherwise improving real property or an appurtenance to real property through similar activities.
 - 2. "Governmental entity" means this state or a political subdivision of this State. Term includes a municipality.

7. CONTRACTOR'S RESPONSIBILITIES

7.1. *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 Contract Documents. Contractor shall be solely responsible for all means, methods, techniques, sequences, and procedures of construction.

- B. At all times during the progress of Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written consent of Owner. Such consent shall not be unreasonably withheld.
- C. Contractor will be responsible for execution of a satisfactory and complete each piece of work, in accordance with true intent of Contract Documents. Contractor shall provide, without extra charge, all incidental items required as a part of its work even though not particularly specified or indicated. Should Contractor object to methods or materials specified, Contractor shall notify Owner in writing and have same adjusted before proceeding with Work. Proceeding without notice shall be construed as a waiver of any Contractor objections.
- D. Contractor shall verify all measurements and be responsible for same and shall report to Owner and Engineer any errors, discrepancies or inconsistencies in Contract Documents, and shall await instructions before proceeding with Work. Contractor shall be held to have examined premises and the limitations under which Work will have to be executed, as well as any subsurface conditions

7.2. *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out Work and perform construction as required by Contract Documents. Contractor shall at all times maintain good discipline and order at Site.
- B. Except as otherwise required for safety or protection of persons or Work or property at Site or adjacent thereto, and except as otherwise stated in Contract Documents, all Work at Site shall be performed during regular working hours, Monday through Friday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld
 - 1. Regular working hours are defined as Monday through Friday between the hours of 7:00 A.M. and 6:00 P.M., excluding Owner's holidays. However, construction activities within five hundred feet (500') of a dwelling or dwelling unit that is occupied as a residence shall be performed between hours of 8:00 A.M. and 6:00 P.M. Requests to work other than regular working hours shall be submitted to Owner, Owners Representative, and Engineer not less than 48 hours prior to any proposed work outside of regular working hours.
 - 2. Contractor shall reimburse Owner for additional engineering and/or inspection costs incurred as a result of overtime work in excess of regular working hours stipulated in 7.02.B.1 above and for evaluating alternative material, equipment, etc. proposed by Contractor. At Owner's option, overtime and evaluation costs may either be invoiced directly, deducted from Contractor's monthly payment request, or deducted from the Contractor's retention prior to release of final payment. Overtime and evaluation costs for Owner's personnel shall be based on individual's current overtime wage rate. Overtime and evaluation costs for personnel employed by Engineer or other Owner's representatives shall be calculated in accordance with terms of their respective contracts with Owner.
- C. Contractor shall provide and pay for labor in accordance with prevailing wage in locality and shall not pay less than prevailing wage.

7.3. *Services, Materials, and Equipment*

- A. Unless otherwise specified in Contract Documents, 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 Work, whether or not such items are specifically called for in Contract Documents.
- B. All materials and equipment incorporated into Work shall be of good quality and new, except as otherwise provided in Contract Documents. All special warranties and guarantees required by Contract Documents shall expressly run to the benefit of Owner. If required by Owner, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment. Contractor warrants to Owner that materials and equipment used will not be defective or damaged. Contractor shall examine all materials furnished at time and place of delivery and shall reject all defective or damaged material. Any defective material not rejected by Contractor and discovered prior to Final Acceptance of work shall be replaced with non-defective material by the Contractor, and the Contractor shall furnish such additional material and supplies as may be necessary to install such replaced material. Contractor shall remove defective materials and

install the replaced material at Contractor's own expense, furnishing all labor and facilities necessary to meet requirements of Contract Documents or modifications made during construction. Inspection before installation shall not relieve Contractor from the responsibility to furnish good quality materials in place. Owner will not accept delivery of materials for Contractor; therefore, Contractor shall be fully responsible for making his own arrangements with suppliers and shipping agencies for delivery to proper locations. In addition, Contractor shall be responsible for acceptance of delivery of materials and supplies by his own personnel

- C. 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 Contract Documents.
- D. *Excess earth (dirt) shall be removed at Contractor's expense. Contractor shall obtain approval of Owner if disposal site is located inside Owner's jurisdictional boundaries. Material deemed unacceptable for backfill must be disposed of in accordance with all applicable local, county, state, and federal rules and regulations at Contractor's expense.*
- E. Contractor will pay for construction staking of all improvements under Contract Documents. Cut sheets and/or copy of Field Notes shall be issued to Engineer. Engineer will have the authority to stop all Work and withhold approval of payment to Contractor at any time construction stakes have been destroyed and adequate control is not in existence on Site. Decision of Engineer and Owner is final. Halting of work due to violation of this term shall not be considered as cause for extension of Contract Time. Acknowledging that property pins are used for construction staking, Contractor shall direct his work forces to use reasonable care in protecting existing property pins. Prior to commencing excavation operations, Contractor shall meet with Engineer and advise him of which property pins may be disturbed. Contractor, in its inspection of Site prior to construction, shall satisfy itself that all lot corners pins are in place and that these corners are marked so as to be easily located and identified. It is further understood that all lot corner pins destroyed during construction will be replaced by a registered professional land surveyor at Contractor's expense so as to easily be located and identified, before final payment is made.
- F. Contractor shall remove from Site, including staging and access areas, all rejected and condemned materials or work of any kind brought to or incorporated in Project. Should Contractor fail to do so, or to make satisfactory progress in so doing, within forty-eight (48) hours after service of a written notice from Engineer or Owner ordering such removal, condemned material or rejected work may be removed from Project by Owner and cost of such removal shall be paid to Owner by Contractor or Owner may deduct such costs from Contract Price that may be due or may become due to Contractor under provisions of Contract Documents. No such rejected or condemned material shall again be offered for use by Contractor on Project

7.4. "Or Equals"

- A. Whenever an item of material or equipment is specified or described in Contract Documents by using name of a proprietary item or name of a particular Supplier, Contract Price has been based upon Contractor furnishing such item as specified. Specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless Specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.
 - 1. If Engineer, in its sole discretion, determines that 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, Engineer may deem it an "or equal" item. For purposes of this paragraph, 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:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) it will reliably perform at least equally well function and achieve the results imposed by design concept of completed Project as a functioning whole;
 - 3) it has a proven record of performance and availability of responsive service; and

- 4) it is not objectionable to Owner.
- b. Contractor certifies that, if approved and incorporated into Work:
 - 1) there will be no increase in cost to Owner or increase in Contract Time; and
 - 2) it will conform substantially to detailed requirements of item named in Contract Documents.
- B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's sole expense.
- C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer will be sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination. Use of an unapproved "or-equal" item will render such Work defective and will be subject to Article 14 provisions.
- D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be final and binding, and may not be reversed through an appeal under any provision of Contract Documents.
- E. *Treatment as a Substitution Request*: If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider proposed item as a substitute pursuant to Paragraph 7.05.

7.5. *Substitutes*

- A. Unless the specification or description of an item of material or equipment required to be furnished under Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To extent possible such requests shall be made before commencement of related construction at Site.
 - 1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.
 - 2. Requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by Specifications, and as Engineer may decide is appropriate under circumstances.
 - 3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. Application:
 - a. shall certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design,
 - 2) be similar in substance to that specified, and
 - 3) be suited to same use as that specified.
 - b. will state:
 - 1) extent, if any, to which use of the proposed substitute item will necessitate a change in Contract Time,
 - 2) whether use of proposed substitute item in the Work will require a change in any of Contract Documents (or in provisions of any other direct contract with Owner for other work on Project) to adapt design to the proposed substitute item, and
 - 3) whether incorporation or use of proposed substitute item in connection with Work is subject to payment of any license fee or royalty.
 - c. will identify:
 - 1) all variations of proposed substitute item from that specified, and

- 2) available engineering, sales, maintenance, repair, and replacement services.
- d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for substitution itself and all related impacts, including changes in Contract Price or Contract Time. Engineer will advise Contractor in writing of any negative determination. Use of an unapproved substitute item will render such Work defective and will be subject to Article 14 provisions.
- C. *Special Guarantee:* Owner may require Contractor to furnish, at Contractor's expense, a special performance guarantee or other warranty bond with respect to any substitute.
- D. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- E. *Effect of Engineer's Determination:* If Engineer approves substitution request, Contractor shall execute any required documentation and proceed with the substitution. Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of Contract Documents.

7.6. *Concerning Subcontractors, Suppliers, and Others*

- A. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner identity of proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five (5) days.
- B. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, shall constitute a waiver of the right of Owner to completion of Work in accordance with Contract Documents.
- C. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- D. Contractor shall be fully responsible to Owner 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.
- E. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of Work.
- F. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.
- G. Divisions and sections of Specifications and the identifications of any Drawings shall not control Contractor in dividing Work among Subcontractors or Suppliers or delineating Work to be performed by any specific trade.
- H. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds Subcontractor or Supplier to applicable terms and conditions of Contract Documents for benefit of Owner.
- I. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.

7.7. *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to use in performance of the Work or the incorporation in 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 Contract Documents for use in the performance of Work and if, to actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for payment of any license fee or royalty to others, existence of such rights shall be disclosed by Owner in Contract Documents.
- B. **TO THE FULLEST EXTENT PERMITTED BY LAWS AND REGULATIONS, CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS OWNER, ITS OFFICERS, DIRECTORS, MEMBERS, PARTNERS, EMPLOYEES, AGENTS, AND 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.**

7.8. *Permits*

- A. Unless otherwise provided in Contract Documents, Contractor shall pay all governmental charges, permit fees and inspection fees necessary for the prosecution of Work which are applicable at the time of submission of Contractor's Bid (or when Contractor became bound under a negotiated contract).

7.9. *Taxes*

- A. Owner enjoys tax-exempt status. To enjoy cost-savings benefits of its tax-exempt status, Owner will provide a Tax Exemption Certificate to Contractor for use on Project. Contractor shall use that certificate to exempt any purchases made for Work from taxes. All savings for the tax-exempt status will be passed on to Owner by Contractor. Contractor agrees to bind all Subcontractors of any tier to obligation to present and use Tax Exemption Certificate and pass all savings to Owner.

7.10. *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of 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 or takes any other action knowing, having reason to know or reasonably should have known that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses. However, Contractor has no responsibility or liability for determining whether Work as described in Contract Documents complies with applicable Laws or Regulations.
- C. All construction by the Contractor, or his sub-contractors, shall be in accordance with all applicable SSLGC and State of Texas ordinances, rules, and regulations. This includes, but is not limited to, all conditions noted in Contract Documents.
- D. In execution of its obligations under Contract Documents the contract, Contractor must comply with all applicable local, state and federal laws, including but not limited to laws concerned with labor, safety, minimum wages, and the environment. Contractor shall be familiar with and at all times shall observe and comply with all federal, state, and local laws, ordinances and regulations which in any manner affect the conduct of Work, and shall indemnify and save harmless Owner, Texas Water Development Board, and their representatives against any claim arising from violation of any such law, ordinance or regulation by Contractor, their its Subcontractors or their its employees.

Contractor shall not discriminate against any worker or applicant for employment because of race, sex, color, or national origin. Contractor shall comply with all provisions of Executive Order 11246 of September 24, 1965 and Executive Order 11375 of October 13, 1967 and the rules, regulations, and relevant orders of the Secretary of Labor.

- E. As a requirement of Texas Commission on Environmental Quality's (TCEQ's) Texas Pollutant Discharge Elimination System (TPDES), a Stormwater Pollution Prevention Plan (SWP3) shall be prepared by Contractor for this Project. The following conditions apply to this Contract:
 - 1. Prior to start of construction, Contractor and Owner will be required to execute, forward to TCEQ, and Contractor to pay application fee for a Notice of Intent (NOI) to be covered by a TPDES general permit.
 - 2. Prior to start of construction, Contractor and all subcontractors will implement all measures of SWP3.
 - 3. Upon final acceptance of Work by Owner, Contractor, along with Owner, will be required to execute and forward to the TCEQ a Notice of Termination (NOT).
- F. In the execution of its obligations under Contract Documents, Contractor must comply with all applicable local, state and federal laws, including but not limited to laws concerned with labor, safety, minimum wages, and the environment. Contractor shall be familiar with and at all times shall observe and comply with all federal, state, and local laws, ordinances and regulations which in any manner affect the conduct of the work, and shall indemnify and save harmless Owner, Texas Water Development Board, and their representatives against any claim arising from violation of any such law, ordinance or regulation by Contractor, their Subcontractor or their employees

7.11. *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of Work, Contractor shall deliver these record documents to Owner. Delivery of a complete set of record documents to Owner is a condition precedent to Final Completion.
- B. Contractor shall prepare a daily construction diary recording as a minimum the following information concerning events at Site and submit duplication copies to Owner's Representative at weekly intervals. Copies are to be signed by Project Superintendent.
 - 1. Work Performed.
 - 2. Approximate count of Contractor's personnel, by classification, on the site.
 - 3. List by classification, of all Subcontractors, personnel and any professionals on the site that day.
 - 4. List of all equipment on the site by make and model.
 - 5. High and low temperatures together with general weather conditions.
 - 6. Start time and finish time of day's work.
 - 7. Accidents and/or unusual events.
 - 8. Meetings and significant decisions made.
 - 9. Stoppages, delays, shortages and/or losses.
 - 10. Meter readings and/or similar recordings.
 - 11. Emergencies procedures that may have been needed.
 - 12. Orders and requests of governing authorities.
 - 13. Change orders received and implemented.
 - 14. Services connected and/or disconnected.
 - 15. Installed equipment and/or system tests and/or startups and results.
 - 16. Partial completions and/or occupancies.
 - 17. Date of substantial completion certified.
- C. Contractor shall make appropriate daily measurements of facilities constructed and keep accurate records of location (horizontal and vertical) of all facilities.

- D. Upon completion of each facility, Contractor shall furnish Owner with one set of direct prints, marked with red pencil, to show as-built dimensions and locations of all work constructed. As a minimum, final drawings shall include the following:
1. Horizontal and vertical locations of work.
 2. Changes in equipment and dimensions due to substitutions.
 3. "Nameplate" data on all installed equipment.
 4. Deletions, additions, and changes to scope of work.
 5. Any other changes made.

7.12. *Safety and Protection*

- A. Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with Work. Contractor shall comply with all Laws and Regulations regarding safety and 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 Work;
 2. all Work and materials and equipment to be incorporated therein, whether in storage on or off Site; and
 3. other property at Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to Site, when prosecution of Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any.
- D. Contractor shall inform Owner and Engineer of specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.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 Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer 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).
- F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).
- G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from Contract Documents.
- H. Owner prohibits the use, possession, sale, transfer, or storage of prohibited drugs or alcohol on its premises by Contractor's employees. This policy also applies to those employees of contractors who perform work for Owner. Contractor specifically acknowledges its understanding of and familiarity with Owner's policies, procedures, and restrictions concerning the influence, use, or presence of drugs and/or alcohol at the Project and agrees to be bound by and fully comply with the same. Further, Contractor agrees that the foregoing shall apply to its employees and those of its subcontractors and hereby agrees to insure that all personnel engaged in the Work are aware of and familiar with Owner's policies, procedures, and restrictions and to remove from the Project and replace any personnel Contractor believes to be in violation thereof. It is understood and agreed that Owner shall have the right to require removal and replacement of any person or entity not adhering to such requirements.

Contractor shall include the foregoing provisions in each of its subcontracts relating to the Project in order that the terms of this Article shall fully apply to such parties.

- I. During unfavorable weather, wet ground, or other unsuitable construction conditions, the Contractor shall confine its operations to work which will not be affected adversely thereby. No portion of the work shall be constructed under conditions, which would affect adversely the quality or efficiency thereof, unless special means or precautions are taken by the Contractor to perform the work in a proper and satisfactory manner.
- J. Water used for mixing of concrete, testing, or any other purpose incidental to this Project, will be furnished by Contractor. Contractor shall make the necessary arrangements for securing and transporting such water. No separate payment will be made for water used, but the cost thereof shall be included in the various items of the proposal and bid schedule. Contractor will be required to provide and install temporary meter(s) on existing hydrant(s) at Contractor's expense as necessary for Contractor's performance of work.
- K. As a requirement of Texas Commission on Environmental Quality's (TCEQ's) Texas Pollutant Discharge Elimination System (TPDES), a Stormwater Pollution Prevention Plan (SWP3) shall be prepared by the Contractor for this Project. The following conditions apply to this Contract:
 - 1. Prior to start of construction, Contractor for this Project and Owner will be required to execute, forward to the TCEQ, a Notice of Intent (NOI) to be covered by a TPDES general permit. Contractor shall pay any application fee required.
 - 2. Prior to start of construction, Contractor and all subcontractors will implement all measures of SWP3.
 - 3. Upon final acceptance of the Project by Owner, Contractor, along with Owner, will be required to execute and forward to TCEQ a Notice of Termination (NOT).
- L. All traffic control shall be in accordance with Texas Manual of Uniform Traffic Control Devices (TMUTCD). Where the work is carried on in or adjacent to any street, alley, or public place, Contractor shall, at its own cost and expense, furnish and erect such barricades, fences, lights, and danger signals, shall provide such watchmen, and shall provide such other precautionary measures for the protection of persons or property and of the work as are necessary. Where applicable, Contractor shall notify LISD, City of Cedar Park Field Operations, Public Works, and Emergency Services a minimum of seven (7) business days prior to any lane reduction, lane closure, or roadway closure.
- M. Barricades shall be painted in a color that will be visible at night. From sunset to sunrise, Contractor shall furnish and maintain at least one light at each barricade and sufficient number of barricades shall be erected to keep vehicles from being driven on or into any work under construction. Contractor shall furnish watchmen in sufficient numbers to protect work.
- N. Contractor will be held responsible for all damage to work due to failure of barricades, signs, lights, and watchmen to protect it, and whenever evidence is found of such damage, the Engineer may order the damaged portion immediately removed and replace by Contractor at its cost and expense. Contractor's responsibility for maintenance of barricades, signs, and lights, and for providing watchmen shall not cease until the project shall has been accepted by Owner. All lanes of traffic shall be open at end of each working day. No trenches shall remain open at end of each working day.

7.13. *Safety Representative*

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

7.14. *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.

7.15. *Emergencies*

- A. In emergencies affecting the safety or protection of persons or Work or property at 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 Work or variations from Contract Documents have been caused thereby or are required as a result thereof. If

Engineer determines that a change in Contract Documents is required because of action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

- B. In the event there is an accident involving injury to any individual on or near Work, Contractor shall notify Owner's Representative within twenty-four (24) hours of an event and shall be responsible for recording location of the event and the circumstances surrounding the event through photographs, interviewing witnesses, obtaining medical reports and other documentation that describes the event. Copies of such documentation shall be provided to Owner, for Owner's and Engineer's records, within forty-eight (48) hours of the event. Nothing in this section will relieve Contractor of its obligations and responsibilities with respect to an injury under any state and federal laws and regulations.

7.16. *Shop Drawings, Samples, and Other Submittals*

A. *Shop Drawing and Sample Submittal Requirements:*

- 1. Before submitting a Shop Drawing or Sample, Contractor shall have:
 - a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 - c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
- 2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.
- 3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.

B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*

- a. Contractor shall submit the number of copies required in the Specifications.
- b. Data shown on 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 7.16.D.

2. *Samples:*

- a. Contractor shall submit the number of Samples required in the Specifications.
- b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.

- 3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, 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.

4. After review and approval of a Submittal, Shop Drawing or Sample by Engineer in accordance with this section, Contractor may rely on the information provided by Engineer and Work performed in accordance with any approved Shop Drawing, Submittal or Sample and Contract Documents will be presumed to be acceptable to Owner unless an actual defect in Work is discovered.
 5. Contractor shall be responsible for delays caused by rejection of submittal of inadequate or incorrect shop drawings, product data or samples. The Contractor shall be responsible for seeing that only "approved" copies of shop drawings bearing the approval of Engineer are allowed on the job site. Contractor shall be responsible for providing all copies of approved shop drawings necessary for the construction operation. No portion of the work requiring submission of a shop drawing, product data or sample shall be commenced until the submittal has been approved by Engineer. All such portions of Work shall be in accordance with approved submittals.
- C. *Other Submittals:* Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of Contract Documents.
- D. *Operation and Maintenance Manuals and Training:*
1. Contractor shall obtain installation, operation, and maintenance manuals from manufacturers and suppliers for equipment furnished under Contract Documents. Contractor shall submit three copies of each complete manual to Engineer within 90 days after approval of shop drawings, product data, and samples, and not later than the date of shipment of each item of equipment to the project site or storage location.
 2. Owner shall require Engineer to promptly review each manual submitted, noting necessary corrections and revisions. If Engineer rejects the manual, Contractor shall correct and resubmit the manual until it is acceptable to Engineer as being in conformance with the design concept of the project and for compliance with information given in the contract documents. Owner may assess Contractor a charge for reviews of same items in excess of three (3) times. Such procedure shall not be considered cause for delay.
 3. Acceptance of manuals by Engineer does not relieve Contractor of any requirements of terms of Contract Documents.
 4. Contractor shall provide the services of trained, qualified technicians to check final equipment installation, to assist as required in placing same in operation, and to instruct operating personnel in the proper manner of performing routine operation and maintenance of equipment.
 5. Operations and maintenance manuals specified hereinafter are in addition to any operation, maintenance, or installation instructions required by the Contractor to install, test, and start-up the equipment.
 6. Each manual is to be bound in a folder and labeled to identify the contents and project to which it applies. The manual shall contain the following applicable items:
 - a. A listing of the manufacturer's identification, including order number, model, serial number, and location of parts and service centers.
 - b. A list of recommended stock of parts, including part number and quantity.
 - c. Complete replacement parts list.
 - d. Performance data and rating tables.
 - e. Specific instructions for installation, operation, adjustment, and maintenance.
 - f. Exploded view drawings for major equipment items.
 - g. Lubrication requirements.
 - h. Complete equipment wiring diagrams and control schematics with terminal identification.
- E. *Engineer's Review:*
1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of 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 of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.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. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.
3. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Time or Contract Price, unless such changes are included in a Change Order.
4. Neither Engineer's receipt, review, acceptance nor approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.
5. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 4 above.

F. *Re-submittal 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.
2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.17. *Contractor's General Warranty and Guarantee*

- A. Contractor warrants to Owner that materials and equipment furnished under Contract will be of good quality and new unless Contract Documents require or permit otherwise. Contractor further warrants that Work will be performed in a good and workmanlike manner, will conform to the requirements of Contract Documents and will be free from defects, except for those inherent in the quality of Work Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements shall be considered defective. If required by Owner, Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.
- B. Subject to the provisions of Paragraph 15.08 below, the Contractor warrants and guarantees Work for two (2) year from Final Completion ("Correction Period"), or for a longer period if expressly stated in Contract Documents. This includes a warranty and guarantee against any and all defects. Contractor must correct any and all defects in material and/or workmanship which may appear during such Correction Period, or any defects that occur even if discovered more than two (2) year after Final Completion, by repairing (or replacing with new items or new materials, if necessary) any such defect at no cost to the Owner, within a reasonable period of time, and to the Owner's satisfaction.
- C. 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.
- D. Contractor's obligation to perform and complete the Work in accordance with Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in

accordance with Contract Documents or a release of Contractor's obligation to perform the Work in accordance with 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 review and approval of a Shop Drawing or Sample submittal;
6. 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.
9. The failure of the Owner, Engineer, the Resident Project Representative or any other person or entity acting on behalf of the Owner or Engineer to observe, detect or discover any defect in the Work or any non-conformance of the Work with any requirement of the Contract Documents.

Contractor hereby waives any claim or defense to any claim by the Owner that any failure by the Owner, Engineer, Resident Project Representative or any other person or entity acting on behalf of the Owner to observe, detect or discover any defect in the Work relieves or releases, in whole or in part, Contractor from any obligations or responsibility for the correction of such defects or any other obligation of Contractor under the Contract Documents.

- E. Prior to the expiration of the two-year Correction Period, the Owner reserves the right to require a re-inspection of the Work. Such inspection shall be made by duly authorized representatives of the Owner, Engineer, and Contractor, in order to determine if any defects or deficiencies exist which are due to be corrected by the Contractor.
- F. Manufacturer's Warranties on installed machinery and equipment as well as subcontractor and supplier warranties and guarantees, express or implied, respecting any part of the work and any materials used therein shall be deemed obtained – and shall be enforced – by the Contractor as the agent and for the benefit of the Owner.
- G. If the Owner deems it inexpedient to correct any defects or Work injured or done not in accordance with the Contract Documents, an equitable deduction from the Contract Price or refund to Owner shall be made therefore.

7.18. *Indemnification*

- A. **TO THE FULLEST EXTENT PERMITTED BY LAW, AND IN ADDITION TO ANY OTHER OBLIGATIONS OF CONTRACTOR UNDER THE CONTRACT DOCUMENTS OR OTHERWISE, CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS OWNER, ITS OFFICERS, DIRECTORS, MEMBERS, PARTNERS, EMPLOYEES, AGENTS, AND CONSULTANTS FROM AND AGAINST ALL CLAIMS, COSTS, LOSSES, AND DAMAGES (INCLUDING BUT NOT LIMITED TO ALL FEES AND CHARGES OF ENGINEERS, ARCHITECTS, ATTORNEYS, CONSULTANTS, EXPERTS AND OTHER PROFESSIONALS AND ALL COURT OR ARBITRATION OR OTHER DISPUTE RESOLUTION COSTS) ARISING OUT OF OR RELATING TO THE PERFORMANCE OF THE WORK, INCLUDING THE LOSS OF USE RESULTING THEREFROM, REGARDLESS OF ANY COMPARATIVE OR CONTRIBUTORY RESPONSIBILITY OF AN INDEMNITY AND REGARDLESS OF WHETHER SUCH CLAIMS, COSTS, LOSSES, OR DAMAGES WERE CAUSED, IN WHOLE OR IN PART, BY THE NEGLIGENCE, ACTS, ERRORS OR OMISSIONS OF ANY INDEMNITY.**

TO THE EXTENT THAT SUBCHAPTER C OF CHAPTER 151 OF THE TEXAS INSURANCE CODE (“CHAPTER 151”) APPLIES TO THE OWNER, IT IS THE INTENT OF THE OWNER THAT IF THE PROVISIONS OF CHAPTER 151 DO APPLY, NOTHING HEREIN SHALL IMPOSE ANY REQUIREMENTS ON CONTRACTOR THAT ARE PROHIBITED BY CHAPTER 151 AND THAT ANY OF THE PROVISIONS HEREOF THAT ARE NOT PROHIBITED BY CHAPTER 151 SHALL REMAIN IN FULL FORCE AND EFFECT. ACCORDINGLY, IN THE EVENT THAT IN CONSTRUING AND

INTERPRETING THE CONTRACT DOCUMENTS, A COURT OF COMPETENT JURISDICTION OR, IF APPLICABLE, AN ARBITRATOR, DETERMINES THAT CHAPTER 151 APPLIES TO THE OWNER, THEN THE COURT OR ARBITRATOR SHALL REFORM THE PROVISIONS HEREOF SO AS TO COMPLY WITH CHAPTER 151 AND SUCH REFORMATION SHALL NOT AFFECT THE VALIDITY OF ANY PROVISIONS HEREOF THAT ARE NOT PROHIBITED BY CHAPTER 151.

7.19. *Delegation of Professional Design Services*

- A. Unless otherwise provided in the Contract Documents, Contractor shall not be responsible for nor warrant the adequacy of the design, performance, criteria, or design criteria specified by Owner or Engineer in the Contract Documents, Drawings, and Specifications.
- B. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor’s responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.
 - 1. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional’s written approval when submitted to Engineer.
 - 2. Owner shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
 - 3. Pursuant to this paragraph, Engineer’s review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer’s review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.

7.20. *Administrative Charges*

- A. The Contractor shall also pay to the Owner administrative charges after the Substantial and then Final Completion date as follows:
- B. The Owner shall back charge the Contractor for any and all engineering charges and field observation charges incurred after the Substantial and then Final Completion date until acceptance of the Work by Owner.
- C. Back charges will be determined monthly and according to the following schedule:

<u>Description</u>	<u>Rate</u>
Engineer or other outside services on the project	Invoice Amount
Owner Project Manager or Engineer	\$180/hr
Owner Field Observer	\$150/hr
Owner Secretary	\$50/hr

7.21. *Miscellaneous Contractor Responsibilities:*

- A. All private property along and adjacent to the Contractor’s operation, including lawns, yards, shrubs, trees, structures, trails, paths, livestock, fences, and mailboxes shall be adequately protected, and when damaged or removed, shall be repaired, replaced, renewed, or otherwise put in a condition equal to or better than that which existed before the Contractor caused the damage or removal. Contractor shall make provisions for continued mail delivery during construction. All mailboxes and fences affected by construction shall be repaired or replaced immediately. Where livestock are present, Contractor shall take all necessary precautions to assure that no construction or construction related

activity will allow livestock to leave their confine. Where existing fences are being crossed, Contractor shall maintain the integrity of the fence during construction through placement of guards, temporary fences, or other adequate measures as approved by the Engineer. All construction activities, including ingress and egress shall occur within the boundaries and contract constraints of the temporary and permanent construction easements.

- B. It shall be the responsibility of the Contractor, prior to the initiation of construction on easements through private property, to inform the property Owner of his intent to begin construction. Before beginning construction in areas of public dedication, the Contractor shall inform the agency having jurisdiction in the area forty-eight (48) hours prior to initiation of the work. The Contractor's attention is directed to the limits of right-of-way and easements as obtained by the Owner and as shown on the plans. The Contractor shall restrict his operations to within the limits of the right-of-way and easements. He shall be responsible for all damages to trees, crops, grasses, etc. which as a result of his operations occur outside such limits. Should the Contractor require additional right-of-way for ingress or egress, he shall make arrangements with the owners of such property for such right-of-way at no cost to the Owner. Permits and licenses of a temporary nature necessary for the prosecution of the work shall be secured and paid for by the Contractor.
- C. Use of explosives shall not be permitted on this Project.
- D. Contractor shall protect trees, other than Cedar trees, less than six inches (6") in diameter, or that are within the trench width, as directed by Engineer. The working space noted on the plans is not intended to indicate all trees can be removed. Trees to be protected will be identified prior to construction. Unauthorized tree removal will be compensated at \$100.00 per caliper inch of trunk as measured at a point four feet above the ground.
- E. Contractor is not required to provide a field office. Meetings involving SSLGC Staff may be held at Owner's Water Treatment Plant.
- F. Contractor shall provide sanitary facilities with hand washing stations for his employees at locations along the project route, not to exceed 1,000 linear feet in spacing. For Facility projects provide sanitary facilities with hand washing station at a ratio 1:10 workers per week.

8. OTHER WORK AT SITE

8.1. *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. 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 such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.
- D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, 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.

8.2. *Coordination*

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility

owners perform work at or adjacent to the Site, the following will be set forth in the Supplemental General Conditions or provided to Contractor prior to the start of any such other work:

1. identity of individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
 2. an itemization of the specific matters to be covered by such authority and responsibility; and
 3. extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplemental General Conditions, Owner shall have sole authority and responsibility for such coordination.
- C. Other Work occurring at or adjacent to the Site.
1. The following individual will have authority and responsibility for coordination of activities among the various contractors:
Schertz Seguin Local Government Corporation (SSLGC)
Amber Briggs Beard, General Manager
108 W. Mountain
Seguin, 78155

8.3. *Legal Relationships*

- A. If, in the course of performing other work at or adjacent to Site for Owner, Owner's employees, any other contractor working for Owner, or any utility owner causes damage to Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor may be entitled to an equitable adjustment in the Contract Price and/or Contract Time. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Time under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. Contractor's entitlement to an adjustment of the Contract Time is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Time and such delays, disruptions or interferences adversely affect critical path of Work as set forth in most recent Progress Schedule.
- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor.
- C. If Contractor damages, delays, disrupts, or interferes with work of any other contractor, or any utility owner performing other work at or adjacent to Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) **INDEMNIFY AND HOLD HARMLESS OWNER, ITS OFFICERS, DIRECTORS, MEMBERS, PARTNERS, EMPLOYEES, AGENTS, AND CONSULTANTS FROM AND AGAINST ANY SUCH CLAIMS, AND AGAINST ALL 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 DAMAGE, DELAY, DISRUPTION, OR INTERFERENCE.**

9. **OWNER'S RESPONSIBILITIES**

9.1. *Communications to Contractor*

- A. For all Project and performance of Work matters, Owner will issue communications to Contractor through Engineer. However, Owner may, at its discretion, issue communications related to Project directly to Contractor. In all such direct communications, Owner will endeavor to copy Engineer.

- 9.2. *Furnish Data*
- A. Owner shall promptly furnish the data required of Owner under Contract Documents.
- 9.3. *Pay When Due*
- A. Owner shall make payments to Contractor when they are due as provided in the Contract Documents.
- 9.4. *Lands and Easements; Reports, Tests, and Drawings*
- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
- B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
- 9.5. *Limitations on Owner's Responsibilities*
- A. 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 Work. Owner is not responsible for Contractor's failure to perform or furnish Work in accordance with the Contract Documents. Failure or omission of the Owner, Engineer, Resident Project Representative or any other person or entity acting on behalf of the Owner to observe, detect, discover, or object to or condemn any defective Work or material shall not release the Contractor from Contractor's obligation to properly and fully perform the Work pursuant to Contract Documents. The Owner shall not be responsible for the acts, errors or omissions of the Contractor, or any Subcontractor, Supplier or any other person or entity performing or furnishing any of Work on behalf of Contractor.
- 9.6. *Evidence of Financial Arrangements*
- A. Within Thirty (30) days after executing the Agreement, Contractor may request, and Owner shall furnish, reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents.
- 9.7. *Safety Programs*
- A. While at Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
- B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.
- 10. ENGINEER'S STATUS DURING CONSTRUCTION**
- 10.1. *Owner's Representative*
- A. Engineer will act as Owner's representative for Project administration during the construction period. Engineer shall not have the authority to bind the Owner as that authority lies with the Owner's designated representative, but Engineer may communicate on behalf of Owner in all Project matters.
- 10.2. *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'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 10.08. 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.

- 10.3. *Project Representative*
- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in this Article 10.
- 10.4. *Rejecting Defective Work*
- A. Engineer has the authority to reject Work in accordance with Article 14.
- 10.5. *Shop Drawings, Change Orders and Payments*
- A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.
- B. Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.
- C. Engineer's authority as to Change Orders is set forth in Article 11.
- D. Engineer's authority as to Applications for Payment is set forth in Article 15.
- 10.6. *Determinations for Unit Price Work*
- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.
- 10.7. *Decisions on Requirements of Contract Documents and Acceptability of Work*
- A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor.
- 10.8. *Limitations on Engineer's Authority and Responsibilities*
- A. Engineer's authority, responsibility and actions as Owner's representative shall not give rise to any liability to Contractor. Contractor expressly waives any claims it has against Engineer for the performance of its responsibilities as Owner's representative.
- 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. Engineer shall not be responsible for the Contractor's failure to perform or furnish the Work in accordance with the Contract Documents. The failure or omission of the Engineer to observe, detect, discover or object to or condemn any defective Work or material shall not release the Contractor, in whole or in part, from the Contractor's obligation to properly and fully perform the Work in accordance with the Contract Documents.
- C. 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 15.06.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.
- D. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.
- 10.9. *Compliance with Safety Program*
- A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

11. AMENDING CONTRACT DOCUMENTS; CHANGES IN WORK

11.1. *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
1. *Change Orders:*
 - a. A Change Order shall be used to amend or supplement the Contract Documents when Parties agree to the amendment, supplement, modification to the scope of work, or change in Contract Price or Contract Time.
 - b. Any Change Orders involving a change in Project requiring a relocation of Project components, sizing, or process may require additional environmental approval. A map and description of proposed changes should be sent to Owner for forwarding to TWDB Environmental Reviewer for coordination and approval as soon as possible to avoid any delay.
 2. *Work Change Directives:* A Work Change Directive may be issued by the Owner if Parties cannot agree on a Change Order or if:
 - a. Parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by parties as to Work Change Directive's effect, if any, on the Contract Price and Contract Time; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price.
 - b. Contractor must submit any Change Proposal seeking an adjustment of the Contract Price or the Contract Time, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or Contract Time, or both, no later than 60 days after issuance of Work Change Directive.
 - c. Upon receipt of a Change Directive, Contractor shall promptly proceed with the change in the Work involved.
 3. *Field Orders:* Owner or Engineer may authorize minor changes in Work if the changes do not involve an adjustment in Contract Price or Contract Time and are compatible with the design concept of the completed Project as a functioning whole as indicated by Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and on Contractor, which shall perform Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in Contract Price or Contract Time, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.2. *Owner-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. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Time or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under Contract Documents or Laws and Regulations.
- B. Total Contract Price may not be increased by a Change Order unless provision has been made for payment of the added cost by appropriation of current funds or bond funds for that purpose, by authorization of the issuance of certificates, or by a combination of those procedures.
- C. Changes that involve an increase in the Contract Price will be supported by documentation of the cost components. For projects funded through grant proceeds, TWDB staff may request this information to

be provided in a format equivalent to the Cost and Pricing Information form (No. WRD-277). The Contractor shall provide all TWDB requested information to support the processing of a Charge Order or Work Change Directive.

11.3. *Unauthorized Changes in Work*

- A. Contractor shall not be entitled to an increase in Contract Price or an extension of Contract Time with respect to any work performed that is not required by Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

11.4. *Change of Contract Price*

- A. Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.
- B. An adjustment in Contract Price will be determined as follows:
1. where the Work involved is covered by unit prices contained in Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or
 2. where the Work involved is not covered by unit prices contained in Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or
 3. where the Work involved is not covered by unit prices contained in Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).
- C. *Contractor's Fee*: When applicable, the Contractor's fee, which shall include 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 various portions of Cost of the Work:
 - a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be fifteen (15%) percent;
 - b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five (5%) 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 Paragraphs 11.1.C.2.a and 11.1.C.2.b is that Contractor's fee shall be based on: (1) a fee of fifteen (15%) percent of costs incurred under Paragraphs 13.1.A.1 and 13.1.A.2 by the Subcontractor that actually performs Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of Subcontractor that actually performs the Work, a fee of five (5%) percent of amount (fee plus underlying costs incurred) attributable to next lower tier Subcontractor; provided, however, that for any such subcontracted work maximum total fee to be paid by Owner shall be no greater than twenty-five (25%) percent of costs incurred by Subcontractor that actually performs work;
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.1.B.4, 13.01.B.5, and 13.1.C;
 - 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 (1) change, adjustment in Contractor's fee shall be computed on basis of net change in accordance with Paragraphs 11.4.C.2.a through 11.4.C.2.e, inclusive.

11.5. *Change of Contract Time*

- A. Contract Time may only be changed by a Change Order. Any Change Proposal for an adjustment in Contract Time shall comply with the provisions of Paragraph 11.6. Any Claim for an adjustment in Contract Time shall comply with the provisions of Article 12.
- B. An adjustment of Contract Time shall be subject to the limitations set forth in Paragraph 4.5, concerning delays in Contractor's progress.

11.6. *Change Proposals*

- A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Time or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under the Contract. The Change Proposal shall specify any proposed change in Contract Time or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.
 - 1. *Procedures:* Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to Engineer and Owner within 15 days after submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.
 - 2. *Engineer's Action:* Engineer will review each Change Proposal with Owner and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Engineer's action on a Change Proposal will not have the effect of adjusting the Contract Time or Contract Price without express written approval of Owner and a memorialization of Engineer's Action in a Change Order. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.
 - 3. *Binding Decision:* Engineer's decision will be final and binding upon Contractor, unless Contractor appeals the decision by filing a Claim under Article 12.
- B. *Resolution of Certain Change Proposals:* If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

11.7. *Execution of Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders covering:
 - 1. changes in the Contract Price or Contract Time 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;
 - 2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
 - 3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.02, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07; and
 - 4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.

12. CLAIMS

12.1. Claims

- A. *Claims Process*: The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:
1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
 2. Owner or Contractor demands for adjustments in the Contract Price or Contract Time, or other relief under the Contract Documents; and
 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.
- B. *Submittal of Claim*: Unless otherwise provided in the Contract Documents, the party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The responsibility to substantiate a Claim shall rest with the party making the Claim. Except for Claims submitted by the Contractor to increase the Contract Price or Contract Time as permitted in the Contract Documents, the failure of a party to timely give the notice of Claim set forth herein shall not constitute a waiver of such Claim.
- C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation*:
1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.
 2. If Owner and Contractor agree to mediation, the mediation shall occur within 60 days after the agreement to mediate. However, the mediation may be stayed and its scope and schedule may be amended.
 3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
 4. Mediation is a condition precedent to litigation before a court of competent jurisdiction or tribunal.
- E. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party.
- F. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise, that agreement should be memorialized in a Change Order if the Project is ongoing at the time of resolution and the agreement affects the Contract scope, price, or time.

13. COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.1. Cost of the Work

- A. *Purposes for Determination of Cost of the Work*: Term Cost of Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.1 are used for two distinct purposes:
1. To determine Cost of the Work when Cost of the Work is a component of Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
 2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.

- B. *Costs Included:* Except as otherwise may be agreed to in writing by Owner, costs included in Cost of the Work shall be in amounts no higher than those prevailing in the locality of Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:
1. Payroll costs for employees in the direct employ of Contractor in the performance of Work. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time. 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, and vacation and holiday pay applicable thereto.
 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 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 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 13.1.
 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. 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, approved by Owner, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of 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. The cost of utilities, fuel, and sanitary facilities at the Site.
 - e. Costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.
- C. *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 employees, agents and other personnel not included in Paragraph 13.1.B, whether at Site or in Contractor's principal or branch office for general administration of Work. Payroll costs and other compensation excluded here are to be considered administrative costs covered by Contractor's fee.
 2. Expenses of Contractor's principal and branch offices other than Contractor's office at Site.
 3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for Work and charges against Contractor for delinquent payments.
 4. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.1.B.
- D. *Contractor's Fee:* When the Work as a whole is performed on basis of Cost of Work, Contractor's fee shall be determined as set forth in Contract Documents. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of Work, Contractor's fee shall be determined as set forth in Paragraph 11.04.C.
- E. *Documentation:* Whenever Cost of Work for any purpose is to be determined pursuant to this Article 13, 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.

13.2. *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 Contract Documents.
- B. 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. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. 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.
- D. 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 the following paragraph.
- E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:
 - 1. 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 Contract Documents;
 - 2. there is no corresponding adjustment with respect to any other item of Work; and
 - 3. Contractor believes that it 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.

14. TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

14.1. *Access to Work*

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

14.2. *Tests, Inspections, and Approvals*

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall be responsible for providing the services of an independent inspection and testing lab if the Contract Documents so require.
- C. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
 - 1. by Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
 - 2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in Work;
 - 3. by manufacturers of equipment furnished under the Contract Documents;
 - 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and

5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner.

- D. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- 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, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.3. *Defective Work*

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective. The Owner shall have the right, in Owner's sole discretion, to have the Engineer or other consultants specify the means and methods that will be followed to correct or address any defective Work. If the Owner specifies a means or method by which defective Work will be addressed or corrected, the Contractor shall perform the specified work necessary to address or correct the defective Work at Contractor's sole cost and expense.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, and the costs of repair or replacement of work of others resulting from defective Work, including but not limited to any engineering or other consultant's fees incurred by the Owner to investigate such defective Work and/or to determine the appropriate means or methods to address or correct such defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.4. *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work, including but not limited to any engineering or other consultant's fees incurred by the Owner to investigate such defective Work and/or to determine the appropriate means or methods and work necessary to allow Owner to accept the defective Work and Contractor shall pay for all work required to be performed to allow Owner to accept the defective Work and any estimated costs, expenses and the greater of (1) the costs, expenses and damages Owner may sustain in the future as a result of accepting the defective Work or (2) the diminution in the value of the Work resulting from Owner's acceptance of defective Work. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay to Owner the above described costs, expenses and damages incurred by Owner as a result of Owner's acceptance of defective Work.

14.5. *Uncovering Work*

- A. Engineer has the authority to require special inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.
- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, upon Owner's approval and 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, and provide all necessary labor, material, and equipment.
 - 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages 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 pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
 - 2. If the uncovered 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 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, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.6. *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, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated.

14.7. *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, 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, then Owner may, after seven days written notice to Contractor, correct or remedy any such defective Work.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or 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, 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 incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. 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. If the payments due under Article 15 are not sufficient to cover such claims, costs, losses and damages, the Contractor shall pay the amount of such claims, costs, losses and damages to Owner upon demand by Owner.
- D. Contractor shall not be allowed an extension of the Contract Times 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 14.07.

15. PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.1. *Progress Payments*

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Owner and Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments:*
1. At least 20 days before the date established in the Agreement 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, a warehouse bond, 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.
 4. Each payment to the Contractor by the Owner shall be made subject to submission by the Contractor of all written certifications required of the Contractor, their Subcontractors and other general and special conditions elsewhere in this contract.
- C. *Review of Applications:*
1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, 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 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; 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:
 - a. 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; or
 - b. 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. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
 - e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Reductions in Payment by Owner:*

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work;
 - b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. the Work is defective, requiring correction or replacement;
 - g. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - h. other items set forth in the Contract Documents entitling Owner to a set off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, 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, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

- E. *Withholding Payments.* The Owner may withhold from any payment otherwise due the Contractor so much as may be necessary to protect the Owner and if so elects may also withhold any amounts due from the Contractor to any Subcontractors or material dealers, for work performed or material furnished by them. The foregoing provisions shall be construed solely for the benefit of the Owner and will not require the Owner to determine or adjust any claims or disputes between the Contractor and their Subcontractors or Material dealers, or to withhold any monies for their protection unless the Owner elects to do so. The failure or refusal of the Owner to withhold any monies from the Contractor shall in no way impair the obligations of any surety or sureties under any bond or bonds furnished under the Contract Documents.

15.2. *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all

patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

15.3. *Substantial Completion*

- A. When Contractor considers the entire Work Substantially Complete, Contractor shall notify Owner and Engineer in writing that the entire Work is Substantially Complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before Final Payment.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. At that inspection, Owner and Engineer will review, supplement, and edit the initial punch list prepared by Contractor or prepare an additional punch list if Contractor has not yet provided a punch list. If Owner or Engineer does not consider the Work Substantially Complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Owner and Engineer consider the Work Substantially Complete, Engineer will deliver to Owner a preliminary Certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. If Owner and Engineer do not consider the Work Substantially Complete, the Engineer shall notify Contractor of such, in writing, with a specific explanation of those portions of the Work that are the basis for determining the Work is not substantially complete.
- D. After Substantial Completion, the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to Final Payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

15.4. *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any Substantially Completed part of the Work which has specifically been identified in the Contract Documents, or which Owner and Engineer 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, subject to the following conditions:
 - 1. At any time Owner may notify the Contractor in writing that Owner intends to use or occupy any such part of the Work that Owner believes to be Substantially Complete. Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03 for that part of the Work.
 - 2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work. The Owner shall have no obligation, however, to accept any portion of Work as being Substantially Complete or to occupy or use any portion of the Work until all of the Work is Substantially Complete
 - 3. 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 Owner or Engineer does not consider that part of the Work to be Substantially Complete, Engineer will notify Contractor in writing giving the reasons therefor. If Owner and Engineer consider that part of the Work to be Substantially Complete, and if Owner elects to use and occupy that part of the Work, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work.
 - 4. No use or occupancy or separate operation of part of the Work by Owner will relieve Contractor of its insurance obligations under these Contract Documents.
- B. The Owner, at the Owner's sole option, shall have the right to take possession of and use any completed or partially completed portion of the Work regardless of the time for completing the entire Work. The Owner's exercise of such use and possession shall not be construed to mean that the Owner acknowledges that any part of the Work so possessed and used is substantially complete or that it is accepted by Owner, and the Owner's exercise of such use and possession shall not relieve the Contractor of its responsibility to complete all Work in accordance with the Contract Documents.

15.5. *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, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.6. *Final Payment*

A. *Application for Payment:*

1. After Contractor has, in the opinion of the Owner and 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, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for Final Payment.
2. The Final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to Final Payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
 - d. a list of all disputes that Contractor believes are unsettled; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, 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, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.
4. The retainage and its interest earnings, if any, shall not be paid to the Contractor until the TWDB has authorized a reduction in, or release of, retainage on the Work.

B. *Engineer's 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 have been fulfilled, Engineer will, within ten days after receipt of the Final Application for Payment, indicate in writing Engineer's recommendation of Final Payment and present the Final Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary to protect Owner from loss for the reasons stated above with respect to progress payments. Otherwise, Engineer will return the Final 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 Final Application for Payment.

C. *Completion of Work:* The Work is complete (subject to surviving obligations) when it is ready for Final Payment as established by the Engineer's written recommendation of Final Payment.

D. *Payment Becomes Due:* Thirty days after the presentation to Owner of the Engineer's recommendation regarding whether the Work is complete and the amount of the Final Payment to be made to the Contractor, the amount recommended by Engineer (less any further sum Owner is

entitled to set off) will become due and shall be paid by Owner to Contractor, unless Owner disputes the recommendation of the Engineer. If Owner disputes the recommendation of the Engineer, the Owner shall provide to the Contractor a written description of the reasons why the Owner disputes the recommendation of the Engineer and Owner shall pursue a Claim against the Contractor pursuant to the disputes resolution procedures set forth in the Contract Documents.

- E. *Contractor's Warranty and Guarantee:* Contractor's general warranty and guarantee will begin to run upon Final Completion as approved by Owner, and following Engineer's written recommendation.

15.7. *Waiver of Claims*

- A. The making of final payment will not constitute a waiver by Owner of Claims or rights against Contractor. Owner expressly reserves Claims and rights arising from defective Work appearing after Final Completion, from Contractor's failure to comply with the Contract Documents or the terms of any guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.
- B. The acceptance of Final Payment by Contractor will constitute a waiver by Contractor of all Claims and rights against Owner other than those pending matters that have been duly submitted, in writing, expressly reserved, or appealed under the provisions of Article 17.

15.8. *Correction Period*

- A. If within two years after the date of Final Completion (or such longer period of time as may be prescribed 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 in need of repair, adjustment, modification, correction, or found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. correct the defective repairs to the Site or such other adjacent areas;
 - 2. correct such defective Work;
 - 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective;
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom, and
 - 5. Perform such work specified by Owner that will allow Owner to accept defective Work.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired, may have the rejected Work removed and replaced, or may have work performed to allow Owner to accept defective Work. 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 repair, removal and replacement or other work performed to allow Owner to accept defective Work (including but not limited to all costs of repair or replacement of work of others).
- C. 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.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, 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.
- E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

16. SUSPENSION OF WORK AND TERMINATION

16.1. *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Time, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

16.2. *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination of the Agreement or termination of Contractor's right to proceed with the Work for cause:
 - 1. Contractor's 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);
 - 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents; or
 - 3. Contractor's disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor ten (10) days written notice that Owner is considering a declaration that Contractor is in default and termination of the Agreement or Contractor's right to proceed with the Work, Owner may proceed to:
 - 1. declare Contractor to be in default, and give Contractor notice that the Agreement is terminated or Owner has terminated Contractor's right to proceed with the Work; and
 - 2. enforce the rights available to Owner under any applicable performance bond.
- C. If Owner has exercised any of the remedies described in Paragraph 16.02B above, Owner may exclude Contractor from the Site, take possession of the Work, 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 complete the Work as Owner may deem expedient. If Owner chooses to complete the Work in accordance with this provision, Owner and Contractor expressly agree that Owner shall be exempt from publicly bidding the completion work pursuant to Section 252.022 of the Texas Local Government Code.
- D. Owner may not proceed with the remedies under Paragraph 16.02.B if Contractor within seven (7) days of receipt of notice of intent to terminate begins to correct its default and proceeds diligently to cure such default.
- E. If Owner proceeds to complete the Work and/or correct the default, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost of all related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner.
- F. 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, or any rights or remedies of Owner against Contractor or any surety under the Contract Documents and under any applicable Laws and Regulations.

16.3. *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor, Owner, without cause and without prejudice to any other right or remedy of Owner, may terminate the Agreement. In such case, Contractor shall be paid for:
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination;

2. 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;
 3. demobilization expenses; and
 4. overhead and profit on unperformed work.
- B. Contractor shall not be paid for any economic loss arising out of or resulting from such termination, except for those costs expressly identified above.

16.4. *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (2) 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 16.03.
- B. 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. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Time or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

17. FINAL RESOLUTION OF DISPUTES

17.1. *Methods and Procedures*

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this Article:
1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and
 2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after Final Payment has been made.
 3. Reserved claims of Owner or Contractor under the Contract Documents, including Article 12.
- B. *Final Resolution of Disputes:*
1. For any disputes subject to this Article, Owner and Contractor shall endeavor to resolve their Claims by mediation. The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction. Mediation is a condition precedent to litigation before a court of competent jurisdiction.
 2. For any claim not resolved by mediation, the parties agree to submit such claims to the jurisdiction of the District Courts of Williamson County, Texas for final dispute resolution through litigation.

18. MISCELLANEOUS

18.1. *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:
1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended;
 2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice; or
 3. delivered by electronic means with a corresponding confirmation of delivery or read receipt.

18.2. *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, Sunday or a legal holiday, the computation of time will conclude on the next business day.

18.3. *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 special warranty or guarantee, or by other provisions of the Contract Documents.

18.4. *Limitation of Damages*

- A. The Contractor and Owner waive claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes:
 - 1. damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
 - 2. damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there and home office overhead, for losses of financing, bonding capacity, business and reputation, and for loss of profit except anticipated profit arising directly from the Work and any other damages limited by applicable Laws and Regulations.
- B. Contractor expressly acknowledges, to the exclusion of all other damages, the total amount of money awarded in an adjudication brought against the Owner for breach of the Agreement shall be limited to the following:
 - 1. The balance due and owed by the Owner under this Contract as it may have been amended;
 - 2. The amount owed for approved change orders or additional work the Contractor was directed to perform by the Owner in connection with this Contract;
 - 3. Reasonable and necessary attorney's fees that are equitable and just; and
 - 4. Interest as allowed by law, including interest as calculated under the Texas Government Code Chapter 2251.
- C. Notwithstanding any other limitation of damages set forth in this Contract, the total amount of damages awarded in an adjudication brought against the Owner arising under this Contract shall not include:
 - 1. Consequential damages, including those waived under Paragraph 18.04.A.2;
 - 2. Exemplary damages;
 - 3. Damages for unabsorbed home office overhead; or
 - 4. Damages not expressly permitted under Paragraph 18.04

18.5. *No Waiver*

- A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of the Contract Documents.

18.6. *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, Final Completion, and Final Acceptance of the Work or termination or completion of the Agreement or termination of the services of Contractor.

18.7. *Controlling Law*

- A. The Agreement shall be governed by the laws of the State of Texas.

18.8. *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute substantive provisions of the Contract Documents.

18.9. *Prevailing Wage Rates*

- A. This contract is subject to Government Code Chapter 2258 concerning payment of Prevailing Wage Rates. The Owner will determine what the general prevailing rates are in accordance with the statute. The applicable provisions include, but are not limited to the following:

1. §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:
- i. 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.
 - ii. 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

2. §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.
- i. The public body shall use any money collected under this section to offset the costs incurred in the administration of this chapter.
 - ii. A municipality is entitled to collect a penalty under this section only if the municipality has a population of more than 10,000.

3. §2258.024. Records:

- a. A Contractor and Subcontractor shall keep a record showing:
- i. The name and occupation of each worker employed by the Contractor or Subcontractor in the construction of the public work.
 - ii. 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.

4. §2258.025. 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

18.10. *Right to Audit:*

- A. Whenever the Owner enters into any type of contractual arrangement with the Contractor, then the Contractor's "records", upon reasonable notice, shall be open to inspection and subject to audit and/or reproduction during normal business working hours. The Owner's representative, or an outside representative engaged by the Owner, may perform such audits. The Contractor shall maintain

all records relating to this Agreement for four (4) years from the date of Final Payment under the Agreement.

- B. The Owner shall have the exclusive right to examine the records of the Contractor. The term “records” as referred to herein shall include any and all information, materials and data of every kind and character, including without limitation records, books, papers, documents, contracts, schedules, commitments, arrangements, notes, daily diaries, reports, drawings, receipts, vouchers and memoranda, and any and all other agreements, sources of information and matters that may, in the Owner’s judgment, have any bearing on or pertain to any matters, rights, duties or obligations under or covered by any contract document. Such records shall include (hard copy, as well as computer-readable data if it can be made available), written policies and procedures, time sheets, payroll registers, cancelled checks, personnel file data, correspondence, general ledger entries, and any other record in the Contractor’s possession which may have a bearing on matters of interest to the Owner in connection with the Contractor’s dealings with the Owner (all of the foregoing are hereinafter referred to as “records”). In addition, the Contractor shall permit interviews of employees as well as agents, representatives, vendors, subcontractors and other third parties paid by the Contractor to the extent necessary to adequately permit evaluation and verification of the following:
 - 1. The Contractor’s compliance with Contract Documents;
 - 2. The Contractor’s compliance with the Owner’s business ethics policies; and
 - 3. If necessary, the extent of the Work performed by the Contractor at the time of contract termination.
- C. The Contractor shall require all payees (examples of payees include subcontractors, insurance agents, material suppliers, etc.) to comply with the provisions of this Article 18.10 by securing the requirements hereof in a written agreement between the Contractor and payee. Such requirements include a flow-down right of audit provision in contracts with payees that also apply to subcontractors and sub-subcontractors, material suppliers, etc. The Contractor shall cooperate fully and shall require Related Parties and all of the Contractor’s subcontractors to cooperate fully in furnishing or in making available to the Owner from time to time whenever requested, in an expeditious manner, any and all such information, materials, and data.
- D. The Owner’s authorized representative or designee shall have reasonable access to the Contractor’s facilities, shall be allowed to interview all current or former employees to discuss matters pertinent to the performance of this Agreement, and shall be provided adequate and appropriate work space in order to conduct audits in compliance with this Article 18.10.
- E. If an audit inspection or examination in accordance with this Article 18.10 discloses overpricing or overcharges of any nature by the Contractor to the Owner in excess of one-half of one percent (.5%) of the total contract billings, then the reasonable actual cost of the Owner’s audit shall be reimbursed to the Owner by the Contractor. Any adjustments and/or payments, which must be made as a result of any such audit or inspection of the Contractor’s invoices and/or records, shall be made within a reasonable amount of time (not to exceed 90 days) from presentation of the Owner’s findings to the Contractor.
- F. *Review by Owner and TWDB*
 - 1. The Owner, authorized representatives and agents of the Owner, and the TWDB shall, at all times have access to and be permitted to observe and review all work, materials, equipment, payrolls, personnel records, employment conditions, material invoices, and other relevant data and records pertaining to this contract, provided, however that all instructions and approval with respect to the work will be given to the Contractor only by the Owner through authorized representatives or agents.
 - 2. Any such inspection or review by the TWDB shall not subject the state of Texas, or its representatives, to any action for damages.

18.11. *Prohibition Against Boycotting Israel:*

- A. Contractor agrees that Contractor currently does not boycott Israel, as that term is defined in Texas Government Code Section 808.001, as amended, nor will Contractor boycott Israel during the term of this Agreement.

18.12. *Additional Close-Out Procedures*

- A. To Close-out the contract and release final retainage, the following steps must be completed:
 - 1. TWDB Staff must conduct a construction contract final inspection (CCFI).
 - 2. The following submittals must be received, reviewed, and accepted by TWDB:
 - a. The final Change Order, adjustment of quantities, or a statement that all Change Orders have previously been submitted and there will be no more Change Orders.
 - b. The final pay request from the Contractor.
 - c. An affidavit by the Contractor that all bills have been paid.
 - d. Certification by Project Engineer that work has been completed and was constructed in accordance with the approved plans and specifications and sound engineering principles and construction practices.
 - e. Acceptance of the project by the Owner in the form of a written resolution or other formal action; TWDB-0552 Page 19 of 19 Rev 02/17.
 - f. Notification of the beginning date of the warranty period for Contract.
 - g. Confirmation that the Owner has received as-built drawings from Contractor.
 - 3. TWDB will issue a Certificate of Approval allowing the release of retainage.

18.13. *Non-Waiver of Sovereign Immunity*

- A. Nothing in Contract Documents shall constitute and shall not be interpreted or construed to constitute a waiver of sovereign immunity applicable to Owner.
- B. Any limitation of the sovereign immunity of Owner shall be controlled by applicable Laws and Regulations.

END OF SECTION

SECTION 00 70 01

INSURANCE REQUIREMENTS AND INDEMNITY

Contractor will procure and maintain at its expense insurance with insurance companies authorized to do business in State of Texas, covering all operations under this Agreement, whether performed by Contractor or its agents, subcontractors or employees. Before commencing Work, Contractor will furnish to SSLGC an original certificate or certificates in a form satisfactory to SSLGC, showing that Contractor has complied with this paragraph.

Contractor shall not cause any insurance policy to be cancelled or permit it to lapse, and all insurance policies shall include an endorsement to effect that the insurance policy shall not be subject to cancellation or to a reduction in required limits of liability or amounts of insurance until notice has been mailed to City of Seguin, ATTN: Director of Finance, P.O. Box 591, Seguin, TX 78156-0591. Notice shall state date when such cancellation or reduction shall be effective. Cancellation date shall not be less than thirty (30) days after such notice.

Commercial general liability insurance will be written with SSLGC as an additional insured and will be endorsed to provide a waiver of carrier’s right of subrogation against SSLGC. Types and amounts of insurance required are set forth below:

TYPE	AMOUNTS
1. Workers' Compensation	Statutory
2. Commercial General Liability Insurance to include coverage for the following: a. Premises/Operations b. Independent Contractors c. Products/Completed Operations d. Personal Injury e. Contractual Liability f. Professional Liability (when applicable)	\$1,000,000 combined single limits
3. Business Automobile Liability a. Owned/leased vehicles b. Non-owned vehicles c. Hired Vehicles	Combined Single Limit for Bodily Injury and Property Damage of \$500,000 per occurrence
4. See Section 00 70 04 for additional Insurance requirements for Railroad bore.	

A. Limits

- i. Stated limits of insurance are minimum only. They do not limit Contractor’s indemnity obligation, and it will be Contractor’s responsibility to determine what limits are adequate. These limits may be met by basic policy limits or any combination of basic limits and umbrella limits. SSLGC’s acceptance of certificates of insurance that do not comply with these requirements in any respect does not release Contractor from compliance with these requirements.

B. Policies

- i. Contractor shall maintain such General Liability, Excess Liability, Professional and Pollution insurance in identical coverage, form and amount, including required endorsements, for at least two (2) years following Date of Substantial Completion of Work to be performed under this Agreement. Contractor shall provide written representation to Owner stating Work completion date.
- ii. All policies must:
 - a. Be written through insurance companies authorized to do business in State in which work is to be performed and rated no less than A-: VII in the most current edition of A. M. Best’s Key Rating Guide at all times Work is to be performed.

- b. Provide a waiver of subrogation in favor of Owner Parties on all insurance coverage carried by Contractor, whether required herein or not.
 - c. Contain an endorsement providing for thirty (30) days prior written notice of cancellation to Owner.
 - d. Be provided to Owner Parties in compliance with the requirements herein and shall contain no endorsements that restrict, limit, or exclude coverage required herein in any manner without the prior express written approval of Owner.
- iii. Failure of any Owner Party to demand such certificate or other evidence of full compliance with these insurance requirements or failure of any Owner Party to identify a deficiency from evidence that is provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.
 - iv. Contractor shall provide to Owner a certified copy of all insurance policies required herein within ten (10) days of any such request. Renewal policies, if necessary, shall be delivered to Owner prior to expiration of previous policy
 - v. Commencement of Work without provision of required certificate of insurance, evidence of insurance and/or required endorsements, or without compliance with any other provision of this Agreement, shall not constitute a waiver by any Owner Party of any rights. Owner shall have right, but not obligation, of prohibiting Contractor or any subcontractor from performing any Work until such certificate of insurance, evidence of insurance and/or required endorsements are received and approved by Owner.

C. Limits, Deductibles and Retentions

- i. Limits of liability may be provided by a single policy of insurance or by a combination of primary and excess policies, but in no event shall total limits of liability available for any one occurrence or accident be less than amount required herein.
- ii. No deductible or self-insured retention shall exceed \$25,000 without prior written approval of Owner, except as otherwise specified herein. All deductibles and/or retentions shall be paid by, assumed by, for account of, and at Contractor's sole risk. Contractor shall not be reimbursed for same.

D. Forms

- i. If forms of policies, endorsements, certificates or evidence of insurance required by this Exhibit are superseded or discontinued, Owner will have the right to require other equivalent forms.
- ii. Any policy or endorsement form other than a form specified in this Exhibit must be approved in advance by Owner.

E. Evidence of Insurance. Insurance must be evidenced as follows:

- i. ACORD Form 25 Certificate of Liability Insurance for liability coverages.
- ii. ACORD Form 28 Evidence of Commercial Property Insurance for property coverages.
- iii. Evidence shall be provided to Owner prior to commencing Work and prior to expiration of any required coverage.
- iv. ACORD Forms specify:
 - a. Owner as certificate holder at Owner's mailing address;
 - b. Insured's name, which must match that on this Agreement;
 - c. Insurance companies producing each coverage and the policy number and policy date of each coverage;
 - d. Producer of the certificate with correct address and phone number and have signature of authorized representative of producer;
 - e. Additional Insured status in favor of Owner Parties;
 - f. Amount of any deductible or self-insured retention in excess of \$25,000;
 - g. Designated Construction Project(s) General Aggregate Limit;
 - h. Primary and non-contributory status;
 - i. Waivers of subrogation; and

- j. All exclusions and limitations added by endorsement to General Liability coverage. This can be achieved by attachment of Schedule of Forms and Endorsements page.

F. Contractor Insurance Representations to Owner Parties

- i. It is expressly understood and agreed that insurance coverages required herein (a) represent Owner Parties' minimum requirements and are not to be construed to void or limit Contractor's indemnity obligations as contained in this Agreement nor represent in any manner a determination of insurance coverages Contractor should or should not maintain for its own protection; and (b) are being, or have been, obtained by Contractor in support of Contractor's liability and indemnity obligations under this Agreement. Irrespective of requirements as to insurance to be carried as provided for herein, insolvency, bankruptcy or failure of any insurance company carrying insurance of Contractor, or failure of any insurance company to pay claims accruing, shall not be held to affect, negate or waive any of provisions of this Agreement.
- ii. Failure to obtain and maintain required insurance shall constitute a material breach of, and default under, this Agreement. If Contractor shall fail to remedy such breach within five (5) business days after notice by Owner, Contractor will be liable for any and all costs, liabilities, damages and penalties resulting to Owner Parties from such breach, unless a written waiver of specific insurance requirement(s) is provided to Contractor by Owner. In the event of any failure by Contractor to comply with the provisions of this Agreement, Owner may, without in any way compromising or waiving any right or remedy at law or in equity, on notice to Contractor, purchase such insurance, at Contractor's expense, provided that Owner shall have no obligation to do so and if Owner shall do so, Contractor shall not be relieved of or excused from obligation to obtain and maintain such insurance amounts and coverages.
- iii. This Exhibit is an independent contract provision and shall survive termination or expiration of Agreement.

G. Insurance Requirements of Contractor's Subcontractors

- i. Insurance similar to that required of Contractor shall be provided by all subcontractors (or provided by Contractor on behalf of subcontractors) to cover operations performed under any subcontract agreement. Contractor shall be held responsible for any modification in these insurance requirements as they apply to subcontractors. Contractor shall maintain certificates of insurance from all subcontractors containing provisions similar to those listed herein (modified to recognize that certificate is from subcontractor) enumerating, among other things, waivers of subrogation, additional insured status, and primary liability as required herein, and make them available to Owner upon request.
- ii. Contractor is fully responsible for loss and damage to its property on Site, including tools and equipment, and shall take necessary precautions to prevent damage to or vandalism, theft, burglary, pilferage and unexplained disappearance of property. Any insurance covering Contractor's or its subcontractor's property shall be Contractor's and its subcontractor's sole and complete means or recovery for any such loss. To the extent any loss is not covered by said insurance or subject to any deductible or co-insurance, Contractor shall not be reimbursed for same. Should Contractor or its subcontractors choose to self insure this risk, it is expressly agreed that Contractor hereby waives, and shall cause its subcontractors to waive, any claim for damage or loss to said property in favor of Owner Parties.

H. Use of Owners Equipment

- i. Contractor, its agents, employees, subcontractors or suppliers shall use Owners equipment only with express written permission of Owners designated representative and in accordance with Owners terms and condition for such use. If Contractor or any of its agents, employees, subcontractors or suppliers utilize any of Owners equipment for any purpose, including machinery, tools, scaffolding, hoists, lifts or similar items owned, leased or under control of Owner, Contractor shall defend, indemnify and be liable to Owner Parties for any and all loss or damage which may arise from such use and shall pay Owner for such use.

I. Release and Waiver

- i. Contractor hereby releases, and shall cause its subcontractors to release, Owner Parties from any and all claims or causes of action whatsoever which Contractor and/or its subcontractors might otherwise now or hereafter possess resulting in or from or in any way connected with any loss covered by insurance, whether required herein or not, or which should have been covered by insurance required herein, including the deductible and/or uninsured portion thereof, maintained and/or required to be maintained by the Contractor and/or its subcontractors pursuant to this Agreement. **FORGOING RELEASE AND WAIVER APPLY**

EVEN IF LOSS OR DAMAGE IS CAUSED IN WHOLE OR IN PART BY FAULT OR NEGLIGENCE OR STRICT LIABILITY OF OWNER PARTIES.

- ii. **CONTRACTOR WILL INDEMNIFY, HOLD HARMLESS AND DEFEND SSLGC AND ITS EMPLOYEES, AGENTS, OFFICERS, AND SERVANTS FROM ANY AND ALL LAWSUITS, CLAIMS, DEMANDS AND CAUSES OF ACTION OF ANY KIND ARISING FROM NEGLIGENT OR INTENTIONAL ACTS ERRORS OR OMISSIONS OF CONTRACTOR, ITS OFFICERS, EMPLOYEES OR AGENTS. THIS WILL INCLUDE, BUT NOT BE LIMITED TO, AMOUNTS OF JUDGMENTS, PENALTIES, INTEREST, COURT COSTS, REASONABLE LEGAL FEES, AND ALL OTHER EXPENSES INCURRED BY SSLGC ARISING IN FAVOR OF ANY PARTY, INCLUDING AMOUNTS OF ANY DAMAGES OR AWARDS RESULTING FROM CLAIMS DEMANDS AND CAUSES OF ACTION FOR PERSONAL INJURIES, DEATH OR DAMAGES TO PROPERTY ALLEGED OR ACTUAL INFRINGEMENT OF PATENTS, COPYRIGHTS, AND TRADEMARKS AND WITHOUT LIMITATION BY ENUMERATION, ALL OTHER CLAIMS, DEMANDS, OR CAUSES OF ACTION OF EVERY CHARACTER OCCURRING, RESULTING, OR ARISING FROM ANY NEGLIGENT OR INTENTIONAL WRONGFUL ACT, ERROR OR OMISSION OF CONTRACTOR OR ITS AGENTS OR EMPLOYEES. THIS OBLIGATION BY CONTRACTOR WILL NOT BE LIMITED BY REASON OF SPECIFICATION OF ANY PARTICULAR INSURANCE COVERAGE REQUIRED UNDER THIS AGREEMENT.**

END OF SECTION

SECTION 00 70 02

BILLS PAID AFFIDAVIT

BEFORE ME, the undersigned authority, personally appeared, known to me to be a credible person, and after being by me duly sworn, upon oath stated and affirmed that:

“My name is _____ and I am the _____ of _____, hereafter referred to in this affidavit as “Contractor”. Undersigned has personal knowledge of the facts stated herein and has full authority to make the agreements in this affidavit on behalf of Contractor.

Pursuant to and in accordance with a written contract between Contractor and Schertz Seguin Local Government Corporation (“Owner”), Contractor furnished materials and labor for the construction, renovation, or repair of improvements located on or relating to project known as **SSLGC - 36" Pipeline** located in Guadalupe County, Texas. All work provided for under said written construction contract, together with all changes and supplements thereto, has been fully completed in accordance with the terms and provisions thereof.

Contractor has paid each of its subcontractors, laborers, suppliers and materialmen in full for all labor and materials provided to Contractor for or in connection with the construction, renovation, or repair of improvements on or relating to the subject Property, or any portion thereof.

Contractor is not aware of any unpaid bills, claims, demands, or causes of action by any of its subcontractors, laborers, suppliers, or materialmen for or in connection with the furnishing of labor or materials, or both, for the construction, renovation, or repair of improvements located on or related to the subject Property.

In consideration of the funds paid to Contractor by Owner and by Lender on behalf of Owner in reliance on this affidavit, Contractor waives and releases all of Contractor’s statutory and constitutional mechanic’s lien rights connected with the construction of the Project, conditioned on the actual payment or collection if payment is made by check or draft.

Contractor further understand that this Final Bills Paid Affidavit is being given pursuant to and in accordance with Sections 53.085 and 53.259 of the Texas Property Code and that the intentional, knowing, or reckless making of a false or misleading statement in this Affidavit constitutes an offense under said Section and is a Class A misdemeanor.

Contractor hereby indemnifies and holds harmless Owner from any and all claims, demands or causes of action, and any costs, expenses, and attorney’s fees incurred in connection therewith, arising from or connected with, the statements and representations contained herein.”

EXECUTED this _____ day of _____, 20____.

[Name of Contractor]

By: _____

Printed Name: _____

Title: _____

Notary's Acknowledgement

Before me, the undersigned authority, on this day personally appeared _____, who first being duly sworn by me to be the person whose name is subscribed to the foregoing Bills Paid Affidavit, acknowledged that he/she has the authority to make this Bills Paid Affidavit, and further acknowledged to me that he/ she executed the same for the purpose and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE on this the _____ day of _____, 20____.

(Seal)

Notary Public, State of Texas
My commission expires: _____



Texas Water Development Board
Supplemental Contract Conditions and
Instructions

For Construction Services for
Projects Funded through State Programs

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Forms and Guidance:

The Texas Water Development Board (TWDB) forms and guidance documents noted in this instruction document may be accessed through the TWDB's Financial Assistance web site at:

<http://www.twdb.texas.gov/financial/instructions/index.asp>

Search by either the document number or name.

I. INSTRUCTIONS TO APPLICANT

1. Applicability

These Supplemental Conditions contain provisions that are worded to comply with certain statutes and regulations which specifically relate to projects receiving state funds only. Except as noted, these supplemental conditions apply to projects funded by the following financial assistance programs:

- ✓ Agricultural Water Conservation Fund (AWCF)
- ✓ Economically Distressed Areas Program (EDAP)
- ✓ Rural Water Assistance Fund (RWAFF)
- ✓ State Participation (SP)
- ✓ State Water Implementation Fund for Texas (SWIFT)
- ✓ Texas Water Development Fund II (WDF)

Provisions that are applicable to the project's funding source or dollar value of the contract are so noted within these provisions.

NOTES:

- Per Section 17.183(c)(4), Texas Water Code (TWC), U.S. Iron and Steel requirements do not apply to SWIFT projects funded prior to May 1, 2019.
- Effective September 1, 2017, TWC §17.183 eliminated the requirement for *Manufactured Goods*. Thus, projects approved for funding after September 1, 2013 and which are not currently under construction, will only need to meet the requirements of TWC §17.183 as amended by S.B. 1289, 85th Legislative Session, and as outlined in these Contract Conditions.
- Texas Water Code § 17.183 does not apply to the Agricultural Water Conservation Fund; however, the US I&S provisions in Texas Government Code, Chapter 2252, Subchapter F may apply to certain conservation projects funded through the Agricultural Water Conservation Fund. See Attachment 1 for supplemental guidance regarding Agricultural Water Conservation Fund projects.

2. Use of Conditions

The language and conditions listed under ***Section II: Instructions to Bidders*** are to be included in the instructions to bidders for construction services. The provisions listed under ***Section III: Supplemental Contract Conditions*** shall be included in their entirety with the other general and special conditions that are typically included in the construction contract documents by the design engineer.

3. Modifications to Provisions

These provisions shall be included as a stand-alone section in the contract documents. The Applicant and the consulting engineer (Engineer) should carefully study these provisions before incorporating them into the construction contract documents. In particular, Water Districts and other types of districts should be aware of statutes relating to their creation and operation which may affect the application of these conditions. **The TWDB Project Engineer/Reviewer should be consulted if the Applicant thinks there is a need to modify parts of these provisions.**

Supplemental Condition #13 (Archeological Discoveries and Cultural Resources) and #14 (Endangered Species) may be superseded or modified by project specific conditions established during the environmental review process.

These documents may confer certain duties and responsibilities on the Engineer that are beyond, or short of, what the Applicant intends to delegate. The Applicant should ensure that the contractual agreement with the Engineer provides for the appropriate services. Otherwise the Applicant should revise the wording in these special conditions to agree with actually delegated functions.

4. Good Business Practices

There are other contract provisions that the Applicant (Owner) and Engineer should include as a matter of good business practices. It is recommended that provisions addressing the following matters be included in the construction contract.

- (a) Specifying the time frame for accomplishing the construction of the project, and the consequences of not completing on time, including liquidation damages.
- (b) Specifying the type, dollar value, and documentation of insurance the contractor is to carry. At a minimum the contractor should carry worker's compensation, liability and builder's risk insurance.
- (c) Identifying the responsibility of the contractor – Responsibility and Warranty of Work.
- (d) Price reduction for defective pricing of negotiated costs.
- (e) Differing site conditions - notice and claims regarding site conditions differing from indicated conditions.
- (f) Covenants against contingent fees - prohibit contingent fees for securing business.
- (g) Gratuities - prohibitions against offering and accepting gratuities.
- (h) Audit and access to records.
- (i) Suspension of work - conditions under which the Owner may suspend work.
- (j) Termination - conditions under which the Owner may terminate the contract.
- (k) Remedies - procedures for resolving disputes.

5. Other Requirements

There may be other local government requirements and applicable Federal and State statutes and regulations that are not accommodated by these conditions. It is the Applicant's responsibility to ensure that the project and all contract provisions are consistent with the relevant statutes and regulations.

6. Advertisements for Bids

State procurement statutes require advertising a contract for bids for at least two (2) consecutive weeks. By not following this requirement, the project may need to be re-advertised. The official advertisement for bids that is published in newspapers shall include certain information such as, but not limited to, the following:

- (a) A clear description of what is being procured.
- (b) How to obtain plans and specifications (P&S) and necessary forms and information.
- (c) The date and time by which bids are to be submitted (deadline).
- (d) The address where bids are to be provided.
- (e) This contract is contingent upon release of funds from the Texas Water Development Board (TWDB).
- (f) Any contract(s) awarded under this Invitation for Bids is/are subject to the United States Iron and Steel (US I&S) requirements of Texas Water Code §17.183 and/or Texas Government Code, Chapter 2252, Subchapter F, as amended by SB 1289, 85th Legislative Session, as applicable. (NOTE: does not apply to SWIFT projects funded prior to May 1, 2019).
- (g) Acknowledgement of any special requirements such as mandatory pre-bid conference.
- (h) Right to reject any and all bids.
- (i) General bond requirements.

Bid Proposal

The Bid Proposal form should account for the following:

- (a) If lump sum bid, include a list of the materials used and associated costs.
- (b) Distinguish eligible and ineligible items.
- (c) Accommodate trench safety requirements with separate per unit pay item for trench excavation safety protection, Health and Safety Code Chapter 756, Subchapter C.
- (d) Include space for the Contractor to acknowledge receipt of each Addendum issued during the bidding process.

7. Bidding Process

The Plans and Specifications (P&S) should include an explanation of how the bids will be processed. The explanation should include the following components:

- (a) Whether a pre-bid conference will be held, whether it is optional or mandatory, where and when it will be held.
- (b) Specify the criteria and process for determining responsiveness and responsibility of the bidder.
- (c) Specify the method of determining the successful bidder and award (e.g., award to the lowest responsive, responsible bidder, accounting for any multiple parts to bids) and accounting for non-resident bidder reciprocity requirements.
- (d) Allow for withdrawal of a bid due to a material mistake.
- (e) Identify the time frame that the bids may be held by the Applicant before awarding a contract (e.g., typically for 60 or 90 days).
- (f) Acknowledge right of the Applicant to reject any and all bids.

8. Release of Funds

- (a) Submittal of Bid Documents to TWDB Project Engineer/Reviewer to allow contingent award of contract:
 - (1) Advertisement and affidavit of advertisement.
 - (2) Bid tabulation.
 - (3) All addenda submitted and approved for the contract.
 - (4) Bid proposal of apparent low bidder (or chosen bidder, with explanation) with bid bond.
 - (5) Site certificate (ED-101).
 - (6) Consulting engineer's recommendation to award letter.
 - (7) A description of any bidding irregularities.
 - (8) Construction inspection proposal.
 - (9) Vendor Compliance with Reciprocity of Non-Resident Bidders Form (TWDB-0459).

(b) Following contingent award of the contract, TWDB Project Engineer/Reviewer should receive a bound copy of the executed contract documents (including specifications). This document should include:

- (1) Executed agreement.
- (2) Contractor's act of assurance (ED-103).
- (3) Contractor's act of assurance resolution (ED-104).
- (4) Payment and Performance bond (must be executed on or after the date of execution of the contract).
- (5) Contractor's Certificate of Insurance.
- (6) Sufficiency of funds letter (if the project is not 100% funded with TWDB funds).

After reviewing and approving the executed bid documents, the TWDB will issue an authorization for the Applicant to issue a notice to proceed. At this time, TWDB staff can begin releasing construction funds, in accordance with program specific requirements.

For any questions or proposed modifications to these conditions, please contact your TWDB Project Engineer/Reviewer.

II. INSTRUCTIONS TO BIDDERS

The language and conditions listed in this section shall be included in the “Instructions to Bidders” section of the construction contract document.

1. Contingent Award of Contract

This contract is contingent upon release of funds from the Texas Water Development Board. Any contract or contracts awarded under this Invitation for Bids is/are expected to be funded in part by a loan or grant from the Texas Water Development Board. Neither the state of Texas, nor any of its departments, agencies, or employees are or will be a party to this Invitation for Bids or any resulting contract.

2. U.S. Iron and Steel (Does not apply to SWIFT Projects funded prior to May 1, 2019) NA

~~Any contract(s) awarded under this Invitation for Bids is/are subject to the United States Iron and Steel requirements of Texas Water Code §17.183 and/or Texas Government Code, Chapter 2252, Subchapter F, as amended by SB 1289, 85th Legislative Session. The contractor must complete the statement of understanding regarding this requirement, found in the Supplemental Contract Conditions, Item No. 9. Refer to TWDB-1105 – United States Iron and Steel (US I&S) Guidance.~~

3. Bid Guarantee

Each bidder shall furnish a bid guarantee equivalent to five percent of the bid price (Water Code §17.183). If a bid bond is provided, the Contractor shall utilize a surety company which is authorized to do business in Texas in accordance with Surety Bonds and Related Instruments, Chapter 3503 of the Insurance Code.

4. Award of Contract to Nonresident Bidder

A governmental entity may not award a governmental contract to a nonresident bidder unless the nonresident underbids the lowest bid submitted by a responsible resident bidder by an amount that is not less than the amount by which a resident bidder would be required to underbid the nonresident bidder to obtain a comparable contract in the state in which the nonresident's principal place of business is located. A non-resident bidder is a Contractor whose corporate offices or principal place of business is outside of the state of Texas (Source: Texas Government Code, Chapter 2252, Subchapter A, Nonresident Bidders, §2252.002).

The bidder will complete form TWDB-0459, Vendor Compliance with Reciprocity on Non-Resident Bidders, **which must be submitted with the bid.**

III. SUPPLEMENTAL CONTRACT CONDITIONS

1. Supersession

The Owner and the Contractor agree that the TWDB Supplemental Conditions apply to the work eligible for Texas Water Development Board assistance to be performed under this contract and these clauses supersede any conflicting provisions of this contract.

2. Privity of Contract

Funding for this project is expected to be provided in part by a loan or grant from the Texas Water Development Board. Neither the state of Texas, nor any of its departments, agencies or employees is, or will be, a party to this contract or any lower tier contract. This contract is subject to applicable provisions in 31 TAC Chapter 363 in effect on the date of the assistance award for this project.

3. Definitions

- (a) The term "Owner" means the local entity contracting for the construction services.
- (b) The term "TWDB" means the Executive Administrator of the Texas Water Development Board, or other person who may be at the time acting in the capacity or authorized to perform the functions of such Executive Administrator, or the authorized representative thereof.
- (c) The term "Engineer" means the Owner's authorized consulting engineer for the project.

4. Laws to be Observed

In the execution of the contract, the Contractor must comply with all applicable local, state and federal laws, including but not limited to laws concerned with labor, safety, minimum wages, and the environment. The Contractor shall be familiar with and at all times shall observe and comply with all federal, state, and local laws, ordinances and regulations which in any manner affect the conduct of the work, and shall indemnify and save harmless the Owner, Texas Water Development Board, and their representatives against any claim arising from violation of any such law, ordinance or regulation by the Contractor, their Subcontractor or their employees.

5. Review by Owner and TWDB

- (a) The Owner, authorized representatives and agents of the Owner, and the TWDB shall, at all times have access to and be permitted to observe and review all work, materials, equipment, payrolls, personnel records, employment conditions, material invoices, and other relevant data and records pertaining to this contract, provided, however that all instructions and approval with respect to the work will be given to the Contractor only by the Owner through authorized representatives or agents.
- (b) Any such inspection or review by the TWDB shall not subject the state of Texas, or its representatives, to any action for damages.

6. Performance and Payment Bonds

Each Contractor awarded a construction contract must furnish performance and payment bonds:

- (a) the performance bond shall include without limitation guarantees that work done under the contract will be completed and performed according to approved plans and specifications and in accordance with sound construction principles and practices;
- (b) the performance and payment bonds shall be in a penal sum of not less than 100 percent of the contract price and remain in effect for one year beyond the date of approval by the Engineer of the political subdivision; and
- (c) the Contractor shall utilize a surety company that is authorized to do business in Texas in accordance with Surety Bonds and Related Instruments, Chapter 3503 of the Insurance Code.

7. Payments Schedule and Cost Breakdown

- (a) The Contractor shall submit for approval immediately after execution of the Agreement, a carefully prepared Progress Schedule, showing the proposed dates of starting and completing each of the various sections of the work, the anticipated monthly payments to become due to the Contractor, and the accumulated percent of progress each month.

- (b) The following paragraph applies only to contracts awarded on a lump sum contract price:

COST BREAKDOWN - The Contractor shall submit to the Owner a detailed breakdown of the estimated cost of all work to be accomplished under the contract, so arranged and itemized as to meet the approval of the Owner or funding agencies. This breakdown shall be submitted promptly after execution of the agreement and before any payment is made to the Contractor for the work performed under the contract. After approval by the Owner the unit prices established in the breakdown shall be used in estimating the amount of partial payments to be made to the Contractor.

8. Workers' Compensation Insurance Coverage (as applicable, consistent with Texas Labor Code § 406.096)

- (a) The Contractor shall certify in writing that they provide workers' compensation insurance coverage for each employee of the Contractor employed on the public project.
- (b) Each Subcontractor on the public project shall provide such a certificate relating to coverage of the Subcontractor's employees to the general Contractor, who shall provide the Subcontractor's certificate to the governmental entity.
- (c) A Contractor who has a contract that requires workers' compensation insurance coverage may provide the coverage through a group plan or other method satisfactory to the governing body of the governmental entity.
- (d) The employment of a maintenance employee by an employer who is not engaging in building or construction as the employer's primary business does not constitute engaging in building or construction.

(e) In this section:

- (1) "Building or construction" includes:
 - i. erecting or preparing to erect a structure, including a building, bridge, roadway, public utility facility, or related appurtenance;
 - ii. remodeling, extending, repairing, or demolishing a structure; or
 - iii. otherwise improving real property or an appurtenance to real property through similar activities.
- (2) "Governmental entity" means this state or a political subdivision of this state. The term includes a municipality.

9. U.S. Iron and Steel (Does not apply to SWIFT Projects funded prior to May 1, 2019) NA

The following statement must be completed by the Contractor and made a part of the agreement between the Owner and the Contractor.

The Contractor acknowledges to and for the benefit of the Applicant ("Purchaser") and the Texas Water Development Board ("TWDB") that it understands the goods and services under this Agreement are being funded with monies made available by the Water Development Fund, Rural Water Assistance Fund, Economically Distressed Areas, State Participation Fund and/or Agricultural Water Conservation Fund. That these funds have statutory requirements commonly known as "United States Iron and Steel" that requires all of the iron and steel products used in the project to be produced in the United States ("United States Iron and Steel Requirement") including iron and steel products provided by the Contractor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Purchaser and the TWDB that (a) the Contractor has reviewed and understands the United States Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the United States Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the United States Iron and Steel Requirement, as may be requested by the Purchaser or the TWDB. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser to enforce this Agreement and recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Purchaser resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the TWDB or any damages owed to the TWDB by the Purchaser). Neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the TWDB.

In the execution of the Contract, the Contractor shall be familiar with and at all times shall observe and comply with all applicable federal, state, and local laws, ordinances and regulations concerned with the use of iron and steel made in the United States which in any manner affect the conduct of the work, and shall indemnify and save harmless the Texas Water Development Board against any claim arising from violation of any such law, ordinance or regulation by the Contractor or by their Subcontractor or their employees.

~~Additional information on the United States Iron and Steel (US I&S) and its applicability to this contract can be found in the TWDB-11005 guidance.~~

~~It is recommended the Owner receive and maintain files documenting the Contractor's use of US I&S. Compliance with US I&S will be verified by the Owner through the submittal of the TWDB form TWDB-1105-A.~~

10. Prevailing Wage Rates

This contract is subject to Government Code Chapter 2258 concerning payment of Prevailing Wage Rates. The Owner will determine what the general prevailing rates are in accordance with the statute. The applicable provisions include, but are not limited to the following:

§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.

§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.

§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.

§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.

11. Employment of Local Labor (only applicable to projects funded by EDAP)

The Contractor shall, to the maximum feasible extent, employ local labor for construction of the project. The Contractor and every Subcontractor undertaking to do work on the project which is, or reasonably may be done as on-site work, shall employ qualified persons who regularly reside within the political subdivision boundary of the Owner and the economically distressed area where the project is located (Texas Water Code, Section 17.183).

12. Payments

- (a) Progress Payments:
- (1) The Contractor shall prepare their requisition for progress payment as of the last day of the month and submit it, with the required number of copies, to the Engineer for review. Except as provided in paragraph (3) of this subsection, the amount of the payment due the Contractor shall be determined by adding to the total value of work completed to date, the value of materials properly stored on the site and deducting: (1) five percent (5%) minimum of the total amount, as a retainage and (2) the amount of all previous payments. The total value of work completed to date shall be based on the actual or estimated quantities of work completed and on the unit prices contained in the agreement (or cost breakdown approved pursuant to section 7b relating to lump sum bids) and adjusted by approved change orders. The value of materials properly stored on the site shall be based upon the estimated quantities of such materials and the invoice prices. Copies of all invoices shall be available for inspection by the Engineer.
 - (2) The Contractor shall be responsible for the care and protection of all materials and work upon which payments have been made until final acceptance of such work and materials by the Owner. Such payments shall not constitute a waiver of the right of the Owner to require the fulfillment of all terms of the Contract and the delivery of all improvements embraced in this contract complete and satisfactory to the Owner in all details.

- (3) This clause applies to contracts when the Owner is a District or Authority. The retainage shall be ten percent of the amount otherwise due until at least fifty percent of the work has been completed. After the project is fifty percent completed, and if the District or Authority's Board finds that satisfactory progress is being made, then the District may authorize any of the remaining progress payments to be made in full. The District is not obligated to pay interest earned on the first 50% of work completed (Texas Water Code Sec. 49.276(d)).
 - (4) The five percent (5%) retainage of the progress payments due to the Contractor may not be reduced until the building of the project is substantially complete and a reduction in the retainage has been authorized by the TWDB.
- (b) **Withholding Payments.** The Owner may withhold from any payment otherwise due the Contractor so much as may be necessary to protect the Owner and if so elects may also withhold any amounts due from the Contractor to any Subcontractors or material dealers, for work performed or material furnished by them. The foregoing provisions shall be construed solely for the benefit of the Owner and will not require the Owner to determine or adjust any claims or disputes between the Contractor and their Subcontractors or Material dealers, or to withhold any monies for their protection unless the Owner elects to do so. The failure or refusal of the Owner to withhold any monies from the Contractor shall in no way impair the obligations of any surety or sureties under any bond or bonds furnished under this contract.
- (c) **Payments Subject to Submission of Certificates.** Each payment to the Contractor by the Owner shall be made subject to submission by the Contractor of all written certifications required of the Contractor, their Subcontractors and other general and special conditions elsewhere in this contract.
- (d) **Final Payment.**
- (1) Upon satisfactory completion of the work performed under this contract, as a condition before final payment under this contract or as a termination settlement under this contract the Contractor shall execute and deliver to the Owner a release of all claims against the Owner arising under, or by virtue of, this contract, except claims which are specifically exempted by the Contractor to be set forth therein. Unless otherwise provided in this contract, by state law or otherwise expressly agreed to by the parties to this contract, final payment under this contract or settlement upon termination of this contract shall not constitute a waiver of the Owner's claims against the Contractor or their sureties under this contract or applicable performance and payment bonds.
 - (2) After final inspection and acceptance by the Owner of all work under the Contract, the Contractor shall prepare their requisition for final payment which shall be based upon the carefully measured or computed quantity of each item of work at the applicable unit prices stipulated in the Agreement or cost breakdown (if lump sum), as adjusted by approved change orders. The total amount of the final payment due to the Contractor under this contract shall be the amount computed as described above less all previous payments.

- (3) The retainage and its interest earnings, if any, shall not be paid to the Contractor until the TWDB has authorized a reduction in, or release of, retainage on the contract work.
- (4) Withholding of any amount due to the Owner, under general and/or special conditions regarding "Liquidated Damages" shall be deducted from the final payment due the Contractor.

13. Archaeological Discoveries and Cultural Resources

No activity which may affect properties listed or properties eligible for listing in the National Register of Historic Places or eligible for designation as a State Archeological Landmark is authorized until the Owner has complied with the provisions of the National Historic Preservation Act and the Antiquities Code of Texas. The Owner has previously coordinated with the appropriate agencies and impacts to known cultural or archeological deposits have been avoided or mitigated. However, the Contractor may encounter unanticipated cultural or archeological deposits during construction.

If archeological sites or historic structures which may qualify for designation as a State Archeological Landmark according to the criteria in 13 TAC Chapter 26, or that may be eligible for listing on the National Register of Historic Places in accordance with 36 CFR Part 800, are discovered after construction operations are begun, the Contractor shall immediately cease operations in that particular area and notify the Owner, the TWDB, and the Texas Historical Commission, 1511 N. Colorado St. , P. O. Box 12276, Capitol Station, Austin, Texas 78711-2276. The Contractor shall take reasonable steps to protect and preserve the discoveries until they have been inspected by the Owner's representative and the TWDB. The Owner will promptly coordinate with the State Historic Preservation Officer and any other appropriate agencies to obtain any necessary approvals or permits to enable the work to continue. The Contractor shall not resume work in the area of the discovery until authorized to do so by the Owner.

14. Endangered Species

No activity is authorized that is likely to jeopardize the continued existence of a threatened or endangered species as listed or proposed for listing under the Federal Endangered Species Act (ESA), and/or the State of Texas Parks and Wildlife Code on Endangered Species, or to destroy or adversely modify the habitat of such species.

If a threatened or endangered species is encountered during construction, the Contractor shall immediately cease work in the area of the encounter and notify the Owner, who will immediately implement actions in accordance with the ESA and applicable State statutes. These actions shall include reporting the encounter to the TWDB, the U.S. Fish and Wildlife Service, and the Texas Parks and Wildlife Department, obtaining any necessary approvals or permits to enable the work to continue, or implement other mitigation actions. The Contractor shall not resume construction in the area of the encounter until authorized to do so by the Owner.

15. Hazardous Materials

Materials utilized in the project shall be free of any hazardous materials, except as may be specifically provided for in the specifications.

If the Contractor encounters existing material on sites owned or controlled by the Owner or in material sources that are suspected by visual observation or smell to contain hazardous materials, the Contractor shall immediately notify the Engineer and the Owner. The Owner will be responsible for the testing and removal or disposal of hazardous materials on sites owned or controlled by the Owner. The Owner may suspend the work, wholly or in part during the testing, removal or disposal of hazardous materials on sites owned or controlled by the Owner.

16. Changes

*Provisions identified with an asterisk below are consistent with Local Government Code 271.060. Counties and Municipalities may modify the identified provisions, when applicable, to conform to Local Government Code 262.031 (Counties) or 252.048 (Municipalities).

- (a) The Owner may at any time, without notice to any surety, by written order designated or indicated to be a change order, make changes in the work within the general scope of the contract, including but not limited to changes:
 - (1) In the specifications (including drawings and designs);
 - (2) In the time, method or manner of performance of the work;
 - (3) To decrease or increase the quantity of work to be performed or materials, equipment or supplies to be furnished;
- (b) *The total price of a contract may not be increased by a change order unless provision has been made for the payment of the added cost by the appropriation of current funds or bond funds for that purpose, by the authorization of the issuance of certificates, or by a combination of those procedures.
- (c) *A contract with an original contract price of \$1 million or more may not be increased by more than 25 percent. If a change order for a contract, with an original contract price of less than \$1 million, increases the contract amount to \$1 million or more, subsequent change orders may not increase the revised contract amount by more than 25 percent.
- (d) *A governing body may grant authority to an official or employee responsible for purchasing or for administering a contract to approve a change order that involves an increase or decrease of \$50,000 or less.
- (e) Changes that involve an increase in price will be supported by documentation of the cost components. For projects funded through the EDAP program, or with grant proceeds, TWDB staff may request this information to be provided in a format equivalent to the Cost and Pricing Information form (No. WRD-277).
- (f) Any change orders involving a change in the project requiring a relocation of project components, sizing, or process may require additional environmental approval. A map and description of the proposed changes should be sent to the TWDB Environmental

Reviewer for coordination and approval as soon as possible to avoid any delay.

17. Operation and Maintenance Manuals and Training

- (a) The Contractor shall obtain installation, operation, and maintenance manuals from manufacturers and suppliers for equipment furnished under the contract. The Contractor shall submit three copies of each complete manual to the Engineer within 90 days after approval of shop drawings, product data, and samples, and not later than the date of shipment of each item of equipment to the project site or storage location.
- (b) The Owner shall require the Engineer to promptly review each manual submitted, noting necessary corrections and revisions. If the Engineer rejects the manual, the Contractor shall correct and resubmit the manual until it is acceptable to the Engineer as being in conformance with the design concept of the project and for compliance with information given in the contract documents. Owner may assess Contractor a charge for reviews of same items in excess of three (3) times. Such procedure shall not be considered cause for delay.
- (c) Acceptance of manuals by Engineer does not relieve Contractor of any requirements of terms of Contract.
- (d) The Contractor shall provide the services of trained, qualified technicians to check final equipment installation, to assist as required in placing same in operation, and to instruct operating personnel in the proper manner of performing routine operation and maintenance of the equipment.
- (e) Operations and maintenance manuals specified hereinafter are in addition to any operation, maintenance, or installation instructions required by the Contractor to install, test, and start-up the equipment.
- (f) Each manual is to be bound in a folder and labeled to identify the contents and project to which it applies. The manual shall contain the following applicable items:
 - (1) A listing of the manufacturer's identification, including order number, model, serial number, and location of parts and service centers.
 - (2) A list of recommended stock of parts, including part number and quantity.
 - (3) Complete replacement parts list.
 - (4) Performance data and rating tables.
 - (5) Specific instructions for installation, operation, adjustment, and maintenance.
 - (6) Exploded view drawings for major equipment items.
 - (7) Lubrication requirements.
 - (8) Complete equipment wiring diagrams and control schematics with terminal identification.

18. As-built Dimensions and Drawings

- (a) Contractor shall make appropriate daily measurements of facilities constructed and keep accurate records of location (horizontal and vertical) of all facilities.

- (b) Upon completion of each facility, the Contractor shall furnish the Owner with one set of direct prints, marked with red pencil, to show as-built dimensions and locations of all work constructed. As a minimum, the final drawings shall include the following:
- (1) Horizontal and vertical locations of work.
 - (2) Changes in equipment and dimensions due to substitutions.
 - (3) "Nameplate" data on all installed equipment.
 - (4) Deletions, additions, and changes to scope of work.
 - (5) Any other changes made.

19. Close-Out Procedures

To close-out the contract and release final retainage, the following steps must be completed:

- (a) TWDB Staff must conduct a construction contract final inspection (CCFI).
- (b) The following submittals must be received, reviewed, and accepted by TWDB:
- (1) The final change order, adjustment of quantities, or a statement that all change orders have previously been submitted and there will be no more change orders;
 - (2) The final pay request from the Contractor;
 - (3) An affidavit by the Contractor that all bills have been paid;
 - (4) Certification by the consulting Engineer that the work has been completed and was constructed in accordance with the approved plans and specifications and sound engineering principles and construction practices;
 - (5) Acceptance of the project by the Owner in the form of a written resolution or other formal action;
 - (6) Notification of the beginning date of the warranty period for the contract; and
 - (7) Confirmation that the Owner has received as-built drawings from the Contractor.
 - (8) Certificate of Compliance with U.S. Iron and Steel Requirements (TWDB-1105A)
- (c) TWDB will issue a Certificate of Approval allowing the release of retainage.

IV. FORMS AND GUIDANCE LIST

The following documents, mentioned throughout this guidance are available on the TWDB website at: <http://www.twdb.texas.gov/financial/instructions/index.asp>

Forms:

The following forms must be included in the bid documents:

- Contractor's Act of Assurance (ED-103)
- Contractor's Act of Assurance Resolution (ED-104)
- Certificate of Compliance with U.S. Iron and Steel Requirements (TWDB-1105A)
- Site Certificate (ED-101)
- Vendor Compliance with Reciprocity of Non-Resident Bidders (TWDB-0459).

Guidance Document:

- United States Iron and Steel Guidance (TWDB-1105)

SECTION 00 70 04

GENERAL TERMS AND CONDITIONS RAILROAD CROSSING

Section 1. LIMITATION AND SUBORDINATION OF RIGHTS GRANTED.

A. The foregoing grant is subject and subordinate to the prior and continuing right and obligation of Licensor to use and maintain its entire property including the right and power of Licensor to construct, maintain, repair, renew, use, operate, change, modify or relocate railroad tracks, signal, communication, fiber optics, or other wirelines, pipelines and other facilities upon, along or across any or all parts of its property, all or any of which may be freely done at any time or times by Licensor without liability to Licensee or to any other party for compensation or damages.

B. The foregoing grant is also subject to all outstanding superior rights (including those in favor of licensees and lessees of Railroad Property) and the right of Licensor to renew and extend the same, and is made without covenant of title or for quiet enjoyment. It shall be Licensee's sole obligation to obtain such additional permission, license and grants necessary on account of any such existing rights.

Section 2. ENGINEERING REQUIREMENTS; PERMITS.

A. Licensee's Facilities will be designed, constructed, operated, maintained, repaired, renewed, modified, reconstructed, removed, or abandoned in place on Railroad Property by Licensee or its contractor to Licensor's satisfaction and in strict conformity with: (i) Licensor's current engineering standards and specifications, including those for shoring and cribbing to protect Licensor's railroad operations and facilities ("UP Specifications"), except for variances approved in advance in writing by Licensor's Assistant Vice President Engineering – Design or its authorized representative ("UP Engineering Representative"); (ii) such other additional safety standards as Licensor, in its sole discretion, elects to require, including, without limitation, American Railway Engineering and Maintenance-of-Way Association ("AREMA") standards and guidelines (collectively, "UP Additional Requirements"); and (iii) all applicable laws, rules, and regulations, including any applicable Federal Railroad Administration and Federal Energy Regulatory Commission regulations and enactments (collectively, "Laws"). If there is any conflict between UP Specifications, UP Additional Requirements, and Laws, the most restrictive will apply.

B. Licensee shall keep the soil over Licensee's Facilities thoroughly compacted, and maintain the grade over and around Licensee's Facilities even with the surface of the adjacent ground.

C. If needed, Licensee shall secure, at Licensee's sole cost and expense, any and all necessary permits required to perform any work on Licensee's Facilities.

Section 3. NOTICE OF COMMENCEMENT OF WORK; EMERGENCIES.

A. Licensee and its contractors are strictly prohibited from commencing any work associated with Licensee's Facilities without Licensor's written approval that the work will be in strict compliance with the "ENGINEERING REQUIREMENTS; PERMITS" Section of this Exhibit B. Upon Licensor's approval, Licensee shall contact both of Licensor's field representatives ("Licensor's Field Representatives") at least ten (10) days before commencement of any work on Licensee's Facilities.

B. Licensee shall not commence any work until: (1) Licensor has determined whether flagging or other special protective or safety measures ("Safety Measures") are required for performance of the work pursuant to the "FLAGGING" Section of this Exhibit B and provided Licensee written authorization to commence work; and (2) Licensee has complied with the "PROTECTION OF FIBER OPTIC CABLE SYSTEMS" Section of this Exhibit B.

C. If, at any time, an emergency arises involving Licensee's Facilities, Licensee or its contractor shall immediately contact Licensor's Response Management Communications Center at (888) 877-7267.

Section 4. FLAGGING.

A. Following Licensee's notice to Licensor's Field Representatives required under the "NOTICE OF COMMENCEMENT OF WORK; EMERGENCIES" Section of this Exhibit B, Licensor shall inform Licensee if Safety Measures are required for performance of the work by Licensee or its contractor on Railroad Property. If Safety Measures are required, no work of any kind may be performed by Licensee or its contractor(s) until arrangements for the Safety Measures have been made and scheduled. If no Safety Measures are required, Licensor will give Licensee written authorization to commence work.

B. If any Safety Measures are performed or provided by Licensor, including but not limited to flagging, Licensor shall bill Licensee for such expenses incurred by Licensor, unless Licensor and a federal, state, or local governmental entity have agreed that Licensor is to bill such expenses to the federal, state, or local governmental entity. Additional information regarding the submission of such expenses by Licensor and payment thereof by Licensee can be found in the "LICENSEE'S PAYMENT OF EXPENSES" Section of this Exhibit B. If Licensor performs any Safety Measures, Licensee agrees that Licensee is not relieved of any of responsibilities or liabilities set forth in this Agreement.

C. For flagging, the rate of pay per hour for each flagger will be the prevailing hourly rate in effect for an eight-hour day for the class of flagmen used during regularly assigned hours and overtime in accordance with Labor Agreements and Schedules in effect at the time the work is performed. In addition to the cost of such labor, a composite charge for vacation, holiday, health and welfare, supplemental sickness, Railroad Retirement and unemployment compensation, supplemental pension, Employees Liability and Property Damage, and Administration will be included, computed on actual payroll. The composite charge will be the prevailing composite charge in effect at the time the work is performed. One and one-half times the current hourly rate is paid for overtime, Saturdays and Sundays, and two and one-half times current hourly rate for holidays. Wage rates are subject to change, at any time, by law or by agreement between Licensor and its employees, and may be retroactive as a result of negotiations or a ruling of an authorized governmental agency. Additional charges on labor are also subject to change. If the wage rate or additional charges are changed, Licensee (or the governmental entity, as applicable) shall pay on the basis of the new rates and charges.

D. Reimbursement to Licensor will be required covering the full eight-hour day during which any flagger is furnished, unless the flagger can be assigned to other railroad work during a portion of such day, in which event reimbursement will not be required for the portion of the day during which the flagger is engaged in other railroad work. Reimbursement will also be required for any day not actually worked by the flaggers following the flaggers' assignment to work on the project for which Licensor is required to pay the flaggers and which could not reasonably be avoided by Licensor by assignment of such flaggers to other work, even though Licensee may not be working during such time. When it becomes necessary for Licensor to bulletin and assign an employee to a flagging position in compliance with union collective bargaining agreements, Licensee must provide Licensor a minimum of five (5) days notice prior to the cessation of the need for a flagger. If five (5) days notice of cessation is not given, Licensee will still be required to pay flagging charges for the days the flagger was scheduled, even though flagging is no longer required for that period. An additional ten (10) days notice must then be given to Licensor if flagging services are needed again after such five day cessation notice has been given to Licensor.

Section 5. SAFETY.

A. Safety of personnel, property, rail operations and the public is of paramount importance in the prosecution of any work on Railroad Property performed by Licensee or its contractor, and takes precedence over any work on Licensee's Facilities to be performed Licensee or its contractors. Licensee shall be responsible for initiating, maintaining and supervising all safety operations and programs in connection with any work on Licensee's Facilities. Licensee and its contractor shall, at a minimum comply, with Licensor's then current safety standards located at the below web address ("Licensor's Safety Standards") to ensure uniformity with the safety standards followed by Licensor's own forces. As a part of Licensee's safety responsibilities, Licensee shall notify Licensor if it determines that any of Licensor's Safety Standards are contrary to good safety practices. Licensee and its contractor shall furnish copies of Licensor's Safety Standards to each of its employees before they enter Railroad Property.
Note: Refer to Union Pacific Current Safety Requirements

B. Licensee shall keep the job site on Railroad Property free from safety and health hazards and ensure that their employees are competent and adequately trained in all safety and health aspects of the work.

C. Licensee represents and warrants that all parts of Licensee's Facilities within and outside of the limits of Railroad Property will not interfere whatsoever with the constant, continuous, and uninterrupted use of the tracks, property, and facilities of Licensor, and nothing shall be done or suffered to be done by Licensee at any time that would in any manner impair the safety thereof.

D. Licensor's operations and work performed by Licensor's personnel may cause delays in Licensee's or its contractor's work on Licensee's Facilities. Licensee accepts this risk and agrees that Licensor shall have no liability to Licensee or any other person or entity for any such delays. Licensee must coordinate any work on Railroad Property by Licensee or any third party with Licensor's Field Representatives in strict compliance with the "NOTICE OF COMMENCEMENT OF WORK; EMERGENCIES" Section of this Exhibit

E. Licensor shall have the right, if it so elects, to provide any support it deems necessary for the safety of Licensor's operations and trackage during Licensee's or its contractor's construction, maintenance, repair, renewal, modification, relocation, reconstruction, or removal of Licensee's Facilities. In the event Licensor provides such support, Licensor shall invoice Licensee, and Licensee shall pay Licensor as set forth in the "LICENSEE'S PAYMENT OF EXPENSES" Section of this Exhibit B.

F. Licensee may use unmanned aircraft systems ("UAS") to inspect Licensee's Facilities only upon the prior authorization from and under the direction of Licensor's Field Representatives. Licensee represents and warrants that its use of UAS on Railroad Property will comply with Licensor's then-current Unmanned Aerial Systems Policy and all applicable laws, rules and regulations, including any applicable Federal Aviation Administration regulations and enactments pertaining to UAS.

Section 6. PROTECTION OF FIBER OPTIC CABLE SYSTEMS.

A. Fiber optic cable systems may be buried on Railroad Property. Protection of the fiber optic cable systems is of extreme importance since any break could disrupt service to users resulting in business interruption and loss of revenue and profits. In addition to the notifications required under the "NOTICE OF COMMENCEMENT OF WORK; EMERGENCIES" Section of this Exhibit B, Licensee shall telephone Licensor during normal business hours (7:00 a.m. to 9:00 p.m. Central Time, Monday through Friday, except for holidays) at 1-800-336-9193 (also a 24-hour, 7-day number for emergency calls) to determine if fiber optic cable is buried anywhere on Railroad Property to be used by Licensee. If it is, Licensee shall telephone the telecommunications company(ies) involved, and arrange for a cable locator, make arrangements for relocation or other protection of the fiber optic cable, all at Licensee's expense, and will not commence any work on Railroad Property until all such protection or relocation has been completed.

Section 7. LICENSEE'S PAYMENT OF EXPENSES.

A. Licensee shall bear the entire cost and expense of the design, construction, maintenance, modification, reconstruction, repair, renewal, revision, relocation, or removal of Licensee's Facilities.

B. Licensee shall fully pay for all materials joined, affixed to and labor performed on Railroad Property in connection with the construction, maintenance, modification, reconstruction, repair, renewal, revision, relocation, or removal of Licensee's Facilities, and shall not permit or suffer any mechanic's or materialman's lien of any kind or nature to be enforced against the property for any work done or materials furnished thereon at the instance or request or on behalf of Licensee. Licensee shall promptly pay or discharge all taxes, charges, and assessments levied upon, in respect to, or on account of Licensee's Facilities, to prevent the same from becoming a charge or lien upon any property of Licensor, and so that the taxes, charges, and assessments levied upon or in respect to such property shall not be increased because of the location, construction, or maintenance of Licensee's Facilities or any improvement, appliance, or fixture connected therewith placed upon such property, or on account of Licensee's interest therein. Where such tax, charge, or assessment may not be separately made or assessed to Licensee but shall be included in the assessment of the property of Licensor, then Licensee shall pay to Licensor an equitable proportion of such taxes determined by the value of Licensee's property upon property of Licensor as compared with the entire value of such property.

C. As set forth in the "FLAGGING" Section of this Exhibit B, Licensor shall have the right, if it so elects, to provide any Safety Measures Licensor deems necessary for the safety of Licensor's operations and trackage during Licensee's or its contractor's construction, maintenance, modification, reconstruction, repair, renewal, revision,

relocation, or removal of Licensee's Facilities, including, but not limited to supervision, inspection, and flagging services. In the event Licensor provides such Safety Measures, Licensor shall submit an itemized invoice to Licensee's notice recipient listed in the "NOTICES" Article of this Agreement. Licensee shall pay to Licensor the total amount listed on such invoice within thirty (30) days of Licensee's receipt of such invoice.

Section 8. MODIFICATIONS TO LICENSEE'S FACILITIES.

A. This grant is subject to Licensor's safe and efficient operation of its railroad, and continued use and improvement of Railroad Property (collectively, "Railroad's Use"). Accordingly, Licensee shall, at its sole cost and expense, modify, reconstruct, repair, renew, revise, relocate, or remove (individually, "Modification", or collectively, "Modifications") all or any portion of Licensee's Facilities as Licensor may designate or identify, in its sole discretion, in the furtherance of Railroad's Use.

B. Upon any Modification of all or any portion of Licensee's Facilities to another location on Railroad Property, Licensor and Licensee shall execute a Supplemental Agreement to this Pipeline Agreement to document the Modification(s) to Licensee's Facilities on Railroad Property. If the Modifications result in Licensee's Facilities moving off of Railroad Property, this Agreement will terminate upon Licensee's completion of such Modification(s) and all requirements contained within the "TERMINATION; REMOVAL OF LICENSEE'S FACILITIES" Section of this Exhibit B. Any such Modification(s) off of Railroad Property will not release Licensee from any liability or other obligation of Licensee arising prior to and upon completion of any such Modifications to the Licensee's Facilities.

Section 9. RESTORATION OF RAILROAD PROPERTY.

A. In the event Licensee, in any manner moves or disturbs any property of Licensor in connection with the construction, maintenance, modification, reconstruction, repair, renewal, revision, relocation, or removal of Licensee's Facilities, then, Licensee shall, as soon as possible and at Licensee's sole cost and expense, restore Licensor's property to the same condition as the same were before such property was moved or disturbed.

Section 10. INDEMNITY.

A. Definitions. As used in this Section:

1. "Licensor" includes Licensor, its affiliates, its and their officers, directors, agents and employees, and other railroad companies using Railroad Property at or near the location of Licensee's installation and their officers, directors, agents, and employees.
2. "Licensee" includes Licensee and its agents, contractors, subcontractors, sub-subcontractors, employees, officers, and directors, or any other person or entity acting on its behalf or under its control.
3. "Loss" includes claims, suits, taxes, loss, damages (including punitive damages, statutory damages, and exemplary damages), costs, charges, assessments, judgments, settlements, liens, demands, actions, causes of action, fines, penalties, interest, and expenses of any nature, including court costs, reasonable attorneys' fees and expenses, investigation costs, and appeal expenses.

B. Licensee shall release, defend, indemnify, and hold harmless Licensor from and against any and all Loss, even if groundless, fraudulent, or false, that directly or indirectly arises out of or is related to Licensee's construction, maintenance, modification, reconstruction, repair, renewal, revision, relocation, removal, presence, use, or operation of Licensee's Facilities, including, but not limited to, any actual or alleged:

1. Bodily harm or personal injury (including any emotional injury or disease) to, or the death of, any person(s), including, but not limited to, Licensee, Licensor, any telecommunications company, or the agents, contractors, subcontractors, sub-subcontractors, or employees of the foregoing;
2. Damage to or the disturbance, loss, movement, or destruction of Railroad Property, including loss of use and diminution in value, including, but not limited to, any telecommunications system(s) or fiber optic cable(s) on or near Railroad

3. Removal of person(s) from Railroad Property;
4. Any delays or interference with track or Railroad's Use caused by Licensee's activity(ies) on Railroad Property, including without limitation the construction, maintenance, modification, reconstruction, repair, renewal, revision, relocation, or removal of Licensee's Facilities or any part thereof, any activities, labor, materials, equipment, or machinery in conjunction therewith ;
5. Right(s) or interest(s) granted pursuant to this Agreement;
6. Contents escaping from Licensee's Facilities, including without limitation any actual or alleged pollution, contamination, breach, or environmental Loss;
7. Licensee's breach of this Agreement or failure to comply with its provisions, including, but not limited to, any violation or breach by Licensee of any representations and warranties Licensee has made in this Agreement; and
8. Violation by Licensee of any law, statute, ordinance, governmental administrative order, rule, or regulation, including without limitation all applicable Federal Railroad Administration regulations.

C. THE FOREGOING OBLIGATIONS SHALL APPLY TO THE FULLEST EXTENT PERMITTED BY LAW FOR THE BENEFIT OF LICENSOR TO LOSSES CAUSED BY, ARISING FROM, RELATING TO, OR RESULTING FROM, IN WHOLE OR IN PART, THE NEGLIGENCE OF LICENSOR, AND SUCH NEGLIGENCE OF LICENSOR SHALL NOT LIMIT, DIMINISH, OR PRECLUDE LICENSEE'S OBLIGATIONS TO LICENSOR IN ANY RESPECT. NOTWITHSTANDING THE FOREGOING, SUCH OBLIGATION TO INDEMNIFY LICENSOR SHALL NOT APPLY TO THE EXTENT THE LOSS IS CAUSED BY THE SOLE, ACTIVE AND DIRECT NEGLIGENCE, GROSS NEGLIGENCE, OR WILLFUL MISCONDUCT OF LICENSOR AS DETERMINED IN A FINAL JUDGMENT BY A COURT OF COMPETENT JURISDICTION.

Section 11. TERMINATION; REMOVAL OF LICENSEE'S FACILITIES.

A. If Licensee does not use the right herein granted on Licensee's Facilities for one (1) year, or if Licensee continues in default in the performance of any provision of this Agreement for a period of thirty (30) days after written notice from Licensor to Licensee specifying such default, Licensor may, at its sole discretion, terminate this Agreement by written notice to Licensee at the address listed in the "NOTICES" Article of this Agreement. This Agreement will not terminate until Licensee complies with Paragraphs "C" and "D" of this Section found below.

B. In addition to the provisions of Paragraph "A" above, this Agreement may be terminated by written notice given by either party, without cause, upon thirty (30) days written notice to the non-terminating party at the address listed in the "NOTICES" Article of this Agreement. This Agreement will not terminate until Licensee complies with Paragraphs "C" and "D" of this Section found below.

C. Prior to the effective date of any termination described in this Section, Licensee shall submit an application to Licensor's online Utility Contracts System at this link for Licensee's removal, or if applicable, abandonment in place of Licensee's Facilities located on Railroad Property ("Removal/Abandonment Work"). Upon the UP Engineering Representative's approval of Licensee's application for the Removal/Abandonment Work, Licensor and Licensee shall execute a separate consent document that will govern Licensee's performance of the Removal/Abandonment Work from those portions of Railroad Property not occupied by roadbed and/or trackage ("Consent Document"). Licensee shall then restore the impacted Railroad Property to the same or reasonably similar condition as it was prior to Licensee's installation of Licensee's Facilities. For purposes of this Section, Licensee's (i) performance of the Removal/Abandonment Work, and (ii) restoration work will hereinafter be collectively referred to as the "Restoration Work".

D. Following Licensee's completion of the Restoration Work, Licensee shall provide a written certification letter to Licensor at the address listed in the "NOTICES" Article of this Agreement which certifies that the Restoration Work has been completed in accordance with the Consent Document. Licensee shall report to governmental authorities, as required by law, and notify Licensor immediately if any environmental contamination is discovered during Licensee's performance of the Restoration Work. Upon discovery, the Licensee shall initiate

any and all removal, remedial and restoration actions that are necessary to restore the property to its original, uncontaminated condition. Licensee shall provide written certification to Licensor at the address listed in the "NOTICES" Article of this Agreement that environmental contamination has been remediated and the property has been restored in accordance with Licensor's requirements. Upon Licensor's receipt of Licensee's restoration completion certifications, this Agreement will terminate.

E. In the event that Licensee fails to complete any of the Restoration Work, Licensor may, but is not obligated, to perform the Restoration Work. Any such work actually performed by Licensor will be at the cost and expense of Licensee. In the event that Licensor performs any of the Restoration Work, Licensee shall release Licensor from any and all Loss (defined in the "INDEMNITY" Section of this Exhibit B) arising out of or related to Licensor's performance of the Restoration Work.

F. Termination of this Agreement for any reason will not affect any of rights or obligations of the parties which may have accrued, or liabilities or Loss (defined in the "INDEMNITY" Section of this Exhibit B), accrued or otherwise, which may have arisen prior to such termination.

INSURANCE REQUIREMENTS

In accordance with Article 5 of this Agreement, Licensee shall (1) procure and maintain at its sole cost and expense, or (2) require its Contractor(s) to procure and maintain, at their sole cost and expense, the following insurance coverage:

A. Commercial General Liability Insurance. Commercial general liability (CGL) with a limit of not less than \$2,000,000 each occurrence and an aggregate limit of not less than \$4,000,000. CGL insurance must be written on ISO occurrence form CG 00 01 12 04 (or a substitute form providing equivalent coverage).

The policy must also contain the following endorsement, WHICH MUST BE STATED ON THE CERTIFICATE OF INSURANCE:

- Contractual Liability Railroads ISO form CG 24 17 10 01 (or a substitute form providing equivalent coverage) showing "Union Pacific Railroad Company Property" as the Designated Job Site.

B. Business Automobile Coverage Insurance. Business auto coverage written on ISO form CA 00 01 10 01 (or a substitute form providing equivalent liability coverage) with a limit of not less \$2,000,000 for each accident, and coverage must include liability arising out of any auto (including owned, hired, and non-owned autos).

The policy must contain the following endorsements, WHICH MUST BE STATED ON THE CERTIFICATE OF INSURANCE:

- "Coverage For Certain Operations In Connection With Railroads" ISO form CA 20 70 10 01 (or a substitute form providing equivalent coverage) showing "Union Pacific Railroad Company Property" as the Designated Job Site.

C. Workers' Compensation and Employers' Liability Insurance. Coverage must include but not be limited to:

- Licensee's statutory liability under the workers' compensation laws of the state(s) affected by this Agreement.
- Employers' Liability (Part B) with limits of at least \$500,000 each accident, \$500,000 disease policy limit \$500,000 each employee.

If Licensee is self-insured, evidence of state approval and excess workers' compensation coverage must be provided. Coverage must include liability arising out of the U. S. Longshoremen's and Harbor Workers' Act, the Jones Act, and the Outer Continental Shelf Land Act, if applicable.

D. Environmental Liability Insurance. Environmental Legal Liability Insurance (ELL) applicable to bodily injury, property damage, including loss of use of damaged property or of property that has not been

physically injured or destroyed, cleanup costs, and defense, including costs and expenses incurred in the investigation, defense, or settlement of claims, or compliance with statute, all in connection with any loss arising from the insured's performance under this Agreement. Except with respect to the limits of insurance, and any rights or duties specifically assigned to the first named insured, this insurance must apply as if each named insured were the only named insured; and separately to the additional insured against which claim is made or suit is brought. Coverage shall be maintained in an amount of at least \$2,000,000 per loss, with an annual aggregate of at least \$4,000,000.

Licensee warrants that any retroactive date applicable to ELL insurance coverage under the policy is the same as or precedes the Effective Date of this Agreement, and that continuous coverage will be maintained for a period of five (5) years beginning from the time the work under this Agreement is completed or if coverage is cancelled for any reason the policies extended discovery period, if any, will be exercised for the maximum time allowed.

E. Railroad Protective Liability Insurance. Licensee must maintain for the duration of work "Railroad Protective Liability" insurance written on ISO occurrence form CG 00 35 12 04 (or a substitute form providing equivalent coverage) on behalf of Licensor only as named insured, with a limit of not less than \$2,000,000 per occurrence and an aggregate of \$6,000,000. The definition of "JOB LOCATION" and "WORK" on the declaration page of the policy shall refer to this Agreement and shall describe all WORK or OPERATIONS performed under this Agreement. Notwithstanding the foregoing, Licensee does not need Railroad Protective Liability Insurance after its initial construction work is complete and all excess materials have been removed from Licensor's property; PROVIDED, however, that Licensee shall procure such coverage for any subsequent maintenance, repair, renewal, modification, reconstruction, or removal work on Licensee's Facilities.

F. Umbrella or Excess Insurance. If Licensee utilizes umbrella or excess policies, and these policies must "follow form" and afford no less coverage than the primary policy.

Other Requirements

G. All policy(ies) required above (except business automobile, workers' compensation and employers' liability) must include Licensor as "Additional Insured" using ISO Additional Insured Endorsement CG 20 26 (or substitute form(s) providing equivalent coverage). The coverage provided to Licensor as additional insured shall not be limited by Licensee's liability under the indemnity provisions of this Agreement. BOTH LICENSOR AND LICENSEE EXPECT THAT LICENSOR WILL BE PROVIDED WITH THE BROADEST POSSIBLE COVERAGE AVAILABLE BY OPERATION OF LAW UNDER ISO ADDITIONAL INSURED FORM CG 20 26.

H. Punitive damages exclusion, if any, must be deleted (and the deletion indicated on the certificate of insurance), unless (a) insurance coverage may not lawfully be obtained for any punitive damages that may arise under this Agreement, or (b) all punitive damages are prohibited by all states in which this Agreement will be performed.

I. Licensee waives all rights of recovery, and its insurers also waive all rights of subrogation of damages against Licensor and its agents, officers, directors and employees for damages covered by the workers' compensation and employers' liability or commercial umbrella or excess liability obtained by Licensee required in this Agreement, where permitted by law. This waiver must be stated on the certificate of insurance.

J. All insurance policies must be written by a reputable insurance company acceptable to Licensor or with a current Best's Insurance Guide Rating of A- and Class VII or better, and authorized to do business in the state(s) in which the work is to be performed.

K. The fact that insurance is obtained by Licensee will not be deemed to release or diminish the liability of Licensee, including, without limitation, liability under the indemnity provisions of this Agreement. Damages recoverable by Licensor from Licensee or any third party will not be limited by the amount of the required insurance coverage.

END OF SECTION

SECTION 00 80 00

Prevailing Wage Rates

"General Decision Number: TX20200033 01/03/2020

Superseded General Decision Number: TX20190033

State: Texas

Construction Types: Heavy
PIPELINE - ON-SHORE PIPELINE CONSTRUCTION:

Counties: Texas Statewide.

PIPELINE - ON-SHORE CONSTRUCTION

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.80 for calendar year 2020 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 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 \$10.80 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2020. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR 5.5(a)(1)(ii) (or the EO minimum wage rate, if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/03/2020

SUTX1997-002 01/01/1997

Rates

Fringes

Laborers:		
Drillers.....	\$ 16.08	2.01
Hot Pay.....	\$ 15.58	2.01
Jackhammermen.....	\$ 15.58	2.01
Loaders.....	\$ 16.08	2.01
Powderman, blasters & shooters.....	\$ 16.58	2.01
Unskilled.....	\$ 15.08	2.01
Pipefitter.....	\$ 36.49	7.45
Power equipment operators:		
Group 1.....	\$ 22.95	6.05
Group 2.....	\$ 17.54	4.80
Group 3.....	\$ 12.37	3.55
Truck drivers:		
Group 1.....	\$ 18.82	a
Group 2.....	\$ 18.82	a
Group 3.....	\$ 16.81	a
Group 4.....	\$ 16.04	a
Group 5.....	\$ 15.71	a

FOOTNOTE

a - \$2.52 PER HOUR PLUS \$41.00 PER WEEK

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

TRUCK DRIVER CLASSIFICATIONS

GROUP 1 - Truck Mechanics

GROUP 2 - Lowboy, rollagon or similar type equipment

GROUP 3 - A-Frame, Gin pole, Tandem float (4 & 5 axle) , rubber-tired tractor, fork lift, winch truck, track truck equipment, stringing truck

GROUP 4 - Single axle float (3 axle), flat bed truck (3 axle) dump truck (3 axle), skid truck (3 axle), hot pass (2 axle), Flat bed truck (2 axle) dump truck (2 axle), skid truck (2 axle) water truck (2 axle), pick up, bus jeep, staion wagon, swamp buggy or similar type equipment.

GROUP 5 - Stringer bead & hot pass (2 axle, flat bed truck (2 axle), dump truck (2 axle), skid truck (2 axle), water truck (2 axle), pick-up, bus jeep, station wagon, swamp buggy or similar type equipment.

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1 – Backhoe, dragline, clam, crane, ditching machine, side booms (except those in GROUP 2), mechanic, operator on dredges, bulldozer, cleaning machine, coating machine, back filler, motor grader, end loader (3 yd. & over), blending machine, wate-kote machine, equipment welder, track tractor

GROUP 2 – Pipe dream, gin truck or winch truck with poles when used for hoisting, side boom (cradling rock drill), tow tractor,, farm tractor, road boring machine, end loader (under 3 y.d), fork lift (industrial type), pot fireman (power agitated); straightening machine, boring machine, bombardier (track or tow rig), mobile lubrication & service engineer, hydrostatic testing operator, rollagon or similar type equipment

GROUP 3 Fuel man, oiler or swamper (on trenching machine or shovel- type equipment)

WELDERS – Receive rate prescribed for craft performing operation to which welding is incidental.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (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.

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END OF GENERAL DECISION

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SECTION 00 80 01

TCEQ WATER DISTRIBUTION SYSTEM

GENERAL CONSTRUCTION REQUIREMENTS

1. This water distribution system must be constructed in accordance with the current Texas Commission on Environmental Quality (TCEQ) Rules and Regulations for Public Water Systems 30 Texas Administrative Code (TAC) Chapter 290 Subchapter D. When conflicts are noted with local standards, the more stringent requirement shall be applied. Construction for public water systems must always, at a minimum, meet TCEQ's "Rules and Regulations for Public Water Systems.
2. An appointed engineer shall notify in writing the local TCEQ's Regional Office when construction will start. Please keep in mind that upon completion of the water works project, the engineer or owner shall notify the commission's Water Supply Division, in writing, as to its completion and attest to the fact that the work has been completed essentially according to the Drawings and Change Orders on file with the commission as required in 30 TAC §290.39(h)(3).
3. All newly installed pipes and related products must conform to American National Standards Institute (ANSI)/NSF International Standard 61 and must be certified by an organization accredited by ANSI, as required by 30 TAC §290.44(a)(1).
4. Plastic pipe for use in public water systems must bear the NSF International Seal of Approval (NSF-pw) and have an ASTM design pressure rating of at least 150 psi or a standard dimension ratio of 26 or less, as required by 30 TAC §290.44(a)(2).
5. No pipe which has been used for any purpose other than the conveyance of drinking water shall be accepted or relocated for use in any public drinking water supply, as required by 30 TAC §290.44(a)(3).
6. Water transmission and distribution lines shall be installed in accordance with the manufacturer's instructions. However, the top of the water line must be located below the frost line and in no case shall the top of the water line be less than 24 inches below ground surface, as required by 30 TAC §290.44(a)(4).
7. Pursuant to 30 TAC §290.44(a)(5), the hydrostatic leakage rate shall not exceed the amount allowed or recommended by the most current AWWA formulas for PVC pipe, cast iron and ductile iron pipe. Include the formulas in the notes on the Drawings.
 - a. Hydrostatic leakage rate for polyvinyl chloride (PVC) pipe and appurtenances shall not exceed the amount allowed or recommended by formulas in America Water Works Association (AWWA) C-605 as required in 30 TAC §290.44(a)(5). Please ensure that the formula for this calculation is correct and most current formula is in use;
$$Q = LD\sqrt{P}/148,000$$
Where:
 - Q = the quantity of makeup water in gallons per hour,
 - L = the length of the pipe section being tested, in feet,
 - D = the nominal diameter of the pipe in inches, and
 - P = the average test pressure during the hydrostatic test in pounds per square inch (psi).
 - b. Hydrostatic leakage rate for ductile iron (DI) pipe and appurtenances shall not exceed the amount allowed or recommended by formulas in America Water Works Association (AWWA) C-600 as required in 30 TAC §290.44(a)(5). Please ensure that the formula for this calculation is correct and most current formula is in use;

$$L = SD\sqrt{P}/148,000$$

Where:

L = the quantity of makeup water in gallons per hour,
S = the length of the pipe section being tested, in feet,
D = the nominal diameter of the pipe in inches, and
P = the average test pressure during the hydrostatic test in pounds per square inch (psi).

8. Maximum allowable lead content of pipes, pipe fittings, plumbing fittings, and fixtures to 0.25%.
9. System must be designed to maintain a minimum pressure of 35 psi at all points within the distribution network at flow rates of at least 1.5 gallons per minute per connection. When the system is intended to provide firefighting capability, it must also be designed to maintain a minimum pressure of 20 psi under combined fire and drinking water flow conditions as required by 30 TAC §290.44(d).
10. Contractor shall install appropriate air release devices in the distribution system at all points where topography or other factors may create air locks in the lines. All vent openings to the atmosphere shall be covered with 16-mesh or finer, corrosion resistant screening material or an acceptable equivalent as required by 30 TAC §290.44(d)(1).
11. Pursuant to 30 TAC §290.44(d)(4), accurate water meters shall be provided. Service connections and meter locations should be shown on the Drawings.
12. Pursuant to 30 TAC §290.44(d)(5), sufficient valves and blowoffs to make repairs. The engineering report shall establish criteria for this design.
13. Pursuant to 30 TAC §290.44(d)(6), the system shall be designed to afford effective circulation of water with a minimum of dead ends. All dead-end mains shall be provided with acceptable flush valves and discharge piping. All dead-end lines less than two inches in diameter will not require flush valves if they end at a customer service. Where dead ends are necessary as a stage in the growth of the system, they shall be located and arranged to ultimately connect the ends to provide circulation.
14. Contractor shall maintain a minimum separation distance in all directions of nine feet between the proposed waterline and wastewater collection facilities including manholes and septic tank drainfields. If this distance cannot be maintained, the Contractor must immediately notify the Engineer for further direction. Separation distances, installation methods, and materials utilized must meet 30 TAC §290.44(e)(1- 4) of the current rules.
15. Pursuant to 30 TAC §290.44(e)(5), the separation distance from a potable waterline to a wastewater main or lateral manhole or cleanout shall be a minimum of nine feet. Where the nine-foot separation distance cannot be achieved, the potable waterline shall be encased in a joint of at least 150 psi pressure class pipe at least 18 feet long and two nominal sizes larger than the new conveyance. The space around the carrier pipe shall be supported at five-foot intervals with spacers or be filled to the springline with washed sand. The encasement pipe shall be centered on the crossing and both ends sealed with cement grout or manufactured sealant.
16. Pursuant to 30 TAC §290.44(e)(6), fire hydrants shall not be installed within nine feet vertically or horizontally of any wastewater line, wastewater lateral, or wastewater service line regardless of construction.
17. Pursuant to 30 TAC §290.44(e)(7), suction mains to pumping equipment shall not cross wastewater mains, wastewater laterals, or wastewater service lines. Raw water supply lines shall not be installed within five feet of any tile or concrete wastewater main, wastewater lateral, or wastewater service line.
18. Pursuant to 30 TAC §290.44(e)(8), waterlines shall not be installed closer than ten feet to septic tank drainfields.

19. Pursuant to 30 TAC §290.44(f)(1), the contractor shall not place the pipe in water or where it can be flooded with water or sewage during its storage or installation.
20. Pursuant to 30 TAC §290.44(f)(2), when waterlines are laid under any flowing or intermittent stream or semi-permanent body of water the water main shall be installed in a separate watertight pipe encasement. Valves must be provided on each side of the crossing with facilities to allow the underwater portion of the system to be isolated and tested.
21. Contractor shall disinfect the new water mains in accordance with AWWA Standard C-651 and then flush and sample the lines before being placed into service. Samples shall be collected for microbiological analysis to check the effectiveness of the disinfection procedure which shall be repeated if contamination persists. A minimum of one sample for each 1,000 feet of completed water line will be required or at the next available sampling point beyond 1,000 feet as designated by the Engineer, in accordance with 30 TAC §290.44(f)(3).

END OF SECTION

SECTION 00 80 02

NATIONWIDE PERMIT 12

UTILITY LINE ACTIVITIES

Pursuant to United States Army Corps of Engineers (USACE), Nationwide Permit 12 for Utility Line Activities, Contractor shall comply with the following special environmental conditions, as issued on August 8, 2018 by USACE for this Project.

United States Army Corps of Engineers, Fort Worth District

The USACE provided a response letter dated July 11, 2018 (Project Number SWF-2018-00081), stating that the project will involve activities subject to the requirements of Section 404 and that the project appears to qualify for a Nationwide Permit 12 for Utility Line Activities.

Provided that the permittee complies with all the terms and conditions therein, the project may proceed. The Nationwide Permit is valid until March 18, 2022 unless prior to that date the nationwide permit is suspended, revoked, or modified such that the activity would no longer comply with the terms and conditions of the nationwide permit on a regional or national basis. The USACE will issue a public notice announcing the changes when they occur. Furthermore, activities that have commenced, or are under contract to commence, in reliance on a nationwide permit will remain authorized provided the activity is completed within 12 months of the date of the nationwide permit's expiration, modification, or revocation, unless discretionary authority has been exercised on a case-by-case basis to modify, suspend, or revoke the authorization in accordance with 33 CFR 330.4(e) and 33 CFR 330.5(c) or (d).

To avoid impacts to potential jurisdictional waters of the United States, including wetlands, the proposed pipeline that traverses surface water will use HDD technology. No impacts to these aquatic features are anticipated. No forested wetlands are located within the ROW.

END OF SECTION

PROPOSAL DOCUMENTS

ADDENDUM NO. __

Schertz Seguin Local Government Corporation

Contract 3

36" Pipeline

Date

Prepared by John Winkler, P. E. No. 50524

Offerers on this Project are hereby notified that this Addendum shall be attached and made a part of the above named Proposal Documents dated _____. *Note that competitive sealed proposals for this Project will be received until xxxx, xxxx, 2020 at City of Seguin, Seguin, Texas.*

The following items are issued to add to, modify, and clarify Proposal Documents including all Technical Specifications. These items shall have the full force and effect as Proposal Documents and cost involved shall be included in the appropriate bid prices. Proposals to be submitted on prescribed date shall conform with any additions, deletions, or revisions listed herein.

Acknowledgement of this Addendum shall be provided on the appropriate location of Section 00 30 00 Proposal Form. Failure to acknowledge may subject the offerer to disqualification.

A. REVISIONS TO PROCUREMENT DOCUMENTS

B. REVISIONS TO SPECIFICATIONS

C. CLARIFICATIONS

SECTION 01 10 00
SUMMARY OF WORK

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Work. Work consists of providing necessary labor, materials, equipment, supervision, and plant to construct the following:
 - 1. 96,000 linear feet of 36" Pipeline
 - 2. Air Release Valves and Blow-offs
 - 3. Cathodic Protection System
 - 4. Drainage, fencing, gates, valves, and appurtenances.

- B. Work includes construction and installation of pipeline, supports, accessories; piping and valves; electrical and control work including service; protective coatings; crushed limestone backfill; HMAC, site fill, site grading, drainage swales and slope paving; check valves; valves; air release valves; pipeline connections; seeding; fencing; testing, disinfection, and all additional items needed for a completely functional water system.

- C. Project Site. Project is located in southeast Guadalupe County from SSLGC BPS #1 to City of Schertz.

- D. Owner:
Schertz Seguin Local Government Corporation
Amber Briggs Beard
General Manager
108 W. Mountain
Seguin, TX 78155
830-386-2567

- E. Engineer:
Walker Partners
823 Washington Avenue, Suite 100
Waco, Texas 76701
Attention: Mr. John Winkler, P.E.
Telephone: (254) 714-1402

1.2 WORK SEQUENCE

- A. Within 10 days from date of Notice to Proceed, Contractor shall submit a critical path method (CPM) construction schedule to Engineer for approval. Schedule shall be chronological, graphical, and shall indicate order in which Work is to be performed. Sequence and interdependence of all major activities must be shown with float. Critical path must be clearly indicated. Schedule shall be drawn to a calendar time scale. Commencement and completion dates for each activity shall be shown, as well as duration in calendar days, for each activity. Schedule shall show not only activities for actual physical construction of Project, but also activities such as Contractor's submittal of shop drawings and Engineer's review and approval of shop drawings. Failure to include any element of work required to complete Project within scheduled contract time shall not release Contractor from his obligation to complete work in accordance with Contract Documents. All temporary pumping and piping methods must be approved by Engineer. All temporary pumping and piping shall be at Contractor's expense and shall be included in base bid. In addition to construction schedule, Contractor shall submit a schedule of values within 10 days of Notice to Proceed. Schedule of values should be directly related to construction schedule. Contractor shall update the construction schedule monthly to reflect the progress of work. Updated schedules shall be submitted to Engineer for approval. Monthly partial payments will be dependent upon submission of an updated construction schedule satisfactory to Engineer. If actual

progress of work falls behind Contractor's approved construction schedule, Owner may elect to deduct value of work scheduled but not completed from progress payments due. Value of work will be determined from Contractor's approved schedule of values. These deductions will continue until Contractor has taken steps to bring progress of project back in line with approved construction schedule.

1.3 PROGRESS REPORTING

- A. Monthly progress meetings shall be held on dates mutually agreed to by Engineer, Owner, and Contractor. These meetings may be held at Site or Owner's facilities as determined by Engineer. Items to be discussed at this meeting include progress of work, upcoming work items, status of submittals, monthly pay estimates, etc.

1.4 USE OF PREMISES

- A. Construction equipment and temporary storage of materials shall be restricted to construction area shown on Drawings.

1.5 CONTRACTS

- A. Construct work under a single lump sum contract. Total Base Bid and any combination of alternates, substitutions, or supplementary items may be used to determine which Contractor will be awarded Contract. Any bids which are found to be "front-loaded" with expenses may be rejected.

1.6 OWNER OCCUPANCY

- A. Owner will not retain ownership until construction is completed, and Owner has issued a Certificate of Final Completion. One-year maintenance period begins only after Engineer has issued a Certificate of Final Completion.

1.7 SAFETY

- A. Contractor shall be solely responsible for safety of himself, his employees, and other persons during construction operations. All work shall be done in accordance with Occupational Safety and Health Administration, safety and health regulations of United States Government for construction, State of Texas laws and regulations, Guadalupe County, TDLR, TCEQ, and EPA.

1.8 PERMITS

- A. Permits, fees, and licenses necessary for pursuit of Work shall be obtained and paid for by Contractor.

1.9 COORDINATION

- A. Contractor is responsible for all coordination with all utility companies, pipeline companies, ambulance, sheriff, and fire departments during construction. Contractor shall give a minimum of 48-hours advance notice before working on weekends or holidays.

1.10 NOISE AND VIBRATION

- A. Select construction equipment to operate with minimum noise and vibration. If, in opinion of Engineer, objectionable noise or vibration is produced by equipment, rectify such conditions without extra cost to Owner. Sound Power Level (PWL) of any equipment shall not exceed local ordinances.

1.11 SITE ADMINISTRATION

- A. Contractor's Responsibility. Contractor is responsible for all areas of Site used by him or his subcontractors in performance of Work. He will exert full control over actions of all employees and other persons with respect to use and preservation of property and existing facilities, except such controls as may be specifically reserved to Owner or others. Contractor reserves the right to exclude from Site all persons who have no purpose related to Work or its inspection, exclusive of Owner's operations personnel, and may require all persons on Site to observe same regulations as he requires of his employees.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Refer to specific Specification sections.
- B. Construct, install, connect, adjust and finish products as stipulated in respective sections of Specifications.
- C. Repair or replace items damaged by Contractor.

PART 3 - EXECUTION

3.1 GENERAL

- A. Refer to individual sections of Specifications of Project Manual.

END OF SECTION

SECTION 01 10 14

PROTECTION OF ENVIRONMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Addresses:
 - 1. Minimizing potential for pollution of air, water, or land; control of noise, disposal of solid waste materials, and protection of deposits of historical or archaeological interest.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Propopsal Requirements, Contract Forms, and Conditions of the Contract.
 - 2. Division 01 - General Requirements.

1.02 SUBMITTALS

- A. Shop Drawings:
 - 1. See Section 01 33 00 - Submittals for requirements for mechanics and administration of submittal process.
 - 2. Prior to the start of any construction activities submit:
 - a. A detailed proposal of all methods of control and preventive measures to be utilized for environmental protection.
 - b. A drawing of work area, haul routes, storage areas, access routes and current land conditions including trees and vegetation.
 - c. Submit manufacturer's catalog sheets and other product data on dispensing equipment, pump, and aboveground fuel storage tanks, indicating capacity and dimensions of tank.
 - d. Submit drawings to show location of tank protection area and driveway. Indicate nearest inlet or channelized flow area. Clearly dimension distances and measurements.
 - e. Submit list of spill containment equipment, and quantities thereof, located at fueling area.

1.03 ENVIRONMENTAL CONTROLS

- A. Provide and maintain methods, equipment, and temporary construction as necessary for controls over environmental conditions at construction site and adjacent areas.
- B. Work to minimize impact to surrounding environment. Adopt construction procedures that do not cause unnecessary excavation and filling of terrain, indiscriminate destruction of vegetation, air or stream pollution, nor harassment or destruction of wildlife.
- C. Recognize and adhere to environmental requirements of Project. Limit disturbed areas to boundaries established by Contract. Avoid pollution of "on-site" streams, sewers, wells, or other water sources.
- D. Burning of rubbish, debris, or waste materials is not permitted.

1.04 POLLUTION CONTROL

- A. Provide methods, means, and facilities required to prevent contamination of soil, water, or atmosphere by discharge of noxious substances from construction operations.
- B. Provide equipment and personnel to perform required emergency measures to contain spillage, and to remove contaminated soils or liquids. Excavate and dispose of contaminated earth off-site, and replace with suitable compacted fill and topsoil.

- C. Provide systems for control of atmospheric pollutants.
 - 1. Prevent toxic concentrations of chemicals.
 - 2. Prevent harmful dispersal of pollutants into atmosphere.
- D. Use equipment that conforms to current Federal, State, and local laws and regulations.
- E. Install or otherwise implement positive controls to prevent hazardous materials migrating from Work area.

1.05 NOISE CONTROL

- A. Owner has no official noise limit, but is governed by State regulations that dictate a maximum level of 85 decibels at any time of day or night. Local municipal noise limits may be more restrictive and shall be followed as required.
- B. Provide vehicles, equipment, and construction activities that minimize noise to greatest degree practicable. Conform noise levels to latest OSHA standards. Do not permit noise levels to interfere with Work or create nuisance in surrounding areas.
- C. Conduct construction operations during daylight hours except as approved by Engineer.
- D. Select construction equipment to operate with minimum noise and vibration. When in opinion of Engineer, objectionable noise or vibration is produced by equipment, rectify conditions without additional cost to Owner. Sound Power Level (PWL) of equipment shall not exceed 85 dbA (re: 10-12 watts) measured 5 feet from piece of equipment. Explicit equipment noise requirements are specified with equipment specifications.

1.06 DUST CONTROL

- A. Control objectionable dust caused by operation of vehicles and equipment. Apply water or use other methods, subject to approval of Engineer, to control amount of dust generated.

1.07 WATER RUNOFF AND EROSION CONTROL

- A. Comply with Texas Pollutant Discharge Elimination System (TPDES) permit when required.
- B. In addition to TPDES requirements:
 - 1. Provide methods to control surface water, runoff, subsurface water, and water from excavations and structures to prevent damage to Work, site, or adjoining properties.
 - 2. Control fill, grading and ditching to direct water away from excavations, pits, tunnels, and other construction areas; and to direct drainage to proper runoff courses so as to prevent erosion, sedimentation or damage.
 - 3. Provide, operate, and maintain equipment and facilities of adequate size to control surface water.
 - 4. Dispose of drainage water in manner to prevent flooding, erosion, or other damage to portion of Site or to adjoining areas and in conformance with environmental requirements.
 - 5. Retain existing drainage patterns external to construction site by constructing temporary earth berms, sedimentation basins, retaining areas, and temporary ground cover as needed to control conditions.
 - 6. Plan and execute construction and earth work by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation.
 - a. Minimize area of bare soil exposed at one time.
 - b. Provide temporary control measures, as berms, dikes, and drains.
 - 7. Construct fills and waste areas by selective placement to eliminate erosion of surface silts or clays.

8. Inspect earthwork periodically to detect evidence of start of erosion. Apply corrective measures as required to control erosion.

1.08 QUALITY ASSURANCE

- A. Person conducting visual examination for pollutant shall be fully knowledgeable about TPDES Construction General Permit, detecting sources of storm water contaminants, inspection of aboveground storage tank and appurtenances for leakage, and day-to-day operations that may cause unexpected pollutant releases.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Employ and utilize environmental protection methods, obtain all necessary permits, and fully observe all local, state, and federal regulations.
- B. No clearing and grubbing or rough cutting permitted until erosion and sediment control systems are in place, other than site Work specifically directed by Engineer to allow soil testing and surveying.
- C. Prohibit equipment and vehicles from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Immediately repair damage caused by construction traffic to erosion and sediment control systems.
- D. Maintain existing erosion and sediment control systems located within easements until acceptance of Project or until directed by Engineer to remove and discard existing system.
- E. Regularly inspect and repair or replace damaged components of erosion and sediment control systems as specified in this Section. Unless otherwise directed, maintain erosion and sediment control systems until project area stabilization is accepted by Owner. Remove erosion and sediment control systems promptly when directed by Engineer. Discard removed materials off site.
- F. Remove and dispose sediment deposits at designated spoil site for Project. If a project spoil site is not designated on Drawings, dispose of sediment off site at location not in or adjacent to stream or flood plain. Assume responsibility for off-site disposal. Spread sediment evenly, compacted and stabilized. Prevent sediment from flushing into a stream or drainage way. If sediment has been contaminated, dispose of in accordance with existing federal, state, and local rules and regulations.
- G. Assume responsibility for collecting, storing, hauling, and disposing of spoil, silt, and waste materials as specified in this or other Specifications and in compliance with applicable federal, state, and local rules and regulations.
- H. Employ protective measures to avoid damage to existing trees to be retained on project site. Conduct construction operations under this Contract in conformance with erosion control practices described in Drawings and this or other Specifications.
- I. Prepare spill response and containment procedures to be implemented in event of significant materials spill. Significant materials include but are not limited to: raw materials; fuels; materials such as solvent, detergents, and plastic pellets; finished materials such as metallic products; raw materials used in food processing or production; hazardous substances designated under Section 101(14) of CERCLA; chemical required to be reported pursuant to Section 313 of Title III of SARA; fertilizers; pesticides, and waste products such as slag, ashes and sludge that have potential to be released with storm water discharges. Spill containment procedures shall be kept on-site or in construction field office.

- J. Spill containment equipment appropriate to size of operation is to be located in close proximity of fueling area. Such equipment includes, but not limited to, suitable waste containers for significant materials, drip pans, booms, inlet covers, or absorbent.
- K. Properly label significant materials or waste containers used for construction activities and stored on-site overnight.
- L. Install, maintain, and inspect erosion, sediment control measures and practices as specified in Drawings and in this or other Specifications
- M. Land Protection:
 - 1. Except for any work or storage area and access routes specifically assigned for use of Contractor, land areas outside limits of construction shall be preserved in their present condition.
 - a. Contractor shall confine his construction activities to areas defined for work within Contract Documents.
 - 2. Manage and control all borrow areas, work or storage areas, access routes and embankments to prevent sediment from entering nearby water or land adjacent to work site.
 - 3. Restore all disturbed areas including borrow and haul areas and establish permanent type of locally adaptable vegetative cover.
 - 4. Unless earthwork is immediately paved or surfaced, protect all side slopes and back slopes immediately upon completion of final grading.
 - 5. Plan and execute earthwork in a manner to minimize duration of exposure of unprotected soils.
 - 6. Except for areas designated by Contract Documents to be cleared and grubbed, Contractor shall not deface, injure or destroy trees and vegetation, nor remove, cut, or disturb them without approval of Engineer.
 - a. Any damage caused by Contractor's equipment or operations shall be restored as nearly as possible to its original condition at Contractor's expense.
 - 7. Utilize, as necessary, erosion control methods to protect side and back slopes, minimize and the discharge of sediment to surface water leaving construction site as soon as rough grading is complete.
 - a. These controls shall be maintained until site is ready for final grading and landscaping or until they are no longer warranted and concurrence is received from Engineer.
 - b. Physically retard the rate and volume of run-on and runoff by:
 - 1) Implementing structural practices such as diversion swales, terraces, straw bales, silt fences, berms, storm drain inlet protection, rockered outlet protection, sediment traps and temporary basins.
 - 2) Implementing vegetative practices such as temporary seeding, permanent seeding, mulching, sod stabilization, vegetative buffers, hydroseeding, anchored erosion control blankets, sodding, vegetated swales or a combination of these methods.
 - 3) Providing Construction sites with graveled or rockered access entrance and exit drives and parking areas to reduce tracking of sediment onto public or private roads.
 - 8. Discharges from construction site shall not contain pollutants at concentrations that produce objectionable films, colors, turbidity, deposits or noxious odors in receiving stream or waterway
- N. Solid Waste Disposal:
 - 1. Collect solid waste on a daily basis.
 - 2. Provide disposal of degradable solid waste to an approved solid waste disposal site.
 - 3. Provide disposal of non-degradable solid waste to an approved solid waste disposal site or in an alternate manner approved by Engineer and regulatory agencies.
 - 4. No building materials wastes or unused building materials shall be buried, dumped, or disposed of on site.

- O. Fuel and Chemical Handling:
1. Store and dispose of chemical wastes in a manner approved by regulatory agencies.
 2. Take special measures to prevent chemicals, fuels, oils, greases, herbicides, and insecticides from entering drainage ways.
 3. Do not allow water used in onsite material processing, concrete curing, cleanup, and other waste waters to enter a drainage way(s) or stream.
 4. Contractor shall provide containment around fueling and chemical storage areas to ensure that spills in these areas do not reach waters of U. S.
- P. Control of Dust:
1. Control of dust shall mean that no construction activity shall take place without applying all such reasonable measures as may be required to prevent particulate matter from becoming airborne so that it remains visible beyond limits of construction.
 - a. Reasonable measures may include paving, frequent road cleaning, planting vegetative ground cover, application of water or application of chemical dust suppressants.
 - b. Use of chemical agents such as calcium chloride must be approved by TxDOT.
 2. Utilize methods and practices of construction to eliminate dust in full observance of agency regulations.
 3. Engineer will determine the effectiveness of dust control program and may request Contractor to provide additional measures, at no additional cost to Owner.
- Q. Burning:
1. Do not burn any material on site.
 2. If Contractor elects to dispose of waste materials by burning, make arrangements for an off-site burning area and conform to all agency regulations.
- R. Control of Noise:
1. Control noise by fitting equipment with appropriate mufflers.
- S. Completion of Work:
1. Upon completion of work, leave area in a clean, natural looking condition.
 2. Ensure all signs of temporary construction and activities incidental to construction of required permanent work are removed.
- T. Historical Protection:
1. If during course of construction, evidence of deposits of historical or archaeological interests is found, cease work affecting find and notify Engineer.
 - a. Do not disturb deposits until written notice from Engineer is given to proceed.
 2. Contractor will be compensated for lost time or changes in construction to avoid find based upon normal change order procedures.
- U. Snake Policy
1. Because snakes are perceived as a threat when encountered during construction, Contractor shall avoid impacts to any snakes, so long as safety of workers is not compromised. If any snake is encountered during performance of Work by Contractor or its crews, such snake shall be permitted to safely leave Project area on its own.
- V. Wildlife Protections
1. Wildlife such as frogs, tortoises, lizards, snakes, and mice are susceptible to flooding into opens pits, trenches, bore holes, etc. left open and/or uncovered on Site. In addition, same wildlife is subject to direct impacts (i.e., crushing by heavy equipment) during site preparation activities. Trenches should not be left open overnight, if possible, in order to prevent wildlife from being trapped. If excavation holes or trenches must be left unfilled at end of work day, they should either be covered or have escape ramps at an angle less than 45 degrees consisting of either short lateral trenches or wooden planks. Trenches should be inspected for presence of trapped reptiles prior to backfilling.

- W. Microhabitats.
 - 1. Contractor shall avoid all microhabitats such as snags, brush piles, fallen logs, creek banks, and pools during course of Work.

3.02 TOPSOIL PLACEMENT FOR EROSION AND SEDIMENT CONTROL SYSTEMS.

- A. When placing topsoil, maintain erosion and sediment control systems consisting of swales, grade stabilization structures, berms, dikes, waterways, and sediment basins.
- B. Maintain grades which have been previously established on areas to receive topsoil.
- C. After areas to receive topsoil have been brought to grade, and immediately prior to dumping and spreading topsoil, loosen subgrade by discing or by scarifying to a depth of at least 2" to permit bonding of topsoil to subsoil. Compact by passing bulldozer up and down slope, tracking over entire surface area of slope to create horizontal erosion control slots.
- D. No sod or seed shall be placed on soil which has been treated with soil sterilants until sufficient time has elapsed to permit dissipation of toxic materials.

3.03 DUST CONTROL

- A. Implement dust control methods to control dust creation and movement on construction sites and roads and to prevent airborne sediment from reaching receiving streams or storm water conveyance systems, to reduce on-site and off-site damage, to prevent health hazards, and to improve traffic safety.
- B. Control blowing dust by using one or more of following methods:
 - 1. Mulches bound with chemical binders such as Carasol, Terratack, or equal.
 - 2. Temporary vegetative cover.
 - 3. Spray-on adhesives on mineral soils when not used by traffic.
 - 4. Tillage to roughen surface and bring clods to surface.
 - 5. Irrigation by water sprinkling.
 - 6. Barriers using solid board fences, snow fences, burlap fences, crate walls, bales of hay, or similar materials.
- C. Implement dust control methods immediately whenever dust can be observed blowing on Site.

3.04 KEEPING STREETS CLEAN

- A. Keep streets clean of construction debris and mud carried by construction vehicles and equipment. If necessary, install stabilized construction exits at construction, staging, storage, and disposal areas. Vehicle/equipment wash area (stabilized with coarse aggregate) may be installed adjacent to stabilized construction exit, as needed. Release wash water into a drainage swale or inlet protected by erosion and sediment control measures.
- B. In addition to stabilized construction exits, shovel or sweep pavement to extent necessary to keep street clean. Water hosing or sweeping of debris and mud off of street into adjacent areas is not allowed.

3.05 EQUIPMENT MAINTENANCE AND REPAIR

- A. Confine maintenance and repair of construction machinery and equipment to areas specifically designated for that purpose. Locate areas so that oils, gasoline, grease, solvents, and other potential pollutants cannot be washed directly into receiving streams or storm water conveyance systems. Provide these areas with adequate waste disposal receptacles for liquid as well as solid waste. Clean and inspect maintenance areas daily.

- B. On construction site where designated equipment maintenance areas are not feasible, take precautions during each individual repair or maintenance operation to prevent potential pollutants from washing into streams or conveyance systems. Provide temporary waste disposal receptacles.

3.06 WASTE COLLECTION AND DISPOSAL

- A. Formulate and implement a plan for collection and disposal of waste materials on Site. In plan, designate locations for trash and waste receptacles and establish a collection schedule. Specify and carry out methods for ultimate disposal of waste in accordance with applicable local, state, and federal health and safety regulations. Make special provisions for collection and disposal of liquid wastes and toxic or hazardous materials.
- B. Keep receptacles and waste collection areas neat and orderly to extent possible. Waste shall not be allowed to overflow its container or accumulate from day-to-day. Locate trash collection points where they shall least likely be affected by concentrated storm water runoff.

3.07 WASHING AREAS

- A. Avoid washing concrete delivery trucks or dump trucks and other construction equipment at locations where runoff shall flow directly into a watercourse or storm water conveyance system. Designate special areas for washing vehicles. Locate these areas where wash water shall spread out and evaporate or infiltrate directly into ground, or where runoff can be collected in temporary holding or seepage basin. Beneath wash areas construct a gravel or rock base to minimize mud production.

3.08 STORAGE OF CONSTRUCTION MATERIALS AND CHEMICALS

- A. Isolate sites where chemicals, cements, solvents, paints, or other potential water pollutants are stored in areas where they shall not cause runoff pollution.
- B. Store toxic chemicals, materials, pesticides, paints, and acids in accordance with manufacturers' guidelines. Protect groundwater resources from leaching by placing a plastic mat, packed clay, tar paper, or other impervious materials on areas where toxic liquids are to be opened and stored.

3.09 DEMOLITION AREAS

- A. Demolition activities which create large amounts of dust with significant concentrations of heavy metals or other toxic pollutants shall use dust control techniques to limit transport of airborne pollutants. However, retain water or slurry used to control dust contaminated with heavy metals or toxic pollutants on site, and prevent runoff directly into watercourses or storm water conveyance systems. Carry out methods of ultimate disposal of these materials in accordance with applicable local, state, and federal health and safety regulations.

3.10 SANITARY FACILITIES

- A. Provide construction sites with adequate portable toilets for workers in accordance with applicable health regulations.

3.11 PESTICIDES

- A. Use and store pesticides during construction in accordance with manufacturers' guidelines and with local, state, and federal regulations. Avoid overuse of pesticides which could produce contaminated runoff. Take great care to prevent accidental spillage. Never wash pesticide containers in or near flowing streams or storm water conveyance systems.

3.12 CONSTRUCTION METHODS

- A. Provide fuel tank protection area and driveway as shown on Drawings.

- B. Do not locate fueling area in or near channelized flow area or close to storm sewer conveyance system. Provide sufficient space to allow installation of other erosion and sediment controls to protect those areas.
- C. Clear and grub fueling area to remove unsuitable materials. Place geotextile fabric as permeable separator to prevent mixing of coarse aggregate with underlying soil. Overlap fabric minimum of 6". Place coarse aggregate on top of geotextile fabric to minimum depth of 8".
- D. Grade protection area and driveway to provide sufficient drainage away from stabilized areas. Use sandbags, gravel, boards, or similar methods to prevent sediment from entering public right-of-way, receiving stream or storm water conveyance system. Provide driveway to fuel tank area with minimum width of 15 feet for one-way traffic and 30 feet for two-way traffic.
- E. Place aboveground storage tank on top of cast-in-place or pre-cast foundation. Base size and thickness of foundation on size and weight of tank to be used, with minimum thickness of 6". Enclose concrete foundation by 5" by 5" concrete curb and extend minimum of 1 foot beyond tank and dispenser assemblies, so that leak and drip can be contained within concrete foundation.
- F. Slope concrete foundation minimum of 1% toward 6" wide by 12" long by 4" deep sump pit. Install minimum of 2" pipe inside sump pit with valve on outside of curb to allow draining of concrete foundation.
- G. Install portable concrete Jersey Barrier around concrete foundation. Provide minimum clearance of 2 feet from edge of foundation. In lieu of Jersey barrier, install 4" diameter steel pipe bollards around foundation. Bury bollards minimum of 3 feet deep, 3 feet above ground, and 4 feet on center, encased in 12" wide concrete foundation.

3.13 MAINTENANCE

- A. Inspections shall be conducted by designated health and safety officer qualified to conduct health and safety inspections.
- B. Inspect stabilized areas after every storm event and at least once a week. Provide periodic top dressing with additional coarse aggregate to maintain required depth. Repair and clean out damaged control measures used to trap sediment.
- C. Inspect fuel tank foundation's bermed area after every storm event and at least once a week. Visually examine storm water contained in tank's bermed foundation area for oil sheen or other obvious indicators of storm water pollution. Properly dispose of storm water when pollutant is present. Record visual examination of storm water discharge in Report noting date and time of examination, name of examiner, observations of water quality, and volume of storm water discharged from bermed area. Keep Report with other storm water pollution control inspection reports on Site, in readily accessible location.

3.14 TEMPORARY FUELING AREA CLOSURE

- A. Dispose of temporary vehicle and equipment fueling area by removal of sediment and erosion controls properly off site. Engineer will inspect top soils in fueling area and immediate vicinity for evidence of fuel leaks. If Engineer determines that sufficient pollutants have been released, remove soil and properly dispose off Site. Other remediation methods may be required.

END OF SECTION

SECTION 01 10 40

PROJECT COORDINATION

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Administer Contract requirements to construct Project. Provide documentation per requirements of this Section. Provide information as requested by Engineer or Owner.

1.02 SUBMITTALS

- A. Provide submittals in accordance with Section 01 33 00 "Submittals".

1.03 COMMUNICATION DURING PROJECT

- A. Engineer is to be first point of contact for all parties on matters concerning this Project.
- B. Engineer will coordinate correspondence concerning:
 - 1. Submittals, including Applications for Payment.
 - 2. Clarification and interpretation of Contract Documents.
 - 3. Contract modifications.
 - 4. Observation of Work and testing.
 - 5. Claims.
- C. Engineer and Owner will normally communicate only with Contractor. Any required communication with Subcontractors or Suppliers will only be with direct involvement of Contractor.
- D. Direct written communications to Engineer at address indicated at pre-construction conference. Include the following with communications as a minimum:
 - 1. Name of Owner.
 - 2. Project name.
 - 3. Contract title.
 - 4. Project number.
 - 5. Date.
 - 6. A reference statement.
- E. Submit communications on the forms referenced in this Section or in Section 01 33 00 "Submittals".

1.04 PROJECT MEETINGS

- A. Pre-construction Conference:
 - 1. Attend a pre-construction conference.
 - 2. Location of conference will be determined by Owner.
 - 3. Time of conference will be determined by Owner but will be after Notice of Award is issued and not later than 15 days after Notice to Proceed is issued.
 - 4. Owner, Engineer, Contractor's project manager and superintendent, representatives of utility companies, and representatives from major Subcontractors and Suppliers may attend conference.
 - 5. Provide and be prepared to discuss:
 - a. Preliminary construction schedule per Section 01 32 16 "Construction Progress Schedule".
 - b. Preliminary submittal schedule per Section 01 33 00 "Submittals"..
 - c. List of Subcontractors and Suppliers.
 - d. Contractor's organizational chart as it relates to this Project.

- e. Letter indicating the agents of authority for Contractor and limit of that authority with respect to execution of legal documents, contract modifications and payment requests.
 - 6. Letter indicating agents of authority for Contractor and the limit of that authority with respect to the execution of legal documents, contract modifications and payment requests.
- B. Progress Meetings:
- 1. Attend meetings with Engineer and Owner.
 - a. Meet on a monthly basis or as requested by Engineer to discuss Project.
 - b. Meet at Site or other location as designated by Engineer.
 - c. Contractor's superintendent and other key personnel are to attend meeting. Other individuals may be requested to attend to discuss specific matters.
 - d. Notify Engineer of any specific items to be discussed a minimum of 1 week prior to meeting.
 - 2. Provide information as requested by Engineer or Owner concerning this Project. Prepare to discuss:
 - a. Status of overall Project schedule.
 - b. Contractor's detailed schedule for next month.
 - c. Anticipated delivery dates for equipment.
 - d. Coordination with Owner and Engineer.
 - e. Status of submittals.
 - f. Information or clarification of Contract Documents.
 - g. Claims and proposed modifications to Contract.
 - h. Field observations, problems, or conflicts.
 - i. Maintenance of quality standards.
 - j. Equipment Deliveries
 - 3. Engineer shall prepare minutes of meetings. Contractor shall review minutes of meeting and notify Engineer, in writing, of any discrepancies within ten days of date of meeting memorandum. Minutes will not be corrected after ten days have expired. Corrections will be reflected in minutes of the following meeting or as an attachment to minutes.
- C. Pre-installation Meetings:
- 1. Conduct pre-installation meetings if required in individual technical specifications or as determined necessary by Engineer (for example, instrumentation, roofing, concrete mix design, etc.).
 - 2. Set time and location of meetings when ready to proceed with associated Work. Submit a Notification by Contractor for meeting 2 weeks before the meeting. Engineer and Owner must approve of proposed time and location.
 - 3. Attend the meeting and require participation of appropriate Subcontractors and Suppliers in meeting.
 - 4. Prepare minutes of meeting and submit to Engineer for review. Owner and Engineer will review minutes of meeting and notify Contractor of any discrepancies within ten days of date of meeting memorandum. Minutes will not be corrected after ten days have expired. Corrections will be reflected in a revised set of meeting minutes.

1.05 REQUESTS FOR INFORMATION

- A. Per Section 01 34 00 - Request for Information (RFI)

1.06 NOTIFICATION BY CONTRACTOR

- A. Notify Owner of:
 - 1. Need for water for construction.
 - 2. Intent to work outside regular working hours.
 - 3. Request to shut down facilities or utilities.
 - 4. Proposed utility connections.
 - 5. Required observation by Engineer, Owner, or inspection agencies prior to covering Work.
 - 6. Training.

- B. Provide notification a minimum of 2 weeks in advance in order to allow Owner and Engineer time to respond appropriately to the notification.

1.07 REQUESTS FOR MODIFICATIONS

- A. Submit a written request to Engineer for any proposed change in Contract Documents.
 - 1. Assign a number to request when issued.
 - 2. Include with request:
 - a. Complete description of proposed modification.
 - b. Reason modification is requested.
 - c. Detailed breakdown of cost of change (necessary only if modification requires a change in Contract Price) pursuant to requirements of General Conditions and this Specification. Itemized breakdown is to include:
 - 1). List of materials and equipment to be installed.
 - 2). Man hours for labor by classification.
 - 3). Equipment used in construction.
 - 4). Consumable supplies, fuels, and materials.
 - 5). Royalties and patent fees.
 - 6). Bonds and insurance.
 - 7). Overhead and profit.
 - 8). Field office costs.
 - 9). Home office cost.
 - 10). Other items of cost.
 - d. Provide a level of detail outline in paragraph above for each Subcontractor or Supplier actually performing Work if Work is to be provided by a Subcontractor or Supplier. Indicate appropriate Contractor mark-ups for Work provided through Subcontractors and Suppliers. Provide level of detail outline above for self-performed Work.
 - e. Provide a revised schedule indicating effect on critical path for Project and a statement of number of days Project may be delayed by modification.
 - 4. Submit a request to Engineer to request a field change or Work Order.
 - 5. Request is required for all substitutions or deviations from Contract Documents.
 - 6. Engineer will evaluate request for a Contract modification.
- B. Owner will initiate changes.
 - 1. Engineer will prepare a description of proposed modifications to Contract Documents.
 - 3. Return request with a proposal to incorporate requested change. Include a breakdown of costs into materials and labor in detail outline above to allow evaluation by Engineer.
- C. Owner will issue a Work Order or a Change Order per General Conditions if a contract modification is appropriate.
 - 1. Modifications to Contract can only be made by a Work Order or a Change Order.
 - 2. Changes in Project will be documented by a Work Order or by a Change Order.
 - 3. Work Orders may be issued by Owner for Contract modifications that do not change Contract Price or Contract Time. If a cost adjustment is required, funds will be subtracted for allowance.
 - 4. Any modifications that require a change in Contract Price or Contract Time can only be approved by Change Order.
 - a. Proposals issued by Contractor in response to a Contract Modification Request will be evaluated by Engineer and approved by Owner
 - b. If a Change Order is recommended, Engineer will prepare a Change Order.
 - c. Change Order will be sent to Contractor for execution with a copy to Engineer recommending approval.
 - d. Change Orders can only be approved by Owner.
 - 1). Work performed on proposed Contract modifications prior to approval of Change Order will be performed at Contractor's risk.
 - 2). No payment will be made for Work on Change Orders until approved by Owner.

- D. Contractor may be informed that Contract Modification Request is not approved and construction is to proceed in accordance with Contract Documents.

1.08 PROJECT RECORDS

- A. Contractor shall maintain at Site one complete record copy of:
1. Drawings.
 2. Specifications.
 3. Addenda.
 4. Contract modifications.
 5. Approved Shop Drawings and Record Data.
 6. Test records.
 7. Clarifications and other information provided in Request for Interpretation (RFI) responses.
- B. Store documents and Samples in Contractor's field office.
1. Documents are to remain separate from documents used for construction. Do not use these documents for construction.
 2. Provide files and racks for storage of documents.
 3. Provide a secure storage space for storage of Samples.
 4. Maintain documents in clean, dry, legible conditions, and in good order.
 5. Make documents and Samples available at all times for inspection by Engineer.
- C. Marking Drawings:
1. Label each document as "Project Record" in large printed letters.
 2. Record information as construction is being performed.
 - a. Do not conceal any Work until required information is recorded.
 - b. Mark Drawings to record actual construction, including the following:
 - 1). Depths of various elements of foundation in relation to finished first floor datum or top of walls.
 - 2). Horizontal and vertical locations of underground utilities and appurtenances constructed and existing utilities encountered during construction.
 - 3). Location of internal utilities and appurtenances concealed in construction. Refer measurements to permanent structure on surface. Include the following equipment:
 - a). Piping.
 - b). Equipment and control devices requiring periodic maintenance or repair.
 - c). Valves, unions, traps, and tanks.
 - 4). Changes of dimension and detail.
 - 5). Changes made by Work Order and Change Order.
 - 6). Details not on original Drawings. Include field verified dimensions and clarifications, interpretations, and additional information issued in response to RFIs.
 - c. Mark Specifications and Addenda to identify products provided.
 - 1). Record product name, trade name, catalog number, and each Supplier (with address and phone number) of each product and item of equipment actually installed.
 - 2). Record changes made by Work Order and Change Order.
 - d. Mark additional Work or information in erasable pencil.
 - 1). Use red for new or revised indication.
 - 2). Use purple for Work deleted or not installed (lines to be removed).
 - 3). Highlight items constructed per Contract Documents in yellow.
 - e. Submit record documents to Engineer for review and acceptance 30 days prior to final completion of Project.
 - 1). Provide one set of marked up Drawings.
 - 2). Provide six sets of Specifications.

- D. Applications for Payment will not be recommended for payment if documents are found to be incomplete or not in order. Final payment will not be recommended without complete record documents per Section 01 78 39 - Project Record Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 23 00

ALLOWANCES

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Include in Contract allowances stated in this Section.
- B. Should net cost be more than specified amount of allowance, contract sum will be adjusted by Change Order on Contract in accordance with General Conditions. No Work in excess of allowance will be permitted except by Change Order on Contract. Should net cost be less than specified amount of allowance, balance will be deducted from final payment.

1.02 TOTALS FOR ALLOWANCES

- A. Total sum of allowances required in Item 2 of Base Bid of this Contract is \$200,000.00 as shown in Items 1.03 below.

1.03 ALLOWANCES FOR CONTINGENCIES

- A. Do not perform any work under Cash Allowances without prior written approval from Owner's Representative authorizing the work.
- B. Contractor's cost for administering services, overhead, profit and other expenses contemplated for allowance shall be included in Contract Price and not in allowance.
- C. Whenever costs are more or less than stipulated allowance, Contract Price shall be adjusted accordingly via Change Order at end of Project. Amount of Change Order shall be difference between actual costs and amount of allowance stated in the Bid or Proposal.
- D. Stipulated amounts are for the following items:
 - 1. Allow Stipulated sum of \$20,000 as indicated in Section 00 30 00 – Proposal Form, to be reimbursed on an Actual Cost Basis for public Agency permits.
 - 2. Allow Stipulated sum of \$100,000.00 as indicated in Section 00 30 00 - Proposal Form to be reimbursed on an Actual Cost Basis for materials testing (concrete and compacted by Arias).
 - 3. Allow Stipulated sum of \$80,000.00 as indicated in Section 00 30 00 - Proposal Form for special requirements as directed by Owner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 FIELD ORDER

- A. Work performed under "Allowance" shall only be initiated only after execution of a Work Order based on agreed costs determined by one of the following methods:
 - 1. By accepting an amount agreed upon by both Owner and Contractor with Engineer's recommendation, which amount is to be calculated based on time, materials, equipment, overhead, and profit.
 - 2. By applying applicable price or prices as set forth in Contract Documents or in the detailed schedule of values or by applying a unit price agreed to by both Owner and Contractor with Engineer's recommendation.

END OF SECTION

SECTION 01 25 13

PRODUCT SUBSTITUTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Construction Drawings, Technical Specifications, Addenda, and general provisions of Contract, including Contract General Conditions and Supplementary General Conditions and other Division 01 Specifications, apply to this Section.

1.02 SECTION INCLUDES

- A. General requirements applicable to substitutions of materials, products, equipment, and systems.

1.03 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by Contractor after award of Contract are considered to be requests for substitutions. Following are not considered to be requests for substitutions:
 - 1. Substitutions requested during bidding period, and accepted by Addendum prior to award of Contract, are included in Contract Documents and are not subject to requirements specified in this Section for Substitutions.
 - 2. Revisions to Contract Documents requested by Owner or Engineer.
 - 3. Specified options of products and construction methods included in Contract Documents.
 - 4. Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.04 SUBSTITUTION OF MATERIALS AND EQUIPMENT

- A. Substitutions, General: Catalog numbers and specific brands or trade names are used in materials, products, equipment and systems required by Specifications to establish standards of quality, utility and appearance required. Alternative products which are of equal quality and of required characteristics for purpose intended may be proposed for use provided Contractor complies with provisions of Supplementary General Conditions and Contract General Conditions, subject to the following provisions.
 - 1. See Section 01 60 00 - Product Requirements for requirements regarding product options.
 - 2. Substitutions will only be authorized by properly executed Change Order or Field Instruction.
 - 3. Product and Material Substitution period ends 6 calendar days prior to bid. Owner or Engineer has no obligation to entertain substitutions.

1.05 SUBMITTALS

- A. Requests for substitutions will not be considered before selection of Contractor. Substitutions will not be considered when:
 - 1. Indicated on shop drawings or product data submittals without separate formal "Substitution Request" by Contractor.
 - 2. Requested directly by subcontractor or supplier.
 - 3. Acceptance will require revision of Contract Documents.
 - 4. Proposed changes are not in compliance with general intent of Contract Documents.
- B. Requests for substitutions will be considered only as allowed in the Supplementary General Conditions and Contract General Conditions. Other requests will be considered after Notice to Proceed only when:

1. Specified product or method of construction cannot be provided within Contract Time. Engineer will not consider request if product or method cannot be provided as result of failure to pursue Work promptly or coordinate activities properly.
 2. Subsequent information or changes indicate specified product will not perform as intended.
 3. Requested substitution offers Owner substantial advantage, in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities include compensation to Engineer for redesign and evaluation services, compensation to Owner's Representative for additional processing and evaluation services, increased cost of other construction by Owner, and similar considerations.
 4. Specified product or method of construction cannot receive necessary approval by governing authority, and requested substitution can be approved.
 5. Specified product or method of construction cannot be provided in manner that is compatible with other materials and where Contractor certifies that substitution will overcome incompatibility.
 6. Specified product or method of construction cannot be coordinated with other materials and where Contractor certifies that proposed substitution can be coordinated.
 7. Specified product or method of construction cannot provide warranty required by Contract Documents and where Contractor certifies that proposed substitution provides required warranty.
- C. Do not order or install substitute products without written acceptance from Engineer.
- D. Only 1 request for substitution for each product will be considered. When substitution is not accepted, provide specified product.
- E. Engineer will determine acceptability of substitutions.
- F. Submit 2 copies of each request to Engineer. Submit separately for each substitution.
1. Identify products by Specification Section and Article numbers.
 2. Provide manufacturer's name and address, trade name of products, and model or catalog number.
 3. List fabricators and suppliers as appropriate.
 4. Document each request with complete data substantiating compliance of proposed substitution with requirements of Contract Documents including independent laboratory testing reports, approval numbers, listings, and approved assembly descriptions as requested by Engineer, or as required by agencies having jurisdiction.
 5. Attach product data as specified in Section 01 33 00 - Submittals..
 6. Give itemized comparison of proposed substitution with specified product, listing variation, and reference to Specification and Article numbers.
 7. Give quality and performance comparison between proposed substitution and specified product.
 8. Submit written certification from manufacturer that proposed substitution is appropriate for this application.
 9. List availability of maintenance services and replacement materials.
 10. State effect of substitution on construction schedule, and changes required in other Work or products.
- G. By making requests for substitutions, Contractor:
1. Represents that Contractor has personally investigated proposed substitute product and determined that it is equal to or superior in all respects to that specified.
 2. Represents that Contractor will provide same warranty for substitution that Contractor would for the specified product.
 3. Will coordinate installation of accepted substitute, making such changes as may be required for Work to be compatible with substrates and adjacent materials, and complete in all respects.
 4. Waives claims for additional time related to substitution that may later become apparent.

5. Certifies that cost data presented is complete and includes related costs under this Contract, including redesign costs, and waives claims for additional costs related to substitution which may later become apparent.
- G. Modification of Documents: Where substitution requires changes to design of Work as indicated on accepted Shop Drawings for proper installation; furnish drawings and specifications, as appropriate, revising Shop Drawings.
1. Submit revised Documents for acceptance in accordance with Section 01 33 00 - Submittals.
 2. Revised Drawings shall be sufficiently complete for proper installation of substitution and related Work.
 3. If, in Engineer's sole judgment, proposed substitution is of such significance or deals with product or system affecting basic design or aesthetics, pay Engineer for changes required to Contract Documents:
 4. Contractor is responsible for cost of revised Documents, obtaining and paying for review and plan check by authorities having jurisdiction, and cost of revised construction.
 6. Submit revised drawings with Record Documents.

1.06 SUBMITTAL PROCEDURES

- A. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within 1 week of receipt of request for substitution. Engineer will notify Contractor of acceptance or rejection of substitution within 2 weeks of receipt of request, or 1 week of receipt of additional information or documentation, whichever is later. Acceptance will be in form of Change Order, should a change in Contract cost or time be associated with substitution.
1. Engineer will not make exhaustive attempt to determine products proposed for substitution are equivalent to, or can be modified in order to be equivalent to specified products.
 2. Use product specified if Engineer couldn't make decision on use of proposed substitute within time allocated.
 3. If accepted by Engineer, products proposed for substitution are accepted subject to modifications by manufacturer, if necessary, to meet detailed requirements of Drawings and Specifications.
- B. For Accepted Products: Submit shop drawings, product data, and samples in accordance with Section 01 33 00 - Submittals.
- C. Contractor's submittal, and Engineer's acceptance of Shop Drawings, Product Data, or Samples for construction activities not complying with Contract Documents do not constitute acceptable or valid request for substitution, nor do they constitute approval.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 32 16

CONSTRUCTION PROGRESS SCHEDULE

PART 1 - GENERAL

1.01 REQUIREMENTS

- A. Prepare and submit a Progress Schedule for Work and update schedule routinely for duration of Project.
- B. Provide schedule in adequate detail to allow Owner to monitor Work progress, to anticipate time and amount of progress payments, and to relate submittal processing to sequential activities of Work.
- C. Incorporate and specifically designate dates of anticipated submission of submittals and dates when submittals must be returned to Contractor into schedule.
- D. Assume complete responsibility for maintaining progress of Work per schedule submitted.

1.02 SUBMITTALS

- A. Submit Progress Schedules in accordance with Section 01 33 00 "Submittals." Submit schedules within the following times:
 - 1. Preliminary schedule within 10 days after Notice of Award. Schedule is to be available at pre-construction conference.
 - 2. Detailed schedule at least 10 days prior to first payment request.
- B. Submit Progress Schedules with requests for partial payment. Schedules may be used to evaluate requests for partial payment. Failure to submit schedule may cause delay in review and approval of progress payments.

1.03 SCHEDULE REQUIREMENTS

- A. Schedule is to be in adequate detail to:
 - 1. Assure adequate planning, scheduling, and reporting during execution of Work.
 - 2. Assure coordination of Work of Contractor and various Subcontractors and Suppliers.
 - 3. Assist in monitoring progress of Work.
 - 4. Assist in evaluating proposed changes to Contract Time and Project schedule.
 - 5. Assist Owner in review of Contractor's monthly payment requests.
- B. Provide personnel with 5 years' minimum experience in scheduling construction work comparable to this Project. Prepare schedule using acceptable scheduling software.
- C. Provide the schedule in form of a computer generated critical path schedule which includes Work to be performed on Project. It is intended that schedule accomplish the following:
 - 1. Give early warning of delays in time for correction.
 - 2. Require that detailed plans for execution of Work be prepared in form of future activities and events in sequential relationships.
 - 3. Establish inter-relationships of significant planned Work activities and provide a logical sequence of interdependence of planned Work activities.
 - 4. Provide continuous current status information.
 - 5. Allow analysis of Contractor's program for completion of Project.
 - 6. Permit preparation of new schedules when an existing schedule is not achievable.
 - 7. Log progress of Work as it actually occurs.
- D. A time scaled CPM arrow or precedence diagram shall be prepared to indicate each activity and its start and stop dates.

1. Develop Milestone dates and Project completion dates to conform to time constraints, sequencing requirements and Contract completion date.
 2. Use calendar day durations while accounting for normal holidays and weather conditions in projection of duration of each activity.
 3. Clearly indicate by a graphical method, critical path for Work to complete Project. Only one critical path shall be shown on construction schedule.
- E. Schedule is to be accompanied by a time scaled horizontal bar chart which indicates graphically Work scheduled at any time during Project. Chart shall indicate:
1. Complete sequence of construction by activity.
 2. Identification of activity by structure, location, and type of Work.
 3. Chronological order of start of each item of Work.
 4. Activity start and stop dates.
 5. Activity duration.
 6. Successor and predecessor relationships for each activity. Group related activities or use lines to indicate relationships.
 7. Clearly indicated critical path. Indicate only one critical path on schedule. Subsystem with longest time of completion is critical path where several subsystem each have a critical path. Float time is to be assigned to other subsystems.
 8. Projected percentage of completion, based on dollar value of Work included in each activity as of first day of each month.
- F. Submit a separate submittal schedule indicating dates when the submittals are to be sent to Engineer.
1. List specific dates submittal is to be sent to Engineer.
 2. List specific dates submittal must be processed in order to meet proposed schedule.
 3. Allow a reasonable time to review submittals, taking into consideration size and complexity of submittal, submission of other submittals, and other factors that may affect review time.
 4. Allow time for re-submission of submittals for each item. Contractor is responsible for delays associated with additional time required to review incomplete or erroneous submittals and for time lost when submittals are submitted for products that do not meet requirements of Specifications.
- G. Update schedule routinely to indicate progress made on Project to that date.

1.04 SCHEDULE REVISIONS

- A. Revise schedule if it appears that schedule no longer represents actual progress of Work.
1. Submit a written report if schedule indicates that Project is more than 30 days behind schedule. Report is to include:
 - a. Number of days behind schedule
 - b. Narrative description of steps to be taken to bring Project back on schedule.
 - c. Anticipated time required to bring Project back on schedule.
 2. Submit a revised schedule indicating action that Contractor proposes to take to bring Project back on schedule.
- B. Revise schedule to indicate any adjustments in Contract Time approved by Change Order.
1. Revised schedule is to be included with Contract Modification Request and in response to Proposed Contract Modifications by Owner and Engineer for which an extension of time is requested.
 2. Failure to submit a revised schedule indicates that modification shall have no impact on ability of Contractor to complete Project on time and that cost associated with change of additional plant or work force have been included in cost proposed for modification.
- C. Updating Project schedule to reflect actual progress is not considered a revision to Project schedule.

- D. Payment estimates may not be recommended for payment without a revised schedule and if required, report indicating Contractor's plan for bringing Project back on schedule.

1.05 FLOAT TIME

- A. Define float time as amount of time between earliest start date and latest start date of a chain of activities on construction schedule.
- B. Float time is not for exclusive use or benefit of either Contractor or Owner.
- C. Where several subsystems each have a critical path, subsystem with longest time of completion is critical path and float time is to be assigned to other subsystems.
- D. Contract Time cannot be changed by submission of this schedule. Contract Time can only be modified by approved Change Order.
- E. Schedule completion date must be same as contract completion date. Time between end of construction and contract completion date is to be indicated as float time.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 33 00

SUBMITTALS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Submit documentation as required by Contract Documents and as reasonably requested by Owner and Engineer to:
 - 1. Record products incorporated into Project for Owner.
 - 2. Provide information for operation and maintenance of Project.
 - 3. Provide information for administration of Contract.
 - 4. Allow Engineer to advise Owner if products proposed for Project by Contractor conform, in general, to design concepts of Contract Documents.
- B. Contractor's responsibility for full compliance with Contract Documents is not relieved by Engineer's review of submittals. Contract modifications can only be approved by Change Order or Work Order.

1.02 CONTRACTOR'S RESPONSIBILITIES

- A. Review and certify 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 submittals.
 - 4. Submittals are complete for their intended purpose.
 - 5. Conflicts between submittals related to various Subcontractors and Suppliers have been resolved.
 - 6. Quantities and dimensions shown on submittals.
- C. Submit information per procedures described in this Section and detailed Specifications.
- D. Furnish the following submittals:
 - 1. Submittal schedule.
 - 2. Schedules, data, and other documentation as described in detail in this Section or referenced in General Conditions and Contract Documents.
 - 3. Documentation required for administration of Contract per Section 01 10 40 "Quality Requirements."
 - 4. Shop Drawings required for consideration of a contract modification.
 - 5. Submittals as required in detailed Specifications.
 - 6. Submittals not required will be returned without Engineer's review.
- E. Submit a schedule indicating date submittals will be sent to Engineer and proposed dates that product will be incorporated into Project. Make submittals promptly in accordance with schedule to cause no delay in Project.
 - 1. Send submittals to Engineer allowing a reasonable time for delivery, review and marking submittals. Include time for review of a resubmission if necessary. Allow adequate time for submittal review process, ordering, fabrication, and delivery of product to not delay progress on Project.
 - 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. Submit information for all of components and related equipment required for a complete and operational system in same submittal.

1. Include electrical, mechanical, and other information required to indicate how various components of system function.
 2. Provide certifications, warranties, and written guarantees with submittal package for review when they are required.
 3. Fabrication or installation of any products prior to approval of Shop Drawings is done at Contractor's risk. Products not meeting requirements of Contract Documents are defective and may be rejected at Owner's option.
- G. Payment will not be made for products for which submittals are required until submittals have been received. Payment will not be made for products for which Shop Drawings or Samples are required until these are approved by Engineer.

1.03 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 proposed products are in full and complete compliance with design criteria and requirements of Contract Documents including Drawings and Specifications as modified by Addenda, Field Orders, and Change Orders.
- C. Furnish and install products that fully comply with information included in submittal.

1.04 SUBMITTAL PROCEDURES

- A. Submit an electronic copy of each submittal through Project portal (website) provided by or by email as required by Owner. Contractor will be provided access to log onto website to post submittal documents and check status of submittals, if website is used.
 1. Complete contents of each submittal, including associated drawings, Product Data, etc., shall be submitted in Portable Document Format (PDF.) Submit PDF document with adequate resolution to allow documents to be printed in a format equivalent to document original. Documents are to be scalable to allow printing on standard 8-1/2 x 11 or 11 x 17 papers.
 2. Create and submit color PDF documents where color is important to evaluation of submittal and/or where comments will be lost if only black and white PDF documents are provided. Submit Sample and color charts.
- B. Transmit all submittals, with a properly completed format as required by Owner.
 1. Use a separate transmittal form for each specific product, class of material, and equipment system.
 2. Submit items specified in different Specifications separately unless they are part of an integrated system.
- C. Assign a submittal number to documents originated to allow tracking of submittal during review process.

1. Assign number consisting of a prefix, a sequence number, and a letter suffix. Prefixes shall be as follows:

<u>Prefix</u>	<u>Description</u>	<u>Originator</u>
AP	Application for Payment	Contractor
CO	Change Order	Engineer
CMR	Contract 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
PD	Photographic Documentation	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 same number as original submittal followed by an alphabetical suffix indicating number of times same submittal has been sent to Engineer for processing. For example: "SD 025 A" represents shop drawing number 25 and letter "A" designates this is second time this submittal has been sent for review.
4. Clearly note submittal number on each page or sheet of submittal.
5. Correct assignment of numbers is essential since different submittal types are processed in different ways.

D. Submit documents with uniform markings.

1. Mark submittals to:
 - a. Highlight Contractor's corrections in green.
 - b. Highlight items pertinent to the products being furnished in yellow and delete items that are not when Supplier's standard drawings or information sheets are provided.
 - c. Cloud items and highlight in yellow where selections by Engineer or Owner are required.
 - d. Mark dimensions with prefix FD to indicate field verified dimensions on Shop Drawings.
 - e. Provide an 8" by 3" blank space for Contractor's and Engineer's stamp. Contractor may use a digital certification if this is preferred. Certification must bear a digital signature.
2. Define abbreviations and symbols used in Shop Drawings.
 - a. Use terms and symbols in Shop Drawings consistent with Contract Drawings.
 - b. Provide a list of abbreviations and their meaning as used in Shop Drawings.
 - c. Provide a legend for symbols used on Shop Drawings.

E. Mark submittals to reference Drawing number and/or Specifications, detail designation, schedule or location that corresponds with data submitted. Other identification may also be required, such as layout drawings or schedules to allow reviewer to determine where a particular product is used.

F. Deliver Samples required by Specifications to Site. Provide a minimum of four Samples.

G. Construct mock-ups from actual products to be used in construction per detailed Specifications.

H. Submit color charts and Samples for every product requiring color, texture or finish selection.

1. Submit all color charts and Samples at one time.
2. Do not submit color charts and Samples until all Record Data have been submitted or Shop Drawings for products have been approved.
3. Submit color charts and Samples not less than 30 days prior to when these products are to be ordered or released for fabrication to comply with schedule for construction of Project.

I. Submit Contract Modification Request per Section 01 25 13 "Product Substitution" to request modifications to Contract Documents.

1.05 REVIEW PROCEDURES

- A. Shop Drawings are reviewed in order received, unless Contractor request that a different priority be assigned.
- B. Mark a submittal as "Priority" to place review for this submittal ahead of submittals previously delivered. Priority submittals will be reviewed before other submittals for this Project which have been received but not reviewed. Use discretion in use of "Priority"

submittals as this may delay review of submittals previously submitted. Revise Schedule of Contractor's Submittals for substantial deviations from previous schedule.

C. Review procedures vary with type of submittal.

1.06 SUBMITTAL REQUIREMENTS

- A. Shop Drawings are required for those products that cannot adequately be described in Contract Documents to allow fabrication, erection or installation of product without additional detailed information from Supplier.
1. Shop Drawings are requested so that Engineer can:
 - a. Assist Owner in selecting colors, textures or other aesthetic features.
 - b. Compare proposed features of product with specified features so as to advise Owner that product does, in general, conform to Contract Documents.
 - c. Compare performance features of proposed product with those specified so as to advise Owner that it appears that product will meet designed performance criteria.
 - d. Review required certifications, guarantees, warranties, and service agreements for compliance with Contract Documents.
 2. Certify on Contractor's stamp that Contractor has reviewed Shop Drawings and made all necessary corrections such that products, when installed, will be in full compliance with Contract Documents. Shop Drawings submitted without this certification will be returned without review.
 3. Submit Shop Drawings for:
 - a. Products indicated in submittal schedule following this Section.
 - b. When a substitution or equal product is proposed.
 4. Include a complete description of material or equipment to be furnished. Information is to include:
 - a. Type, dimensions, size, arrangement, model number, and operational parameters of components.
 - b. Weights, gauges, materials of construction, external connections, anchors, and supports required.
 - c. Performance characteristics, capacities, engineering data, motor curves, and other information necessary to allow a complete evaluation of mechanical components.
 - d. All applicable standards such as ASTM or Federal Specification numbers.
 - e. Fabrication and installation drawings, setting diagrams, manufacturing instructions, templates, patterns, and coordination drawings.
 - f. Wiring and piping diagrams and related controls.
 - g. Mix designs for concrete, asphalt, or other materials proportioned for Project.
 - h. Complete and accurate field measurements for products which must fit existing conditions. Indicate on submittal that the measurements represent actual dimensions obtained at Site.
 5. Provide all required statements of certification, guarantees, Extended Service Agreements, and other related documents with Shop Drawing. Effective date of these documents shall be date of acceptance of Work by Owner.
 6. Comments will be made on items called to attention of Engineer for review and comment. Any marks made by Engineer do not constitute a blanket review of submittal or relieve Contractor from responsibility for errors or deviations from Contract requirements.
 - a. Submittals that are reviewed will be returned with one or more of the following designations:
 - 1). Approved: Submittal is found to be acceptable as submitted.
 - 2). Approved as Noted: Submittal is acceptable with corrections or notations made by Engineer and may be used as corrected.
 - 3). Revise and Resubmit: Submittal has deviations from Contract Documents, significant errors, or is inadequate and must be revised and resubmitted for subsequent review.

- 4). Not Approved: Products are not acceptable.
 - b. Drawings with a significant or substantial number of markings by Contractor may be marked "Approved as Noted" and "Revise and Resubmit." These drawings are to be revised to provide a clean record of submittal.
 - c. Dimensions or other data that do not appear to conform to Contract Documents will be marked as "At Variance With" (AVW) Contract Documents or other information provided. Contractor is to make revisions as appropriate to comply with Contract Documents.
- B. Certifications, Warranties and Service Agreements include documents as specified in detailed Specifications, as shown in 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 Specifications (refer to Section 01 40 00 "Quality Requirements.").
 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 Site. List names, addresses, and telephone numbers of approved service organizations on or attach it to certificate.
 3. Extended Warranty (EW): A guarantee of performance for product or system beyond normal 1 year warranty described in General Conditions. Issue warranty certificate in name of Owner.
 4. Extended Service Agreement (ESA): Contract to provide maintenance beyond that required to fulfill requirements for warranty repairs, or to perform routine maintenance for a definite period beyond warranty period. Issue service agreement in name of Owner.
 5. Certification of Adequacy of Design (CAD): Certified letter from manufacturer of equipment stating that they have designed equipment to be structurally stable and to withstand all imposed loads without deformation, failure, or adverse effects to performance and operational requirements of unit. Letter shall state that mechanical and electrical equipment is adequately sized to be fully operational for conditions specified or normally encountered by product's intended use.
 6. Certification of Applicator/Subcontractor (CSQ): Certified letter stating that Applicator or Subcontractor proposed to perform a specified function is duly designated as factory authorized and trained for application of specified product.
- C. Submit Record Data to provide information to allow Owner to adequately identify products incorporated into Project and allow replacement or repair at some future date.
1. Provide Record Data for all products per submittal schedule. Record Data is not required for items for which Shop Drawings and/or operations and maintenance manuals are required.
 2. Provide information only on specified products. Submit a Contract Modification Request for approval of deviations or substitutions and obtain approval by Work Order or Change Order prior to submitting Record Data.
 3. Provide the same information required for Shop Drawings.
 4. Record Data will be received by Engineer, logged, and provided to Owner for Project record.
 - a. Record Data may be reviewed to see that information provided is adequate for purpose intended. Inadequate drawings may be returned as unacceptable.
 - b. Record Data is not reviewed for compliance with Contract Documents. Comments may be returned if deviations from Contract Documents are noted during cursory review performed to see that information is adequate.
- D. Provide Samples for comparison with products delivered to Site for use on Project.
1. Samples shall be of sufficient size and quantity to clearly illustrate functional characteristics of product, with integrally related parts and attachment devices.
 2. Indicate the full range of color, texture, and patterns.
 3. Dispose of Samples when related Work has been completed and approved, and disposal is requested by Engineer. At Owner's option Samples will become the property of Owner.

- E. Construct mock-ups for comparison with Work being performed.
 - 1. Construct mock-ups of size or area indicated in detailed Specifications.
 - 2. Construct mock-ups complete with texture and finish to represent finished product.
 - 3. Protect mock-ups until Work has been completed and accepted by Owner.
 - 4. Dispose of mock-ups when related Work has been completed and disposal is approved by Engineer.
 - F. Submit Operation and Maintenance manuals (O&M) for all equipment, mechanical devices, or components described in Contract Documents per Section 01 73 00 "Operation and Maintenance Data". Include copies of approved Shop Drawings in manual.
 - G. Submit Request for Interpretation (RFI) in accordance with Section 01 34 00.
 - H. Submit Progress Schedules (SCH) in accordance with Section 01 32 16 "Construction Progress Schedule".
 - I. Submit Certified Test Reports (CTR) from independent testing laboratories in accordance with Section 01 40 00 "Quality Requirements."
 - 1. Submit test reports for material fabricated for this Project with Shop Drawings for that product.
 - 2. Submit test reports produced at point of production for standard production products with Record Data for that product.
 - J. Submit a list of Suppliers and Subcontractors as Record Data in accordance with Section 01 10 40 "Project Coordination."
 - K. Submit Process Performance Bonds (PPB) as required.
- 1.07 SUBMITTALS REQUIRED FOR THIS PROJECT
- A. Furnish the following Submittals:
 - 1. Products as indicated within these Specifications and as indicated in Drawings.
 - 2. When a substitution or equal product is proposed.
- 1.08 REQUESTS FOR DEVIATION
- A. Submit requests for deviation from Contract Documents for any product that does not fully comply with Contract Documents.
 - B. Submit request by Contract Modification Request (CMR) per Section 01 25 13 "Product Substitution." Identify any and all deviations and reason change is requested.
 - C. Include amount if cost savings to Owner for deviations that result in a reduction in cost.
 - D. A Change Order or Work Order will be issued by Engineer for deviations approved by Owner. Deviations from Contract Documents may only be approved by Change Order or Work Order.
- 1.09 SUBMITTALS FOR EQUAL NON SPECIFIED PRODUCTS
- A. Products of listed Suppliers are to be furnished where detailed Specifications list several manufacturers but do not specifically list "or equal" or "or approved equal" products. Use of any products other than those specifically listed is a substitution and must be approved.
 - B. Contractor may submit other manufacturers' products that are in full compliance with Specifications where detailed Specifications list one or more manufacturers followed by phrase "or equal" or "or approved equal."
 - 1. Submit Shop Drawings of adequate detail to document that the proposed product is equal or superior to the specified product.

2. Prove that product is equal. It is not Engineer's responsibility to prove product is not equal.
 - a. Indicate on a point by point basis for each specified feature that product is equal to Contract Document requirements.
 - b. Make a direct comparison with specified manufacturer's published data sheets and available information. Provide this printed material with submittal.
 - c. Decision of Engineer regarding acceptability of proposed product is final.
3. Provide a typewritten certification that, in furnishing proposed product as an equal. Contractor:
 - a. Has thoroughly examined the proposed product and has determined that it is equal or superior in all respects to product specified.
 - b. Has determined that product will perform in same manner and result in same process as specified product.
 - c. Will provide same warranties and/or bonds as for product specified.
 - d. Will assume all responsibility to coordinate any modifications that may be necessary to incorporate product into construction and will waive all claims for additional Work which may be necessary to incorporate product into Project which may subsequently become apparent.
 - e. Will maintain same time schedule as for specified product.
4. A modification request is not required for any product that is in full compliance with Contract Documents.

1.10 SUBMITTALS FOR SUBSTITUTIONS

- A. Substitutions are defined as any product that Contractor proposes to provide for Project in lieu of specified product.
- B. Submit the following for consideration of approval of a Supplier or product which is not specified:
 1. Contract Modification Request for deviation from Contract Documents.
 2. Prove that product is acceptable as a substitute. It is not Engineer's responsibility to prove product is not acceptable as a substitute.
 - a. Indicate on a point by point basis for each specified feature that product is acceptable to meet intent of Contract Documents requirements.
 - b. Make a direct comparison with specified Suppliers published data sheets and available information. Provide this printed material with submittal.
 - c. Decision of Engineer regarding acceptability of proposed substitute product is final.
 3. Provide a written certification that, in making substitution request, Contractor:
 - a. Has determined that substituted product will perform in substantially same manner and result in same ability to meet specified performance as specified product.
 - b. Will provide same warranties and/or bonds for substituted product as specified or as would be provided by manufacturer of specified product.
 - c. Will assume all responsibility to coordinate any modifications that may be necessary to incorporate the substituted product into Project and will waive all claims for additional Work which may be necessary to incorporate substituted product into Project which may subsequently become apparent.
 - d. Will maintain same time schedule as for specified product.
- C. Pay engineering cost for review of substitutions.
 1. Cost for additional review time will be billed to Owner by Engineer for actual hours required for review and marking of Shop Drawings by Engineer.
 2. Cost for additional review shall be paid to Owner by Contractor on a monthly basis.

1.11 WARRANTIES AND GUARANTEES

- A. Submit warranties and guarantees required by Contract Documents with Shop Drawings or Record Data.

- B. Provide additional copies for equipment and include this additional copy in Operation and Maintenance Manuals. Refer to Section 01 73 00 "Operation and Maintenance Data."
- C. Provide a separate manual for warranties and guarantees.
 - 1. Provide a log of all products for which warranties or guarantees are provided, and for all equipment. Index log by Specification section number on Engineer approved forms.
 - 2. Indicate start date, warranty or guarantee period and date upon which warranty or guarantee expires for products or equipment for which a warranty or guarantee is required.
 - 3. Indicate date for start of correction period specified in General Conditions for each piece of equipment and date on which specified correction period expires.
 - 4. Provide a copy of warranty or guarantee under a tab indexed to log.

1.12 RESUBMISSION REQUIREMENTS

- A. Make all corrections or changes in submittals required by Engineer and resubmit until approved.
- B. For Shop Drawings:
 - 1. Revise initial drawings or data and resubmit as specified for original submittal.
 - 2. Highlight in yellow those revisions which have been made in response to first review by Engineer.
 - 3. Highlight in blue any new revisions which have been made or additional details of information that has been added since the previous review by Engineer.
- C. For Samples:
 - 1. Submit new Samples as required for initial Sample.
 - 2. Remove Samples which have been rejected.
- D. Pay for excessive review of Shop Drawings.
 - 1. Excessive review of Shop Drawings is defined as any review required after original review has been made and first re-submittal has been checked to see that corrections have been made.
 - 2. Cost for additional review time will be billed to Owner by Engineer for actual hours required for review and marking of Shop Drawings by Engineer.
 - 3. Pay cost for additional review to Owner on a monthly basis as billed by Owner.
 - 4. Need for more than one resubmission or any other delay of obtaining Engineer's review of submittals, will not entitle Contractor to an extension of Contract Time. All costs associated with such delays shall be at Contractor's expense.

1.13 ENGINEER'S DUTIES

- A. Review submittals and return with reasonable promptness.
- B. Affix stamp, indicate approval, rejection, need for re-submittal and distribute.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 34 00

REQUESTS FOR INTERPRETATION (RFI)

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Construction Drawings, Technical Specifications, Addenda, and general provisions of Contract, including Contract General Conditions and Supplementary General Conditions and other Division 01 Specifications, apply to this Section.

1.02 SECTION INCLUDES

- A. Procedures for submitting requests for interpretation (RFI).
- B. Limitations on use of RFI to obtain interpretation and clarification.

1.03 RELATED SECTIONS

- A. Section 01 33 00 - Submittals: Restriction on use of submittals for changes in materials, products, equipment and systems.

1.04 DEFINITIONS

- A. Request for Interpretation: Document submitted by Contractor requesting clarification of a portion of Contract Documents, hereinafter referred to as an RFI.

1.05 CONTRACTOR'S REQUESTS FOR INTERPRETATION (RFIs)

- A. Contractor's Requests for Interpretation (RFIs): Should Contractor be unable to determine from Contract Documents the exact material, process, or system to be installed; or when elements of construction are required to occupy same space (interference); or when an item of Work is described differently at more than one place in Contract Documents; Contractor shall request that Engineer make an interpretation of Contract Documents requirements to resolve such matters. Contractor shall comply with procedures specified herein to make Requests for Interpretation (RFIs).
- B. Submission of RFIs: RFIs shall be prepared and submitted on a form provided by Engineer.
 - 1. Forms shall be completely filled in, and if prepared by hand, shall be fully legible after copying by xerographic process.
 - 2. Each RFI shall be given a discrete, consecutive number.
 - 3. Each page of RFI and each attachments to RFI shall bear Owner's project name, project number, date, RFI number and a descriptive title.
 - 4. Contractor shall sign all RFIs attesting to good faith effort to determine from Contract Documents the information requested for interpretation. Frivolous RFIs shall be subject to reimbursement from Contractor to Owner for fees charged by Engineer, Engineer's consultants and other design professionals engaged by Owner.
- C. Subcontractor-Initiated and Supplier-Initiated RFIs: RFIs from subcontractors and material suppliers shall be submitted through, be reviewed by and be attached to an RFI prepared, signed and submitted by Contractor. RFIs submitted directly by subcontractors or material suppliers will be returned unanswered to Contractor.
 - 1. Contractor shall review all subcontractor- and supplier-initiated RFIs and take actions to resolve issues of coordination, sequencing and layout of Work.

2. RFIs submitted to request clarification of issues related to means, methods, techniques and sequences of construction or for establishing trade jurisdictions and scopes of subcontracts will be returned without interpretation. Such issues are solely Contractor's responsibility.
 3. Contractor shall be responsible for delays resulting from necessity to resubmit an RFI due to insufficient or incorrect information presented in RFI.
- D. Requested Information: Contractor shall carefully examine Contract Documents, in particular, Article 5 of Contract General Conditions, to ensure that information sufficient for interpretation of requirements of Contract Documents is not included. RFIs that request interpretation of requirements clearly indicated in Contract Documents will be returned without interpretation.
1. In all cases in which RFIs are issued to request clarification of issues related to means, methods, techniques and sequences of construction, for example, pipe and duct routing, clearances, specific locations of Work shown diagrammatically, apparent interferences and similar items, Contractor shall furnish all information required for Engineer to analyze and/or understand the circumstances causing RFI and prepare a clarification or direction as to how the Contractor shall proceed.
 2. If information included with this type RFI by Contractor is insufficient, RFI will be returned unanswered.
- E. Unacceptable Uses for RFIs: RFIs shall not be used to request the following:
1. Approval of submittals (use procedure specified in Section 01 33 00 - Submittals)
 2. Approval of substitutions (refer to Section 01 33 00 - Submittals)
 3. Changes that entail change in Contract Time and Contract Sum (comply with provisions of Contract General Conditions, as discussed in detail during pre-construction meeting)
 4. Different methods of performing Work than those indicated in Contract Drawings and Specifications (comply with provisions of Contract General Conditions).
- F. Disputed Requirements: In event Contractor believes that a clarification by Engineer results in additional cost or time, Contractor shall comply with Article 10 of Contract General Conditions.
- G. RFI Log: Contractor shall prepare and maintain a log of RFIs, and at any time requested by the Engineer, Contractor shall furnish copies of RFI log showing all outstanding RFIs.
- H. Review Time: Engineer will return RFIs to Contractor and Owner within seven calendar days of receipt. RFIs received after 12:00 noon shall be considered received on next regular working day for express purpose of establishing starting time of seven-calendar day response period.

PART 2 - PRODUCTS.(Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This Section describes requirements for quality control necessary for execution of Contract. Requirements within the following subject areas are included:
1. General Quality Control (QC)
 2. Workmanship
 3. Manufacturer's Instructions
 4. Manufacturer's Certificates
 5. Mockups
 6. Manufacturer's Field Services
 7. Testing Laboratory Services

1.02 GENERAL QUALITY CONTROL

- A. Contractor shall maintain control over Subcontractors, Suppliers, Manufacturer's, products, services, site conditions, and workmanship to produce Work of a specified quality.
- B. Contractor's quality control responsibilities include, but are not limited to, the following:
1. Providing the quality specified in Drawings and Specifications.
 2. Implementing and maintaining an effective quality control system.
 3. Performance of all control activities and tests.
 4. Completion of acceptable documentation of quality control activities.
 5. Contractor shall place a competent person onsite to oversee quality control system. This person, or approved alternate, must have full authority to act for Contractor on quality control matters and shall be on-site during all phases of construction activities. Responsibilities include materials, workmanship, methods, and techniques to provide that all Work is constructed properly by qualified, competent, and professional craftsmen and/or tradesmen. A competent person is one that has been trained in excavation safety, Work zone traffic control, confined space entry, and hazardous materials responsibilities. Additionally, this person must have authority to perform such duties as sign pay requests, negotiate change orders, etc.
- C. Contractor shall document quality control activities performed during Contract by Contractor, Subcontractors, testing laboratories, and Vendor's in accordance with Contract Documents. Contractor shall prepare quality control reports consisting of or considering the following items:
1. Testing activities, control procedures, test results, nature of deficiencies proposed remedial actions, and corrective procedures instituted.
 2. Reports shall reference specification section.
 3. Reports shall include Subcontractor Work.
 4. Reports should concentrate on Work items that have been completed and provide evidence of control activities.
 5. Reports shall be submitted on a weekly basis, but always before request for payment on completed Work.
 6. Reports shall reflect accurate and precise quality control actions taken.
- D. Contractor shall develop and submit, for review by Engineer, a detailed Project specific Quality Control Plan after receipt of notice of award and prior to pre-construction conference. It shall be reviewed and formally accepted prior to initiation of construction. In some cases, this requirement can be met by an interim plan. This first submission by Contractor shall include, as a minimum, a general plan for quality control, plus specifics for Work, which is about to begin. Contractor shall also state familiarity with specifications and plans (i.e., shoring plans) and assure properly skilled personnel are in place prior to construction. A final acceptable plan must be received within a

reasonable time. Plan shall be job-specific and shall address any unusual or unique aspects of job or activity for which it is written. Quality Control Plan shall be prepared in accordance with the following concepts. Quality control should be divided into three phases. Phases and required documentation are as follows, and as a minimum include:

1. Pre-Construction Phase
 - a. Quality control organization
 - (i) List of personnel/chain of authority
 - (ii) Qualifications of quality control personnel (including Subcontractors, suppliers, Manufacturer's)
 - (iii) Name and qualifications of competent person, and alternate.
 - b. Definable construction features
 - (i) List of definable features/items (identified by specification numbers).
 - (ii) Schedule of values for all definable features shall be submitted and approved/accepted prior to submittal of first pay request.
 - c. General administrative procedures
 - (i) Identify all responsible personnel (Contractor authorized representatives to sign Contract Documents, pay request, change orders, etc.)
 - (ii) Identify all construction forms/procedures
 - d. Contractor coordination with other agencies
 - (i) Identify all agencies and a contract person from each agency as appropriate (including but not limited to: Texas Department of Transportation, Texas Commission for Environmental Quality, Environmental Protection Agency, etc.)
 - (ii) Identify all existing utilities/field conditions as appropriate
 - e. Submittals
 - (i) Identify appropriate, including but not limited to: all definitions, procedures, product data, shop drawings, samples, Manufacturer's certificates/warranties, etc.
 - (ii) Prepare a schedule of specified submittals to be submitted for review and approval/acceptance (verify all material and Contract requirements).
 - (iii) Identify Engineer, etc. responsible for review and acceptance of Project submittals.
 - (iv) Prepare a Construction Project Safety Program (Contractor and Subcontractors).
 - (v) Testing laboratory services (to be used by Contractor): submit data for review and approval/acceptance of laboratory as specified in Contract Documents. Material Testing – All tests performed shall be recorded and numbered. One (1) copy shall be maintained at Site, one (1) copy shall be given to Engineer, and two (2) copies to Owner. Attach testing analysis data of materials to be used on Project to appropriate material submittal. Submit a quality control testing plan (example backfill material, roadway construction material compaction testing, concrete material testing, pipe testing, density testing, motors/pumps tests, other tests as required or appropriate). Testing requirements and procedures shall include but not be limited to:
 - (a) Provide and outline of proposed testing procedures.
 - (b) Provide a listing of all required tests as specified in Contract, in addition to providing a listing of all non-specified testing procedures pending approvals/acceptances.
 - (c) Specify whether tests are to be performed by an independent, Engineer approved certified testing laboratory or by Contractor with approved certified equipment and procedures or by others (Subcontractors or suppliers) approved by Engineer.

- (d) ASTM 3740 – Minimum requirement for agencies engaged in testing and/or inspection of soil and rock as used in engineering design and construction.
- (e) Repair all materials and equipment that fail during testing with no additional compensation.
- (f) Provide all required materials, labor, equipment, water, and power required for testing.

2. Construction Phase

- a. Construction sequencing
 - (i) Construction schedule: include but not limited to: bar graphs, phasing plans, network diagrams, critical path item identification, equipment/material/supplies delivery impact, narrative reports, etc.
 - (a) Shop drawing logs
 - (b) Submittal logs
 - (c) Request for information logs
 - (d) Traffic control plans
 - (e) Coordinate use of Owner’s premises
- b. Including but not limited to layout of temporary facilities, temporary utilities and controls, security, field office and storage facilities, operation of Owner’s valves, facilities, tie-ins, by-pass pumping, flow diversion or interruption of Owner’s facilities, etc.
- c. Preparation of right of way
- d. Temporary controls
 - (i) Including but not limited to: erosion and sedimentation controls, dust control, construction noise control, etc.
 - (a) Surveying
 - (b) Delivery, storage, inspection and installation of materials
 - (c) Testing of on-site materials and equipment
 - (d) Manufacturer's field services
 - (e) Training schedule
 - (f) Starting of systems

3. Construction Completion Phase

- a. Equipment training
- b. Manufacturer's inspection/acceptance reports (as applicable)
- c. Deficiency punch lists
- d. Removal of utilities, facilities and controls
 - (i) Plan and coordinate with proper personnel and/or agencies.
- e. Coordinate system operation turn-over to Owner
- f. Complete all post construction documentation/administration (as required by Contract)
- g. Project record documents
 - (i) Maintain records and documents throughout construction process.
 - (ii) Prepare final submittals on items required (include but not limited to: as-built drawings, specifications and addenda, approved/accepted shop drawings, material samples, construction photographs, change orders, contract modifications, testing and analysis records, survey data, construction reports such as daily reports, monthly reports, payroll records, and safety data such as SDS, safety meetings, incident reports, etc.).

E. Quality Assurance (QA) is means by which Owner assures that completed Project complies with quality established by construction Contract Documents. Owner will assure that quality control will be accomplished through reviews, observation and tests by Engineer.

1.03 WORKMANSHIP

A. Contractor will comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship is required.

- B. Contractor will produce Work that meets or exceeds workmanship standards described in these specifications.

1.04 MANUFACTURER'S INSTRUCTIONS

- A. Contractor shall comply with published instructions in full detail, including each in-step sequence recommended by Manufacturer. In event that these instructions conflict with these Specifications, Contractor shall obtain clarification from Owner.

1.05 MANUFACTURERS' CERTIFICATES

- A. Contractor shall submit Manufacturer certificates that guarantee compliance with specified requirements when indicated by these Specifications.

1.06 MANUFACTURERS' FIELD SERVICES

- A. When required in respective Specification sections, Contractor will require Manufacturer's to provide qualified personnel to observe field conditions; conditions of surfaces and previous installations; quality of workmanship; start-up of equipment; test, adjust, and balance of equipment as applicable, and to make appropriate recommendations.
- B. Contractor shall submit written report to consultant listing Manufacturer's observations and recommendations.

1.07 TESTING LABORATORY SERVICES

- A. Testing, sampling, inspection and certifications of materials and equipment specified in this Project Manual shall be paid by Contractor and shall be by agencies agreeable to Engineer. This provision and Paragraph V of General Conditions shall take precedence even if indicated otherwise in other Specifications.
- B. Sampling of materials and laboratory testing of materials shall be performed at expense of Contractor in an independent, certified commercial testing laboratory. Selection of a testing laboratory is subject to review and approval of Engineer.
- C. Sampling and testing of equipment shall be performed at expense of Contractor by an independent certified commercial testing laboratory acceptable to Engineer.
- D. Contractor shall submit name and qualifications of laboratory to Engineer for review no less than thirty (30) calendar days prior to date laboratory is to be used. Qualifications of outside testing laboratories will meet or exceed the following:
 - 1. Satisfy "Recommended Requirements for Independent Laboratory Qualifications," published by American Council of Independent Laboratories.
 - 2. Satisfy requirements of ASTM E329, "Standard Specification for Agencies Engaged in Construction Inspection, Testing or Special Inspections."
 - 3. Submit a copy of report of inspection of facilities made by Materials Reference Laboratory of National Bureau of Standards during most recent inspection, with a memorandum of remedies of any deficiencies reported by inspection.
 - 4. Submit copies of the recent certificates of calibration for all pertinent devices within laboratory that will be used in required testing for this Work.
 - 5. Conduct testing in accordance with requirements of governing authorities and specified standards.
 - 6. Provide reports to Engineer that conform to requirements contained in Section 01 33 00 – Submittals giving observations and results of tests, indicating compliance or non-compliance with standards and with these Specifications.

- E. Engineer may require special inspection, testing or approval of material or Work for determining compliance with requirements of Contract Documents. Contractor shall arrange for such special testing, inspection or approval procedure. Should the material or Work fail to comply with requirements of Contract Documents, Contractor shall bear all costs of special testing, inspection or approval as well as cost of replacement of any unsatisfactory material or Work as provided by General Conditions, otherwise, should Work prove not defective, Owner shall bear such costs and an appropriate change order shall be issued.

END OF SECTION

SECTION 01 50 00

TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Provide labor, materials, equipment and incidentals necessary to construct temporary facilities to provide and maintain control over environmental conditions at Site. Remove temporary facilities when no longer needed.
- B. Construct temporary impounding works, channels, diversions, furnishing and operation of pumps, installing piping and fittings, and other construction for control of conditions at Site. Remove temporary controls at end of Project.
- C. Provide a Storm Water Pollution Prevention Plan in accordance with TCEQ General Permit TXR150000, file required legal notices and obtain required permits prior to beginning any construction activity.
- D. Provide labor, materials, equipment, and incidentals necessary to prevent storm water pollution for duration of Project. Provide and maintain erosion and sediment control structures as required to preventive sediment and other pollutants from Site from entering any storm water system, including open channels. Remove pollution control structures when no longer required to prevent storm water pollution.
- E. Cost for Temporary Controls as described in this Section and provided by Suppliers and Subcontractors as described in this Section are to be included in Cost of Work.

1.02 QUALITY ASSURANCE

- A. Construct and maintain temporary controls with adequate workmanship using durable materials to provide effective environmental management systems meeting requirements of Contract Documents and requiring minimal maintenance that will disrupt construction activities while providing adequate protection of environment.
- B. Periodically inspect systems to determine that they are meeting requirements of Contract Documents.

1.03 SUBMITTALS

- A. Provide copies of notices, records and reports required by Contract Documents or regulations as Record Data in accordance with Section 01 33 00 "Submittals."
- B. Provide documents requiring approval by Owner or Engineer as Shop Drawings in accordance with Section 01 33 00 "Submittals."

1.04 STANDARDS

- A. Provide a storm water pollution prevention plan that complies with Local, State, and Federal requirements. Comply with all requirements of Texas Commission on Environmental Quality General Permit (TXR150000) for storm water discharges from construction activities under Texas Pollutant Discharge Elimination System (TPDES) program.
- B. Perform Work to comply with "Best Practice" as established by North Central Texas Council Of Governments (NCTCOG) integrated Storm Water Management (iSWM) Design Manual for Construction or local agency of jurisdiction, if applicable.

1.05 PERMITS

- A. Submit the following to TCEQ and Operator of any Municipal Separate Storm Sewer System (MS4) receiving storm water discharges from Site:
 - 1. Notice of Intent (NOI) at least 48 hours prior to beginning construction activity. Construction activity may commence 24 hours after submittal of an electronic NOI.
 - 2. Notice of Change (NOC) letter when relevant facts or incorrect information was submitted in NOI, or if relevant information in NOI changes during course of construction activity.
 - 3. Notice of Termination (NOT) when construction project has been completed and stabilized.
- B. Post a copy of NOI at Site in a location where it is readily available for viewing by general public and Local, State, and Federal authorities prior to starting construction activities and maintain posting until completion of construction activities.
- C. Maintain copies of a schedule of major construction activities, inspection reports, and revision documentation with storm water pollution prevention plan (SWPPP) required under TPDES General Permit (TXR150000) for Storm Water Discharges from Construction Activities for all projects.

1.06 STORM WATER POLLUTION CONTROL

- A. Comply with the current requirements of TPDES General Permit No. TXR15000 (General Storm Water Permit) set forth by Texas Commission on Environmental Quality for duration of Project:
 - 1. Develop a Storm Water Pollution Prevention Plan meeting all requirements of General Storm Water Permit.
 - 2. Submit of a Notice of Intent to Texas Commission on Environmental Quality.
 - 3. Develop and implement appropriate Best Management Practices as established by local agencies of jurisdiction.
 - 4. Provide all monitoring and/or sampling required for reporting to Texas Commission on Environmental Quality.
 - 5. Submit reports to the Texas Commission on Environmental Quality as required as a condition of permit.
 - 6. Submit copies of reports to Engineer as Record Data in accordance with Section 01 33 00 "Submittals."
 - 7. Retain copies of these documents at Site at all times for review and inspection by Owner or regulatory agencies. Post a copy of permit as required by regulations.
 - 8. Pay all costs associated with complying with provisions of General Storm Water Permit. Assume solely responsible for implementing, updating, and modifying General Storm Water Permit per regulatory requirements Storm Water Pollution Prevention Plan and Best Management Practices
- B. Use forms required by Texas Commission on Environmental Quality to file Notice of Intent. Submit Notice of Intent at least 2 days prior to start of construction. Develop Storm Water Pollution Prevention Plan prior to submitting Notice of Intent. Provide draft copies of Notice of Intent, Storm Water Pollution Prevention Plan, and any other pertinent Texas Commission on Environmental Quality submittal documents to Owner for review prior to submittal to Texas Commission on Environmental Quality.
- C. Return any property disturbed by construction activities to either specified conditions or pre-construction conditions as set forth in Contract Documents. Provide an overall erosion and sedimentation control system that will protect all undisturbed areas and soil stockpiles/spoil areas. Implement appropriate Best Management Practices and techniques to control erosion and sedimentation and maintain these practices and techniques in effective operating condition during construction. Permanently stabilize exposed soil and fill as soon as practical during Work.

- D. Assume sole responsibility for means, methods, techniques, sequences, and procedures for furnishing, installing, and maintaining erosion and sedimentation control structures and procedures and overall compliance with General Storm Water Permit. Modify system as required to effectively control erosion and sediment.
- E. Retain copies of reports required by General Storm Water Permit for 3 years from date of final completion.

1.07 POLLUTION CONTROL

- A. Prevent the contamination of soil, water or atmosphere by discharge of noxious substances from construction operations. Provide adequate measures to prevent the creation of noxious air-borne pollutants. Prevent dispersal of pollutants into atmosphere. Do not dump or otherwise discharge noxious or harmful fluids into drains or sewers, nor allow noxious liquids to contaminate public waterways in any manner.
- B. Provide equipment and personnel and perform emergency measures necessary to contain any spillage.
 - 1. Contain chemicals in protective areas and do not dump on soil. Dispose of such materials at off-site locations in an acceptable manner.
 - 2. Excavate contaminated soil and dispose at an off-site location if contamination of soil does occur. Fill resulting excavations with suitable backfill and compact to density of surrounding undisturbed soil.
 - 3. Provide documentation to Owner which states the nature and strength of contaminant, method of disposal, and location of disposal site.
 - 4. Comply with local, State and Federal regulations regarding disposal of pollutants.
- C. Groundwater or run-off water which has come into contact with noxious chemicals, sludge, or sludge-contaminated soil is considered contaminated. Contaminated water must not be allowed to enter streams or water courses, leave Site in a non-contained form or enter non-contaminated areas of Site.
 - 1. Pump contaminated water to holding ponds constructed by Contractor for this purpose, or discharge to areas on the interior of Site, as designated by Engineer.
 - 2. Construct temporary earthen dikes or take other precautions and measures as required to contain contaminated water and pump to a designated storage area.
 - 3. Wash any equipment used for handling contaminated water or soil within contaminated areas three times with uncontaminated water prior to using such equipment in an uncontaminated area. Dispose of wash water used to wash such equipment as contaminated water.

1.08 EARTH CONTROL

- A. Remove excess soil, spoil materials and other earth not required for backfill at time of generation. Control stockpiled materials to eliminate interference with Contractor and Owner's operations.
- B. Dispose of excess earth off Site. Pay cost for disposal unless otherwise noted. Provide written approval by property owner for all disposal on private property, and approval by Owner if such disposal affects use of Site or other easements.

1.09 MANAGEMENT OF WATER

- A. Manage water resulting from rains or ground water at Site. Maintain trenches and excavations free of water at all times.
- B. Lower the water table in construction area by acceptable means if necessary to maintain a dry and workable condition at all times. Provide drains, sumps, casings, well points, and other water control devices as necessary to remove excess water.

- C. Provide continuous operation of water management actions. Maintain standby equipment to provide proper and continuous operation for water management.
- D. Ensure that water drainage does not damage adjacent property. Divert water into same natural watercourse in which its headwaters are located, or other natural stream or waterway as approved by Owner. Assume responsibility for discharge of water from Site.
- E. Remove the temporary construction and restore Site in a manner acceptable to Engineer and to match surrounding material at conclusion of Work.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Provide materials meeting regulatory requirements.

PART 3 - EXECUTION

3.01 CONSTRUCTING, MAINTAINING AND REMOVING TEMPORARY CONTROLS

- A. Construct temporary controls in accordance with regulatory requirements.
- B. Maintain controls in accordance with regulatory requirements where applicable, or in accordance with requirements of Contract Documents.
- C. Remove temporary control when no longer required, but before Project is complete. Correct any damage or pollution that occurs as result of removing controls before point where they are no longer required.

END OF SECTION

SECTION 01 55 26

TRAFFIC CONTROL PLAN

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes traffic control requirements for signs, signals, control devices, flares, lights, and traffic signals as well as construction parking control, English-speaking flag persons, peace officers, designated haul routes and bridging of trenches and excavations.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 – Bidding Requirements, Contract Forms, and Conditions of the Contract.
 - 2. Division 01 – General Requirements.

1.02 MEASUREMENT AND PAYMENT

- A. Measurement is on a lump sum basis for traffic control and regulation, including submittal of traffic control plan, provision of traffic control devices, and provision of equipment and personnel as necessary to protect Work and public. Amount invoiced shall be based on Schedule of Values submitted for traffic control and regulation.

1.03 SUBMITTALS

- A. Conform to requirements of Section 01 33 00 - Submittals.
- B. Provide a traffic control plan responsive to current Texas Manual on Uniform Traffic Control Devices (TMUTCD). If Contractor proposes to implement traffic control without modification to plan provided, submit a letter confirming decision. If Contractor proposes to implement traffic control different than plan provided, submit a traffic control plan.
- C. Submit copies of approved lane closure permits from Guadalupe County, City of Cibolo, City of Schertz or TxDOT as required.
- D. For both traffic control plan and flag person use, submit Schedules of values within 30 days following notice to proceed.
- E. Provide information and records regarding use of qualified flagmen to verify use of “peace officers” as flagmen in compliance with Contract and Texas law, including but not limited to, Article 4413 (29bb), commonly referred to as Private Investigators and Private Security Agencies Act, and Article 2.12, Texas Code of Criminal Procedure.
- F. Provide information and records regarding use of qualified flagmen to verify Contractor’s use of “certified flagmen” as flagmen is in compliance with Contract.

1.4 FLAGMEN

- A. Use flagmen, qualified as described under Paragraph 1.4.B, Uniformed Peace Officers, and Paragraph 1.4.C, Certified Flagmen, to control, regulate, and direct even flow and movement of vehicular and pedestrian traffic when construction operations encroach on public traffic lanes.
- B. Uniformed Peace Officer: Individual who has full-time employment as peace officer and receives compensation as flagman for private employment as individual employee or independent contractor. Private employment may be either employee-employer relationship or on an individual basis. Flagman may not be in employ of another peace officer and may not be a reserve peace officer.
 - 1. Peace officer is defined as:

- a. Sheriffs and their deputies
 - b. Constables and deputy constables
 - c. Marshals or police officers of an incorporated city, town, or village
 - d. As otherwise provided by Article 2.12, Code of Criminal procedure, as amended
2. Individual who has full-time employment as a peace officer is one who is actively employed in a full-time capacity as a peace officer working, on average, a minimum of 32 paid hours per week, being paid a rate of pay not less than prevailing minimum hourly wage rate set by federal Wage and Hour Act and entitled to full benefits of participation in retirement plan, vacation, holidays, and insurance benefits. A reserve peace officer does not qualify, under this definition, as a peace officer.
- C. Certified Flagman: Individual who receives compensation as flagman and meets the following qualifications and requirements:
- 1. Formally trained and certified in traffic control procedures.
 - 2. Required to wear distinctive uniform, bright-colored vest, and be equipped with appropriate flagging and communication devices
 - 3. English speaking, with Spanish as advantageous, but not required, primary, or secondary language.
 - 4. Required to carry proof of training/certification and photographic identification card issued by training institute to allow Engineer to easily determine necessary full-time traffic control is actually provided when and where construction work encroaches upon traffic lanes.

PART 2 - PRODUCTS

2.01 SIGNS, SIGNALS, AND DEVICES

- A. Comply with Texas State Manual on Uniform Traffic Control Devices.
- B. Traffic Barriers, Cones and Drums, Flares and Lights: As approved by local jurisdictions.

PART 3 - EXECUTION

3.01 PUBLIC ROADS

- A. Abide by laws and regulations of governing authorities when using public roads. If Work requires public roads be temporarily impeded or closed, obtain approvals from governing authorities and pay permits before starting any Work. Coordinate activities with Engineer.
- B. Maintain 10-foot-wide, all-weather lane adjacent to Work areas for use of emergency vehicles. Keep all-weather lane free of construction equipment and debris.
- C. Cover or remove permanent signs and construction signs that are incorrect or that do not apply to current situation for a particular phase. Do not mount signs on drums or barricades, except those listed in latest Barricades and Construction standard sheets.
- D. Place positive barriers to protect drop-off conditions greater than 1 foot within clear zone that remain overnight.
- E. Construction activities not to obstruct normal flow of traffic from 7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m. on designated major arterials or as directed by Owner.
- F. Maintain local driveway access to residential and commercial properties adjacent to Work areas at all times. Use all-weather materials as approved by Engineer when maintaining temporary driveway access to commercial and residential driveways
- G. Cleanliness of Surrounding Streets: Keep streets used for entering and leaving job area free of excavated material, debris, and foreign material resulting from construction operations.

- H. Provide Engineer 1-week notice prior to implementing each approved traffic control phase.
- I. Notify local schools, churches, bus lines, police department, commercial businesses, and fire department in writing of construction a minimum of 5 working days prior to beginning Work.
- J. Remove existing signing and striping that are in conflict with construction activities or may cause driver confusion.
- K. Provide safe access for pedestrians along major cross streets.
- L. Alternate closures of cross streets so that two adjacent cross streets are not closed simultaneously.
- M. Do not close more than two consecutive esplanade openings at a time without prior approval by Engineer.

3.02 CONSTRUCTION PARKING CONTROL

- A. Control vehicular parking to prevent interference with public traffic and parking, and access by emergency vehicles.
- B. Monitor parking of construction personnel's vehicles in existing facilities. Maintain vehicular access to and through parking areas.
- C. Prevent parking on or adjacent to access roads or in non-designated areas.

3.03 FLARES AND LIGHTS

- A. Provide flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

3.04 HAUL ROUTES

- A. Utilize haul routes designated by authorities or shown on Drawings for construction traffic.
- B. Confine construction traffic to designated haul routes.
- C. Provide traffic control at critical areas of haul routes to regulate traffic and minimize interference with public traffic.

3.05 TRAFFIC SIGNS AND SIGNALS

- A. Construct necessary traffic control devices for temporary signals including but not limited to loop detectors, traffic signal conduits, traffic signal wiring, and crosswalk signals required to complete Work. Notify, a minimum of 60 days in advance, agency concerning control boxes and switchgear. Agency will perform service, programming, or adjustments, to signal boxes and switchgear should this work be required during construction
- B. Install and operate traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control and areas affected by Contractor's operations. Establish notices, signs, and traffic controls before moving into next phase of traffic control.
- C. Relocate traffic signs and signals as Work progresses to maintain effective traffic control.
- D. Unless otherwise approved by Engineer, provide driveway signs with name of business that can be accessed from particular crossover. Use two signs for each cross-over.
- E. Replace existing traffic control devices in project area.

- F. Engineer may direct Contractor to make minor traffic control sign adjustments to eliminate driver confusion and maintain traffic safety during construction at no additional payment.

3.06 BRIDGING TRENCHES AND EXCAVATIONS

- A. Whenever necessary, bridge trenches and excavation to permit an unobstructed flow of traffic. Provide steel plates that can be laid across construction areas and major drives of commercial businesses.
- B. Secure bridging against displacement by using adjustable cleats, angles, bolts, or other devices whenever bridge is installed:
 - 1. On existing bus route.
 - 2. When more than 5% of daily traffic is comprised of commercial or truck traffic.
 - 3. When more than two separate plates are used for bridge.
 - 4. When bridge is to be used for more than 5 consecutive days.
- C. Install bridging to operate with minimum noise.
- D. Adequately shore trench or excavation to support bridge and traffic.
- E. Extend steel plates used for bridging a minimum of 1 foot beyond edges of trench or excavation. Use temporary paving materials (premix) to feather edges of plates to minimize wheel impact on secured bridging.
- F. Use steel plates of sufficient thickness to support H-20 loading, truck or lane, that produces maximum stress.

3.07 REMOVAL

- A. Remove equipment and devices when no longer required.
- B. Repair damage caused by installation.
- C. Remove post settings to a depth of 2 feet.

3.08 TRAFFIC CONTROL, REGULATION, AND DIRECTION

- A. Use flagmen to control, regulate, and direct even flow and movement of vehicular and pedestrian traffic including but not limited to the following conditions:
 - 1. Where multi-lane vehicular traffic must be diverted into single lane vehicular traffic
 - 2. Where vehicular traffic must change lanes abruptly
 - 3. Where construction equipment must enter or cross vehicular traffic lanes and walks
 - 4. Where construction equipment may intermittently encroach on vehicular traffic lanes and unprotected walks and crosswalks
 - 5. Where traffic regulation is needed due to rerouting of vehicular traffic around Work site.
 - 6. Other areas of Work where construction activities might affect public safety and convenience.
- B. Use and maintain flagmen at points for periods of time as may be required to provide for public safety and convenience of travel.
- C. Use of flagmen is for purpose of assisting in regulation of traffic flow and movement and does not relieve Contractor of full responsibility for taking other steps and providing other flaggers or personnel as Contractor may deem necessary to protect Work and public.

3.09 INSTALLATION STANDARDS

- A. Work in other phases shall be permitted, provided:
 - 1. Phases are not continuous to one work is being done in presently,
 - 2. Installation of utility occurs in only one phase. Keep work and operation in second phase to an absolute minimum. Perform work in no more than two phases at a time. Authorization to perform work in second phase shall not relieve any responsibility of completing backfilling and paving operations in accordance with Contract.
- B. Place temporary pavement with a single lane closure.
- C. Reinstall temporary and permanent pavement markings as directed by Engineer. Alternative markings shall be considered when marking manufacturer's weather conditions cannot be met. These alternatives are to be submitted and approved by Engineer prior to installation. No extra payment will be made for use of alternative markings.

3.10 MAINTENANCE OF EQUIPMENT AND MATERIAL

- A. Designate individual to be responsible for maintenance of traffic handling around construction area. Individual must be accessible at all times to immediately correct any deficiencies in equipment and materials used to handle traffic including missing, damaged, or obscured signs, drums, barricades, or pavement markings. Give name, address, and telephone number of designated individual to Engineer.
- B. Make daily inspections of signs, barricades, drums, lamps, and temporary pavement markings to verify that these are visible, in good working order, and conform with traffic handling plans and directions of Engineer. When not in compliance, immediately bring equipment and materials into compliance by replacement, repair, cleaning, relocation, and realignment.
- C. Keep equipment and materials, especially signs and pavement markings, clean and free of dust, dirt, grime, oil, mud, or debris.
- D. Engineer shall decide if damaged or vandalized signs, drums, and barricades can be reused.

END OF SECTION

SECTION 01 57 00
TPDES REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Preparation of Storm Water Pollution Prevention Plan and notifications to TCEQ.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 – Proposal Requirements, Contract Forms, and Conditions of Contract.
 - 2. Division 01 – General Requirements.
 - 3. Section 01 50 00 - Temporary Controls

1.02 MEASUREMENT AND PAYMENT

- A. Stipulated Price (Lump Sum). If Contract is a Stipulated Price Contract, payment for Work in this Section is included in total Stipulated Price.

1.03 DEFINITIONS

- A. Commencement of Construction Activities: Exposure of soil resulting from activities such as clearing, grading, and excavating.
- B. Large Construction Activity: Project that:
 - 1. Disturbs 5 acres or more, or
 - 2. Disturbs less than 5 acres but is part of a larger common plan of development that will disturb 5 acres or more of land.
- C. Small Construction Activity: Project that:
 - 1. Disturbs 1 or more acres but less than 5 acres, or
 - 2. Disturbs less than 1 acre but is part of a larger common plan of development that will ultimately disturb 1 or more acres but less than 5 acres.
- D. TPDES Operator:
 - 1. Person or persons who have day-to-day operational control of construction activities which are necessary to ensure compliance with SWP3 for site or other Construction General Permit conditions.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 SITE SPECIFIC STORM WATER POLLUTION PREVENTION PLAN (SWP3)

- A. Prepare a SWP3 following Part III of the Construction General Permit.
- B. Update or revise SWP3 as needed during construction following Part III, Section E of Construction General Permit.
- C. Submit the SWP3 and any updates or revisions to Engineer for review and address comments prior to commencing, or continuing, construction activities.

3.02 NOTICE OF INTENT FOR LARGE CONSTRUCTION ACTIVITY

- A. Fill out, sign, and date TCEQ Form 20022 Notice of Intent (NOI) for Storm Water Discharges Associated with Construction Activity under TPDES Construction General Permit (TXR150000)
- B. Submit Notice of Intent by one of the following methods:
 - 1. Submit online at TCEQ ePermits (www6.tceq.state.tx.us/steers) and pay \$225 application fee. Transmit a copy of electronic certificate provided by TCEQ to Engineer.
 - 2. Send a check and completed TCEQ Form 20022 to Texas Commission on Environmental Quality. Transmit a copy of check and completed form to Engineer.
- C. Owner will complete a separate Owner's copy of TCEQ Form 20022 for NOI, and will submit Notice, along with application fee, to TCEQ.
- D. Submission of the Notice of Intent form by Contractor to TCEQ is required a minimum of 7 days before Commencement of Construction Activities.

3.03 CONSTRUCTION SITE NOTICE FOR SMALL CONSTRUCTION ACTIVITY

- A. Fill out, sign, and date Construction Site Notice.
- B. Transmit the signed Construction Site Notice to Engineer at least 7 days prior to Commencement of Construction Activity.

3.04 CERTIFICATION REQUIREMENTS

- A. Fill out TPDES Operator's Information form, including Contractor's name, address, and telephone number and names of persons or firms responsible for maintenance and inspection of erosion and sediment control measures. Use multiple copies as required to document full information.
- B. Contractor and Subcontractors shall sign and date Contractor's Certification for TPDES Permitting.. Include this certification with other Project certification forms.
- C. Submit properly completed certification forms to Engineer for review before beginning construction operations.
- D. Conduct inspections in accordance with TCEQ requirements. Ensure persons or firms responsible for maintenance and inspection of erosion and sediment control measures read, fill out, sign, and date Erosion Control Contractor's Certification for Inspection and Maintenance. Use EPA NPDES Construction Inspection Form to record maintenance inspections and repairs.

3.05 RETENTION OF RECORDS

- A. Keep a copy of this document and SWP3 in a readily accessible location at construction site from Commencement of Construction Activity until submission of the Notice of Termination (NOT) for Storm Water Discharges Associated with Construction Activity under TPDES Construction General Permit (TXR150000). Contractors with day-to-day operational control over SWP3 implementation shall have a copy of SWP3 available at a central location, on-site, for use of all operators and those identified as having responsibilities under SWP3. Upon submission of NOT, submit all required forms and a copy of SWP3 with all revisions to Engineer.

3.06 REQUIRED NOTICES

- A. Post the following notices from effective date of SWP3 until date of final site stabilization as defined in Construction General Permit:
 - 1. Post TPDES permit number for Large Construction Activity, or a signed TCEQ Construction Site Notice for Small Construction Activity. Signed copies of Contractor's NOI must also be posted.

2. Post notices near main entrance of construction site in a prominent place for public viewing. Post name and telephone number of Contractor's local contact person, brief project description and location of SWP3.
 - a. If posting near a main entrance is not feasible due to safety concerns, coordinate posting of notice with Engineer to conform to requirements of Construction General Permit.
 - b. If Project is a linear construction project (e.g., road, utilities, etc.), post notice in a publicly accessible location near active construction. Move notice as necessary.
3. Post a notice to equipment and vehicles operators, instructing them to stop, check, and clean tires of debris and mud before driving onto traffic lanes. Post at each stabilized construction exit area.
4. Post a notice of waste disposal procedures in a readily visible location on site.

3.07 ON-SITE WASTE MATERIAL STORAGE

- A. On-site waste material storage shall be self-contained and shall satisfy appropriate local, state, and federal rules and regulations.
- B. Prepare list of waste material to be stored on-site. Update list as necessary to include up-to-date information. Keep a copy of updated list with SWP3.
- C. Prepare description of controls to reduce pollutants generate from on-site storage. Include storage practices necessary to minimize exposure of materials to storm water, and spill prevention and response measures consistent with best management practices. Keep a copy of description with SWP3.

3.08 NOTICE OF TERMINATION

- A. Submit a NOT to Engineer within 10 days after:
 1. Final stabilization has been achieved on all portions of site that are responsibility of Contractor; or
 2. Another operator has assumed control over all areas of site that have not been stabilized; and
 3. All silt fences and other temporary erosion controls have either been removed scheduled to be removed as defined in SWP3, or transferred to a new operator, if new operator has sought permit coverage.
- B. Engineer will complete NOT and submit Contractor's notices to TCEQ and MS4 entities.

END OF SECTION

SECTION 01 57 23

CONTROL OF GROUND WATER AND SURFACE WATER

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Control of ground water and surface water.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 – Proposal Requirements, Contract Forms, and Conditions of Contract.
 - 2. Division 01 – General Requirements.

1.02 MEASUREMENT AND PAYMENT

- A. No separate payment will be made for control of ground water or surface water. Include cost to control ground water and surface water in unit price for Work requiring control for these pipe sizes.

1.03 REFERENCES

- A. ASTM D698 - Standard Test Methods for Laboratory Compaction of Soils Using Standard Effort (12,400 ft-lbf/ft³ (600kN-m/m³).
- B. Federal Regulations, 29 CFR Part 1926, Standards-Excavation, Occupational Safety and Health Administration (OSHA).

1.04 DEFINITIONS

- A. Ground water control includes both dewatering and depressurization of water-bearing soil layers.
 - 1. Dewatering includes lowering water table and intercepting seepage that would otherwise emerge from slopes or bottoms of excavations, or into tunnels and shafts, and disposing of removed water. Intent of dewatering is to increase stability of tunnel excavations and excavated slopes, prevent dislocation of material from slopes or bottoms of excavations, reduce lateral loads on sheeting and bracing, improve excavating and hauling characteristics of excavated material, prevent failure or heaving of bottom of excavations, and to provide suitable conditions for placement of backfill materials and construction of structures and other installations.
 - 2. Depressurization includes reduction in piezometric pressure within strata not controlled by dewatering alone, as required to prevent failure or heaving of excavation bottom or instability of tunnel excavations.
- B. Excavation drainage includes keeping excavations free of surface and seepage water.
- C. Surface drainage includes use of temporary drainage ditches and dikes and installation of temporary culverts and sump pumps with discharge lines as required to protect Work from any source of surface water.
- D. Equipment and instrumentation for monitoring and control of ground water control system includes piezometers, monitoring wells and flow meters for observing and recording flow rates.

1.05 PERFORMANCE REQUIREMENTS

- A. Conduct subsurface investigations to identify groundwater conditions and to provide parameters for design, installation, and operation of groundwater control systems. Submit prepared method and spacing of readings for review prior to obtaining water level readings.

- B. Design ground water control system, compatible with requirements of Federal Regulations 29 CFR Part 1926 and Section 31.23.15 - Trench Safety Systems, to produce following results:
 - 1. Effectively reduce hydrostatic pressure affecting:
 - a. Excavations
 - b. Tunnel excavation, face stability, or seepage into tunnels
 - 2. Develop substantially dry and stable subgrade for subsequent construction operations
 - 3. Preclude damage to adjacent properties, buildings, structures, utilities, installed facilities, and other work
 - 4. Prevent loss of fines, seepage, boils, quick condition, or softening of foundation strata
 - 5. Maintain stability of sides and bottom of excavations
- C. Provide ground water control systems that include single-stage or multiple-stage well point systems, eductor and ejector-type systems, deep wells, or combinations of these equipment types, as appropriate.
- D. Provide drainage of seepage water and surface water, as well as water from any other source entering excavation. Excavation drainage may include placement of drainage materials, crushed stone and filter fabric, together with ditches and sump pumping.
- E. Provide ditches, berms, pumps, and other methods necessary to divert and drain surface water from excavation and other work areas.
- F. Locate ground water control and drainage systems so as not to interfere with utilities, construction operations, adjacent properties, or adjacent water wells.
- G. Assume sole responsibility for ground water control systems and for any loss or damage resulting from partial or complete failure of protective measures and any settlement or resultant damage caused by ground water control operations. 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, or affect potentially contaminated areas. Repair damage caused by ground water control systems or resulting from failure of system to protect property as required.
- H. Provide adequate number of piezometers installed at proper locations and depths as required to provide meaningful observations of conditions affecting excavation, adjacent structures and water wells.
- I. Provide environmental monitoring wells installed at proper locations and depths as required to provide adequate observations of hydrostatic conditions and possible contaminant transport from contamination sources into work area or ground water control system.

1.06 SUBMITTALS

- A. Conform to requirements of Section 01.33.00 - Submittals.
- B. Submit Ground Water and Surface Water Control Plan for review by Engineer prior to start of any field work. Plan shall be signed by Professional Engineer registered in State of Texas. Submit plan to include following:
 - 1. Results of subsurface investigation and description of extent and characteristics of water bearing layers subject to ground water control
 - 2. Names of equipment suppliers and installation subcontractors
 - 3. Description of proposed ground water control systems indicating arrangement, location, depth, and capacities of system components, installation details and criteria and operation and maintenance procedures
 - 4. Description of proposed monitoring and control system indicating depths and locations of piezometers and monitoring wells, monitoring installation details and criteria, type of equipment and instrumentation with pertinent data and characteristics

5. Description of proposed filters including types, sizes, capacities, and manufacturer's application recommendations
 6. Certification of design calculations demonstrating adequacy of proposed systems for intended applications. Define potential area of influence of ground water control operation near contaminated areas.
 7. Operating requirements, including piezometric control elevations for dewatering and depressurization
 8. Excavation drainage methods including typical drainage layers, sump pump application and other necessary means
 9. Surface water control and drainage installations
 10. Proposed methods and locations for disposing of removed water
- C. Submit following records upon completed initial installation:
1. Installation and development reports for well points, eductors, and deep wells
 2. Installation reports and baseline readings for piezometers and monitoring wells
 3. Baseline analytical test data of water from monitoring wells
 4. Initial flow rates
- D. Submit the following records weekly during operations:
1. Records of flow rates and piezometric elevations obtained during monitoring of dewatering and depressurization. Refer to requirements for Eductor, Well Points, or Deep Wells.
 2. Maintenance records for ground water control installations, piezometers and monitoring wells

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Comply with requirements of agencies having jurisdiction.
- B. Comply with Texas Commission on Environmental Quality regulations and Texas Water Well Drillers Association for development, drilling, and abandonment of wells used in dewatering system.
- C. Obtain necessary permits from agencies with control over use of groundwater and matters affecting well installation, water discharge, and use of existing storm drains and natural water sources. Because review and permitting process may be lengthy, take early action to pursue and submit for required approvals.
- D. Monitor ground water discharge for contamination while performing pumping in vicinity of potentially contaminated sites.

PART 2 - PRODUCTS

2.01 EQUIPMENT AND MATERIALS

- A. Use optional equipment and materials as necessary to achieve desired results for dewatering. Selected equipment and materials are subject to review of Engineer through submittals.
- B. Eductors, well points, or deep wells, where used, must be furnished, installed and operated by experienced contractor regularly engaged in ground water control system design, installation, and operation.
- C. Equipment must be in good repair and operating order.
- D. Keep sufficient standby equipment and materials available to ensure continuous operation, where required.

PART 3 - EXECUTION

3.01 GROUND WATER CONTROL

- A. Perform subsurface investigation by borings as necessary to identify water bearing layers, piezometric pressures, and soil parameters for design and installation of ground water control systems. Perform pump tests, if necessary to determine draw down characteristics of water bearing layers. Present results in Ground Water and Surface Water Control Plan.
- B. Provide labor, material, equipment, techniques and methods to lower, control and handle ground water in manner compatible with construction methods and site conditions. Monitor effectiveness of installed system and its effect on adjacent property.
- C. Install, operate, and maintain ground water control systems in accordance with Ground Water and Surface Water Control Plan. Notify Engineer in writing of changes made to accommodate field conditions and changes to Work. Provide revised drawings and calculations with notification.
- D. Provide for continuous system operation, including nights, weekends, and holidays. Arrange for appropriate backup if electrical power is primary energy source for dewatering system.
- E. Monitor operations to verify system lowers ground water piezometric levels at rate required to maintain dry excavation resulting in stable subgrade for prosecution of subsequent operations.
- F. Where hydrostatic pressures in confined water bearing layers exist below excavation, depressurize those zones to eliminate risk of uplift or other instability of excavation or installed works. Define allowable piezometric elevations in Ground Water and Surface Water Control Plan.
- 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 Engineer.
 - 3. Grout abandoned well and piezometer holes with non-shrink grout along entire shaft length.
- H. During backfilling, dewatering may be reduced to maintain water level 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. Do not allow water levels to rise into cement stabilized sand until at least 48 hour after placement.
- I. Provide uniform diameter for each pipe drain run constructed for dewatering. Remove pipe drain when it has served its purpose. If removal of pipe is impractical, provide grout connections at 50-foot intervals and fill pipe with cement-bentonite grout or cement-sand grout when pipe is removed from service.
- J. Extent of construction ground water control for structures with permanent perforated underground drainage system may be reduced, for units designed to withstand hydrostatic uplift pressure. Provide means of draining affected portion of underground system, including standby equipment. Maintain drainage system during operations and remove it when no longer required.
- K. Remove system upon completion of construction or when dewatering and control of surface or ground water is no longer required.
- L. Compact backfill to not less than 95% of maximum dry density in accordance with ASTM D 698.
- M. Foundation Beds: Maintain saturation line at least 3 feet below lowest elevations where concrete is to be placed. Drain foundations in areas where concrete is to be placed before placing reinforcing steel. Keep free from water for 3 days after concrete is placed.

3.02 REQUIREMENTS FOR EDUCTOR, WELL POINTS, OR DEEP WELLS

- A. Design, install, and operate all dewatering wells to prevent removal of native material except as incidental to well development.
- B. For aboveground piping in ground water control system, include 12” minimum length of clear, transparent piping between every eductor well or well point and discharge header to visually monitor discharge from each installation.
- C. Install sufficient piezometers or monitoring wells to show trench or shaft excavations in water bearing materials are predrained prior to excavation. Provide separate piezometers for monitoring of dewatering and for monitoring of depressurization. Install piezometers and monitoring wells for tunneling as appropriate for selected method of Work.
- D. Install piezometers or monitoring wells not less than 1 week in advance of beginning associated excavation.
- E. Dewatering may be omitted for portions of under drains or other excavations, but only where auger borings and piezometers or monitoring wells show that soil is predrained by existing system and that criteria of ground water control plan are satisfied.
- F. Replace installations that produce noticeable amounts of sediments after development.
- G. Provide additional ground water control installations, or change methods, in event that installations according to ground water control plan do not provide satisfactory results based on performance criteria defined by Drawings and by Specification. Submit revised plan.

3.03 EXCAVATION DRAINAGE

- A. May use excavation drainage methods if necessary to achieve well drained conditions. Excavation drainage may consist of layer of crushed stone and filter fabric, and sump pumping in combination with sufficient wells for ground water control to maintain stable excavation and backfill conditions.

3.04 MAINTENANCE AND OBSERVATION

- A. Conduct daily maintenance and observation of piezometers or monitoring wells while ground water control installations or excavation drainage are operating in area or seepage into tunnel is occurring. Keep system in good condition.
- B. Replace damaged and destroyed piezometers or monitoring wells with new piezometers or wells as necessary to meet observation schedule.
- C. Cut off piezometers or monitoring wells in excavation areas where piping is exposed, only as necessary to perform observation as excavation proceeds. Continue to maintain and make observations, as specified.
- D. Remove and grout piezometers inside or outside excavation area when ground water control operations are complete. Remove and grout monitoring wells when directed by Engineer. Follow applicable regulations for abandoning piezometers and monitoring wells.

3.05 MONITORING AND RECORDING

- A. Monitor and record average flow rate of operation for each deep well, or for each wellpoint or eductor header used in dewatering system. Also monitor and record water level and ground water recovery. Obtain records daily until steady conditions are achieved, and twice weekly thereafter.
- B. Observe and record elevation of water level daily as long as ground water control system is in operation, and weekly thereafter until Work is completed or piezometers or wells are removed.

Comply with Engineer direction for increased monitoring and recording and take measures necessary to ensure effective dewatering for intended purpose.

3.06 SURFACE WATER CONTROL

- A. Intercept surface water and divert it away from excavations through use of dikes, ditches, curb walls, pipes, sumps or other approved means. Requirement includes temporary works required to protect adjoining properties from surface drainage caused by construction operations.
- B. Divert surface water and seepage water into sumps and pump it into drainage channels or storm drains, when approved by agencies having jurisdiction. Provide settling basins when required by agencies.

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Provide products for this Project that comply with requirements of this Section. Specific requirements of detailed equipment specifications govern in case of a conflict with requirements of this Section.

1.02 QUALITY ASSURANCE

- A. Design Criteria:
 - 1. Assume responsibility for design of products to include structural stability and operational capability.
 - 2. Design members to withstand all loads imposed by installation, erection, and operation of product without deformation, failure, or adversely affecting operational requirements of product. Size and strength of materials for structural members are specified as minimums only.
 - 3. Design mechanical and electrical components for all loads, currents, stresses, and wear imposed by startup and normal operations of equipment without deformation, failure, or adversely affecting operation of the unit. Mechanical and electrical components specified for equipment are specified as minimum acceptable for equipment.
- B. Coordination:
 - 1. Provide coordination of entire Project, including verification that structures, piping, and equipment components to be furnished and installed for this Project are compatible.
 - 2. Determine that equipment furnished for this Project is in conformance with all requirements of Contract Documents and with equipment and materials furnished by others on this Project.
 - 3. Electrical components provided for equipment shall comply with all provisions of Contract Documents.
 - 4. Protective coatings and paints applied to equipment shall be fully compatible with final coatings to be field applied in accordance with Contract Documents.
- C. Adaptation of Equipment:
 - 1. Drawings and Specifications are prepared for specified products. Make modifications to incorporate products into Project at no cost to Owner, if a substitution for a product is requested and approved in accordance with Section 01 40 00 "Project Coordination."
 - 2. Do not provide a product with a physical size that exceeds available space. Consideration may be given to acceptance of these products or equipment if Contractor assumes all costs necessary to incorporate item and Engineer approves such revisions.
 - 3. Coordinate electrical requirements for products to be installed in Project, including revisions in electrical equipment components wiring and other factors necessary to incorporate component.

1.03 SUBMITTALS

- A. Provide Submittals in accordance with Section 01 33 00 "Submittals".

1.04 STANDARDS

- A. Applicable industry standards referenced in Specifications shall apply as if written here in its entirety.

- B. Except where otherwise indicated, structural and miscellaneous fabricated steel used in items of equipment shall conform to Standards of American Institute of Steel Construction.

1.05 GUARANTEES AND WARRANTIES

- A. Guarantee and or Warranty products furnished by Contractor under this Contract against:
 - 1. Faulty or inadequate design.
 - 2. Improper assembly or erection.
 - 3. Defective workmanship or materials.
 - 4. Leakage, breakage, or other failure.
- B. Guarantee and or Warranty products installed under this Contract, including products furnished by Owner, against leakage, breakage, or other failure due to improper assembly or erection and against improper installation of equipment. Guarantee and or Warranty period shall be as defined in General Conditions. Individual Sections of Specifications may have more stringent warranty requirements than stated in General Conditions. Most stringent warranty will be required in event of any difference in two aforementioned locations.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Design, fabricate, assemble, deliver and install according to normally accepted engineering and shop practices, except where a higher standard of quality is required by Contract Documents.
- B. Manufacture like parts of duplicate units to standard sizes and gages. Like parts are to be interchangeable.
- C. Two or more items of same kind are to be identical and made by same Supplier.
- D. Provide products suitable for intended service.
- E. Adhere to the equipment capacities, sizes, and dimensions indicated by Contract Documents.
- F. Do not use products for any purpose other than that for which it is designed.
- G. Provide new products unless previously used products are specifically allowed in Contract Documents.
- H. Equipment shall not have been in service at any time prior to delivery, except as required by tests.
- I. Materials shall be suitable for service conditions.
- J. Iron castings shall be tough, close-grained gray iron free from blowholes, flaws, or excessive shrinkage and shall conform to ASTM A48.
- K. Structural members shall be considered as subject to shock or vibratory loads.
- L. Unless otherwise indicated, steel which will be submerged, all or in part, during normal operation of equipment shall be a minimum of 1/4" thick. All edges are to be chamfered to preclude any sharp exposed edges.

2.02 ELECTRIC MOTORS

- A. Unless otherwise required by detailed equipment specifications, motors furnished with equipment shall comply with the following requirements:
 - 1. Motors shall be designed and applied in compliance with NEMA, ANSI, IEEE, and AFBMA standards and NEC for specific duty imposed by driven equipment.

2. Where frequent starting occurs, motors shall be designed for frequent starting duty equivalent to duty service required by driven equipment.
 3. Unless recognized and defined by standards and codes for intermittent duty as a standard industry practice, motors shall be rated for continuous duty at 40 C ambient. Motor temperature rise above 40 C ambient on continuous operation at nameplate horsepower shall not exceed NEMA limit.
 4. Motors shall be designed to start with appropriate starter or variable speed drive.
 5. Motor bearing life shall be based upon actual operating load conditions imposed by driven equipment.
 6. Motors shall be sized for altitude at the location where equipment is to be installed.
 7. Motors with 1.0 service factor shall not be loaded more than 87% of nameplate horsepower. Motors with a 1.15 service factor shall not be loaded more than 100% of nameplate horsepower.
 8. Where detailed equipment specifications call for encapsulated motor windings, the following process shall be used:
 - a. After stator assembly, stator assembly shall be sealed vacuum-pressure impregnation (VPI) of epoxy resin. Stator shall receive two VPI treatments, each treatment consisting of a dip followed by an oven bake. After final cure, stator assembly shall receive a final (third) coating of a durable epoxy varnish to further protect against dust, moisture, and a chemical degradation. Windings shall comply with latest applicable provisions of NEMA MG1.
 9. Motors shall have a clamp-type grounding terminal inside motor conduit box.
 10. Motors with external conduit boxes shall have oversized conduit boxes.
 11. Maximum starting current shall be per NEMA MG1, Class H.
 12. Efficiency shall be per NEMA MG1 for High efficiency motors.
 13. Minimum insulation shall be Type F.
 14. Motors shall be random wound with copper coils.
 15. Motors located in a hazardous location shall be rated for the appropriate classification.
- B. It is intended that Supplier use his standard motor on integrally constructed motor driven equipment such as appliances, hand tools, etc., which would otherwise require redesign of complete unit in order to provide a motor having specified features.
- C. Unless otherwise required by detailed equipment specifications, motors within horsepower ranges indicated below shall be rated and constructed as follows:
1. Below 1/2 HP:
 - a. 115-volt, 60-Hz, 1-phase.
 - b. Drip-proof in clean and dry locations; TEFP in all other locations.
 - c. Permanently lubricated sealed bearings.
 - d. Built-in manual-reset thermal protector; or furnished with integrally mounted stainless steel enclosed manual motor-overload switch.
 2. 1/2 HP to 1 HP:
 - a. 230/460-volt, 60-Hz, 3-phase.
 - b. Drip-proof in clean and dry locations; TEFC in all other locations.
 - c. Permanently lubricated sealed bearings.
 3. 1-1/2 HP and Above:
 - a. 208-volt, 60-Hz, 3-phase.
 - b. Drip-proof in clean and dry locations; TEFC in all other locations.
 - c. Oil or grease lubricated anti-friction or oil lubricated sleeve bearings.
 - d. Vertical motors shall have 15 year average life thrust bearings.
- D. Motors with horsepower ratings of 15 HP or greater shall be provided with space heaters to operate on 120-volt single-phase service.

2.03 EQUIPMENT APPURTENANCES

- A. Cover belt or chain drives, fan blades, couplings, and other moving or rotating parts on all sides by a safety guard.

1. Fabricate safety guards from 16 USS gage or heavier galvanized or aluminum-clad sheet steel or 1/2" mesh galvanized expanded metal.
2. Design guards for easy installation and removal.
3. Provide galvanized supports and accessories for each guard.
4. Provide stainless steel bolts and hardware.
5. Provide safety guards in outdoor locations designed to prevent entrance of rain and dripping water.

2.04 ANCHOR BOLTS

- A. Provide suitable anchor bolts for each product.
- B. Provide anchor bolts, with templates or setting drawings, sufficiently early to permit setting anchor bolts when the structural concrete is placed.
- C. Provide two nuts for each bolt.
- D. Provide anchor bolts for products mounted on baseplates that are long enough to permit 1-1/2" of grout beneath baseplate and to provide adequate anchorage into structural concrete.
- E. Provide stainless steel anchor bolts, nuts, and washers.

2.05 SPECIAL TOOLS AND ACCESSORIES

- A. Furnish tools, instruments, lifting and handling devices, and accessories necessary for proper maintenance and adjustment that are available only from Vendor or are not commonly available.

2.06 LUBRICATION SYSTEMS FOR EQUIPMENT

- A. Provide equipment lubricated by systems which:
 1. Require attention no more frequently than weekly during continuous operation.
 2. Do not require attention during startup or shutdown.
 3. Do not waste lubricants.
- B. Provide lubricants to fill lubricant reservoirs and to replace lubricant consumed during testing, startup, and operation prior to acceptance of equipment by Owner.

2.07 INSULATION OF PIPING

- A. Insulate all piping on or related to equipment as required to prevent freezing under any condition. Insulate piping per Supplier's written instruction or these Specifications, whichever is more stringent.

PART 3 -EXECUTION

3.01 INSTALLATION

- A. Install equipment including equipment pre-selected or furnished by Owner. Assume responsibility for proper installation, startup and making the necessary adjustments so that equipment is placed in proper operating condition per Section 01 91 14 - Facility Start-Up.

3.02 LUBRICATION

- A. Lubricate all products provided or installed for this Project, including products furnished by Owner, per Supplier's written recommendations until product is accepted by Owner.

END OF SECTION

SECTION 01 70 00

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Comply with requirements of General Conditions and specified administrative procedures in closing out Construction Contract.

1.02 SUBMITTALS

- A. Submit affidavits and releases to Engineer as required in Contract Documents.

1.03 SUBSTANTIAL COMPLETION

- A. Submit written notification that Work or designated portion of Work is substantially complete to Inspector when Work is considered to be substantially complete per General Conditions. Include a list of items remaining to be completed or corrected before Project will be considered to be complete.
- B. Facility Checklist. All items on Facility Checklist are part of Contract scope even if not shown or discussed elsewhere in Drawings and Specifications.
- C. Inspector and Engineer shall visit Site to observe Work within a reasonable time after notification is received to determine status of completion.
- D. Engineer shall issue notification to Contractor that Work is either substantially complete or that additional Work must be performed before Project may be considered substantially complete.
 - 1. Engineer shall notify Contractor in writing of items that must be completed before Project can be considered substantially complete.
 - a. Correct the noted deficiencies in Work.
 - b. Issue a second written notice with a revised list of deficiencies when Work has been completed.
 - c. Engineer and Inspector shall revisit Site and procedure shall begin again.
 - 2. Engineer shall issue a Certificate of Substantial Completion to Owner when Project is considered to be substantially complete. Certificate shall include a tentative list of items to be corrected before final payment.
 - a. Owner will review and revise list of items and notify Engineer of any objections or other items that are to be included in list.
 - b. Engineer shall prepare and send to Contractor a definite Certificate of Substantial Completion with a revised tentative list of items to be corrected or completed.
 - c. Review the list and notify Engineer in writing of any objections within 10 days of receipt of Certificate of Substantial Completion.

1.04 FINAL INSPECTION

- A. Submit written certification on form provided by Engineer when Project is complete and:
 - 1. Contract Documents have been reviewed.
 - 2. Work has been completed in compliance with Contract Documents.
 - 3. Equipment and systems have been tested per Contract Documents and are fully operational.
 - 4. Final Operations and Maintenance Manuals have been provided to Owner and all operator training has been completed.
 - 5. Specified spare parts and special tools have been provided.
 - 6. Work is complete and ready for final inspection.

- B. Engineer shall make an inspection with Owner and appropriate regulatory agencies to determine status of completeness within a reasonable time after receipt of Certificate.
- C. Engineer shall issue notice that Project is complete or notify Contractor that Work is not complete or is defective.
 - 1. Submit request for final payment with Closeout submittals described herein if notified that Project is complete and Work is acceptable.
 - 2. Upon receipt of notification from Engineer that Work is incomplete or defective, take immediate steps to remedy stated deficiencies. Send a second certification to Engineer when Work has been completed or corrected.
 - 3. Engineer shall re-visit Site and procedure will begin again.

1.05 RE-INSPECTION FEES

- A. Pay fees to Owner to compensate Engineer for re-inspection of Work required by failure of Work to comply with claims of status of completion made by Contractor.
- B. Owner may withhold an equal amount of these fees from Contractor's final payment.
- C. Cost for additional inspections will be billed to Owner by Engineer for actual hours required for re-inspection and preparation of related reports in accordance with Engineer's standard rates.

1.06 CLOSEOUT SUBMITTALS TO ENGINEER

- A. Record Drawings per Section 01 10 40 "Project Coordination."
- B. Keys and keying schedule.
- C. Warranties, bonds, and insurance.
- D. Evidence of payment or release of liens on forms acceptable to Engineer and as required by General Conditions.
- E. Consent from Surety to Final Payment.
- F. Equipment Installation Reports on equipment.
- G. Shop Drawings, Record Data, Operations and Maintenance Manuals, and other submittals as required by Contract Documents.
- H. Specified spare parts and special tools.
- I. Certificates of Occupancy, operating certificates, or other similar releases required to allow Owner unrestricted use of Work and access to services and utilities.

1.07 FINAL APPLICATION FOR PAYMENT REQUEST

- A. Submit a preliminary final Application for Payment. This application is to include adjustments to Contract Price for:
 - 1. Approved Change Orders.
 - 2. Allowances not previously adjusted by Change Order.
 - 3. Unit prices.
 - 4. Deductions for defective Work that has been accepted by the Owner.
 - 5. Penalties and bonuses.
 - 6. Deductions for liquidated damages.
 - 7. Deductions for re-inspection payments per Contract Documents.
 - 8. Other adjustments.

- B. Engineer shall prepare a final Change Order, reflecting approved adjustments to contract amount which have not been covered by previously approved Change Orders.
- C. Submit final Application for Payment per General Conditions, including final Change Order.

1.08 TRANSFER OF UTILITIES

- A. Transfer utilities to Owner when Certificate of Substantial Completion has been issued, final cleaning has been completed per Section 01 71 00 "Final Cleaning," and Work has been occupied by Owner.
- B. Submit final meter readings for utilities and similar data as of date Owner occupied Work.

1.09 WARRANTIES, BONDS, AND SERVICES AGREEMENTS

- A. Provide warranties, bonds, and service agreements required by Section 01 33 00 "Submittals" or individual Specifications.
- B. Date for start of warranties, bonds, and service agreements is established per General Conditions.
- C. Compile warranties, bonds, and service agreements and review these documents for compliance with Contract Documents.
 - 1. Each document is to be signed by respective Supplier or Subcontractor.
 - 2. Each document is to include:
 - a. Product or work item description.
 - b. Firm, with the name of principal, address, and telephone number.
 - c. Scope of warranty, bond or services agreement.
 - d. Date, duration, and expiration date for each warranty bond and service agreement.
 - e. Procedures to be followed in event of a failure.
 - f. Specific instances that might invalidate warranty or bond.
- D. Submit two copies of each document to Engineer for review and transmittal to Owner.
 - 1. Submit duplicate sets.
 - 2. Documents are to be submitted on 8-1/2" x 11" paper, punched for a standard three-ring binder.
 - 3. Submit each set in a commercial quality three-ring binder with a durable and cleanable plastic cover. Title "Warranties, Bonds, and Services Agreements", Project name and name of Contractor are to be typed and affixed to cover.
- E. Submit warranties, bonds and services agreements:
 - 1. At the time of final completion and before final payment.
 - 2. Within 10 days after inspection and acceptance for equipment or components placed in service during progress of construction.

1.10 CLAIMS AND DISPUTES

- A. Claims and disputes must be resolved prior to recommendations of final Application for Payment. Acceptance and final payment by Contractor will indicate that any outstanding claims or disputed issues have been resolved to full satisfaction of Contractor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 71 00

FINAL CLEANING

PART 1 - GENERAL

1.01 GENERAL

- A. This Section specifies administrative and procedural requirements for final cleaning at Substantial Completion.

1.02 WORK INCLUDES

- A. Perform a thorough cleaning of Site, buildings, or other structures prior to Owner occupancy of buildings, and prior to Final Completion. Leave Site clean and ready for occupancy.

1.03 SUBMITTALS

- A. Provide data for maintenance per Section 01 73 00 "Operation and Maintenance Data."

1.04 QUALITY CONTROL

- A. Use experienced workmen or professional cleaners for final cleaning.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Furnish all labor and products needed for cleaning and finishing as recommended by manufacturer of the surface material being cleaned.
- B. Use cleaning products only on surfaces recommended by Supplier.
- C. Use only those cleaning products which will not create hazards to health or property and which will not damage surfaces.

PART 3 - EXECUTION

3.01 FINAL CLEANING

- A. Thoroughly clean entire Site and make ready for occupancy.
 - 1. Remove all construction debris, boxes, and trash from Site.
 - 2. Remove construction storage sheds and field offices.
 - 3. Restore grade to match surrounding condition and remove excess dirt.
 - 4. Sweep all drives and parking lots clean of dirt and debris. Use water truck or hose down paved site to like new appearance.
- B. Clean floors and inspect for damage.
 - 1. Remove oil, grease, paint drippings, and other contaminants from floors, then mop repeatedly until thoroughly clean. Replace damaged flooring.
 - 2. Clean resilient flooring with an approved cleaner and provide one coat liquid floor polish as recommended by Supplier. Polish to a buffed appearance with powered floor buffer.
- C. Clean and polish inside and outside glass surfaces. Wash with window cleaner and water, apply a coat of high quality glass polish and wipe clean. Do not scratch or otherwise mar glass surfaces.
- D. Clean wall surfaces to remove dirt or scuff marks. Remove excess adhesive along top edges of wall base. Remove adhesive from surfaces of vinyl wall coverings.

- E. Clean plumbing fixtures, valves, and trim. Remove labels and adhesive from fixtures. Remove floor drains and clean baskets or buckets. Polish strainers and exposed chrome or brass.
- F. Remove dirt, oil, grease, dust and other contaminants from floors, equipment and apparatus in mechanical and electrical rooms with vacuum.
- G. Inspect exterior painted surfaces. Remove all tape used during painting. Spot paint any damaged or marred surfaces. Remove any overspray.
- H. Clean roof areas of debris; flush roof drainage systems with water until clear.
- I. Rake clean other surfaces of grounds.
- J. Clean and polish all electrical equipment and exposed conduits. Provide a blemish free appearance on all exposed electrical equipment and conduits.
- H. Clean all process, HVAC, and other equipment and provide a blemish free appearance.

END OF SECTION

SECTION 01 71 13

MOBILIZATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes requirements for mobilization.
- B. Mobilization and Bonds shall not exceed 8% of Total Bid.
- C. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 – Proposal Requirements, Contract Forms, and Conditions of the Contract.
 - 2. Division 01 – General Requirements.

1.02 MEASUREMENT AND PAYMENT

- A. Measurement for mobilization is on lump sum basis.
- B. Mobilization payments will be included in periodic progress payment upon written application subject to following provisions:
 - 1. Authorization for payment of 50% of Contract Price for mobilization will be made upon receipt and approval by Engineer of the following items, as applicable:
 - a. Safety Program/Plan submittal in including the Trench Safety Program/Plan in accordance with Section 31 23 15 - Trench Safety Systems.
 - b. Construction Schedule submittal in accordance with Section 01 32 16 – Construction Progress Schedule
 - c. Pre-construction Conference attendance
 - d. Bonds and Insurance in accordance with Division 00 requirements.
 - 2. Authorization for payment of remaining 50% of Contract Price for mobilization will be made upon completion of Work amounting to 15% of Contract Price less mobilization unit price.
- C. Mobilization payments will be subject to retainage amounts stipulated in Agreement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 71 32

CONSTRUCTION SURVEYING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes requirements for construction surveying.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 – Proposal Requirements, Contract Forms, and Conditions of the Contract.
 - 2. Division 01 – General Requirements.

1.02 QUALITY CONTROL

- A. Conform to State of Texas laws for surveys requiring licensed surveyors. Employ land surveyor acceptable to Owner, if required.

1.03 MEASUREMENT AND PAYMENT

- A. No Separate payment will be made for field surveying. Include cost in unit price for Work requiring field surveying.

1.04 SUBMITTALS

- A. Conform to requirements of Section 01 33 00 - Submittals.
- B. Submit to Owner's representative name, address, and telephone number of Surveyor before starting survey work.
- C. Submit documentation verifying accuracy of survey work on request.
- D. Submit certificate signed by surveyor, that elevations and locations of Work are in conformance with Contract.

1.05 PROJECT RECORD DOCUMENTS

- A. Maintain complete and accurate log of control and survey Work as it progresses.
- B. Prepare certified survey setting forth dimensions, locations, angles, and elevations of construction and site Work upon completion of foundation walls and major site improvements.
- C. Submit Record Documents under provisions of Section 01 78 39 - Project Record Documents.

1.06 EXAMINATION

- A. Verify locations of survey control points prior to starting Work.
- B. Notify Owner's representative immediately of any discrepancies discovered.

1.07 SURVEY REFERENCE POINTS

- A. Control datum for survey established by provided survey as indicated on Drawings. Inform Engineer in advance of time at which horizontal and vertical control points will be established so verification deemed necessary by Engineer may be done with minimum inconvenience to Engineer and minimum delay to Contractor.

- B. Locate and protect survey control points prior to starting site work; preserve permanent reference points during construction.
- C. Notify Engineer 48 hours in advance of need for relocation of reference points due to changes in grades or other reasons.
- D. Report promptly to Engineer loss or destruction of reference point.
- E. Contractor to replace permanent reference points disturbed by operations, at no additional cost to Owner.

1.08 SURVEY REQUIREMENTS

- A. Utilize recognized engineering survey practices.
- B. Establish minimum of two permanent bench marks on site, referenced to established control points. Record locations with horizontal and vertical data on Project Record Documents.
- C. Establish elevations, lines, and levels to provide quantities required for measurement and payment and to provide appropriate controls for Work. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading; fill and topsoil placement; utility locations, slopes, and invert elevations
 - 2. Grid or axis for structures
 - 3. Building foundation, column locations, ground floor elevations
- D. Periodically verify layouts by same means.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 73 00

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Prepare a complete and detailed Operation and Maintenance Manual for each type and model of equipment or product furnished and installed under this Contract.
- B. Prepare all manuals in form of an instruction manual for Owner. Manuals are to be suitable for use in providing operation and maintenance instructions.
- C. Provide complete and detailed information specifically for products or systems provided for this Project. Include information required to operate and maintain product or system.
- D. Manuals are to be in addition to any information packed with or attached to product when delivered. This information is to be taken from product and provided as an attachment to each manual.
- E. Cost for O&M Manuals provided by Suppliers and Subcontractors as described in this Section are to be included in Cost of Work. Contractor efforts are included in Contractor's fee for Construction Phase Services.
- F. Owner shall indicate number and format of O&M Manuals required to be provided.

1.02 SUBMITTALS

- A. Submit preliminary Operation and Maintenance Manual electronically per Section 01 33 00 - Submittals.

1.03 GUARANTEES

- A. Provide copies of manufacturer's warranties, guarantees, or service agreements in accordance with Section 01 70 00 "Execution and Closeout Procedures."

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Print manuals on heavy, first quality paper.
 - 1. Paper shall be 8-1/2" x 11" paper.
 - a. Reduce drawings and diagrams to 8-1/2" x 11" paper size.
 - b. When reduction is not practical, fold drawings and place each separately in a clear, super heavy weight, top loading polypropylene sheet protector designed for ring binder use. Provide a typed identification label on each sheet protector.
 - 2. Punch paper for standard three-ring binders.
- B. Place manuals in Wilson Jones 385 Line D-Ring Dublock Presentation Binders.
 - 1. Binders are to have clear front, back, and spine covers.
 - 2. Sheet lifters are to be provided.
 - 3. Minimum size is 2" capacity. Maximum size is 3" capacity.
- C. Provide tab indexes for each section of manual.
 - 1. Indexes are to be constructed of heavy-duty paper with a reinforced binding edge and punched with 9/32" holes to fit binders.
 - 2. Index is to have clear insertable tabs for a typed insert.

2.02 ELECTRONIC MANUAL FORMAT

- A. Manual contents to be provided on compact disc (CD).
 - 1. Minimum CD storage capacity is 700 MB.
 - 2. CD to have read/write capability.
- B. Provide individual electronic files for each manual.
 - 1. Maximum file size is 5MB. If manual is greater than maximum allowable file size, provide individual files for each major section of manual.
 - 2. Acceptable file types for written documents are Portable Document File (PDF) or Microsoft Word formats. Acceptable file types for drawing files are PDF formats. All files shall be compatible with latest software version available.
 - 3. Filename shall identify plant site, plant area, equipment manufacturer, and date equipment placed in service.
 - 4. Each electronic file shall contain a table of contents at beginning of file which includes hypertext links or bookmarks to navigate file contents per section/chapter.
 - 5. Scanned images of written documents are not acceptable. Document must allow character selection. Text within a file shall be transferable to other documents.
 - 6. Drawing files shall have an ability to turn on/off drawing layers within file.
 - 7. Submit a preliminary version of electronic format of manual for review. Upon approval of preliminary submittal, Contractor shall provide three copies of electronic manual to Owner.

PART 3 - EXECUTION

3.01 MANUAL ORGANIZATION AND CONTENTS

- A. Provide a Table of Contents listing each section of manual for each product or system.
 - 1. Identify each product or system using the nomenclature shown in Contract Documents.
 - 2. Assign a number and letter to each section in manual.
 - a. Assign a number to each product or system. Number is to correspond to Owner's equipment numbering system or other system designated by Engineer.
 - b. A cross reference is to be provided for Owner's numbering system and designations for equipment indicated in Contract Documents.
 - c. Letter assigned will represent part of the manual, consistent with manual contents as required by Paragraphs 3.2, 3.3, and 3.4.
 - 3. Provide index tabs for each section in manual.
 - 4. Designation on each index tab is to correspond to number and letter assigned in Table of Contents.
- B. Include only the information that pertains to product described. Annotate each sheet to:
 - 1. Clearly identify specific product or component installed.
 - 2. Clearly identify data applicable to installation.
 - 3. Delete reference to inapplicable information.
- C. Supplement manual information with drawings as necessary to clearly illustrate relations of component parts of equipment and systems, and control and flow diagrams.
- D. Identify each manual by placing a printed cover sheet in front cover of each binder and as first page in manual. First page is to be placed in a clear polypropylene sheet protector. Information on first page and cover page are to include:
 - 1. Name of Owner.
 - 2. Project name.
 - 3. Volume number.
 - 4. Table of Contents for that volume.
- E. Insert Table of Contents into spine of each manual.

- F. Manuals for several products or systems may be provided in same binder.
 - 1. Sections for each product or system must be included in same binder.
 - 2. Sections must be in numerical order from volume to volume.
- G. Correlate the data into related groups when multiple binders are used.
- H. Fill binders to only three-fourths of its indicated capacity to allow for addition of materials to each binder by Owner.

3.02 EQUIPMENT AND SYSTEMS MANUAL CONTENT

- A. Manual shall provide the following information:
 - 1. A description of unit and component parts.
 - 2. Operating instructions for startup, normal operations, regulation, control, shutdown, emergency conditions, and limiting operating conditions.
 - 3. Maintenance instructions including assembly, installation, alignment, adjustment, and checking instructions.
 - 4. Lubrication schedule and lubrication procedures. Include a cross reference for recommended lubrication products.
 - 5. Troubleshooting guide.
 - 6. Schedule of routine maintenance requirements.
 - 7. Description of sequence of operation by the control manufacturer
 - 8. Warnings for detrimental maintenance practices.
 - 9. Parts lists including:
 - a. Part numbers for ordering new parts.
 - b. Assembly illustrations showing an exploded view of complex parts of product.
 - c. Predicted life of parts subject to wear.
 - d. List of manufacturer's recommended spare parts, current prices with effective date and number of parts recommended for storage.
 - e. Directory of a local source of supply for parts with company name, address, and telephone number.
 - f. Complete nomenclature and list of commercial replacement parts.
 - 10. Outline, cross-section and assembly drawings, engineering data, test data, and performance curves.
 - 11. Control schematics and point to point wiring diagrams prepared for field installation, including circuit directories of panel boards and terminal strips.
 - 12. List of identification nameplates installed on equipment and valve identification per Contract Documents.
 - 13. Other information as may be required by individual Specifications.

3.03 LIST OF SERVICE ORGANIZATIONS

- A. Provide a directory of authorized service organizations with company name, address, telephone number, e-mail address and contact person for warranty repair.

END OF SECTION

SECTION 01 73 20

OPENINGS AND PENETRATIONS IN CONSTRUCTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes requirements for installing and sealing openings and penetrations in construction.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 – Proposal Requirements, Contract Forms, and Conditions of Contract.
 - 2. Division 01 – General Requirements.

1.02 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Concrete Institute (ACI):
 - a. 318 – Building Code Requirements for Structural Concrete.
 - 2. ASTM International (ASTM):
 - a. A36 – Standard Specification for Carbon Structural Steel.
 - b. A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 3. National Fire Protection Association (NFPA):
 - a. 70 – National Electrical Code (NEC).
 - b. 90A – Standard for Installation of Air Conditioning and Ventilating Systems.
 - 4. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
- B. Obtain prior approval from Engineer when any opening larger than 100 square inches must be made in existing or newly completed construction.

1.03 DEFINITIONS

- A. Hazardous Areas: Areas shown in Contract Documents as having Class I or Class II area classifications.
- B. Washdown Areas: Areas having floor drains or hose bibs.

1.04 SUBMITTALS

- A. Shop Drawings:
 - 1. See Section 01 33 00 – Submittals for requirements for mechanics and administration of submittal process.
 - 2. For each structure provide dimensioned or scaled (minimum 1/8" = 1') plan view drawings containing the following information:
 - a. Vertical and horizontal location of all required openings and penetrations.
 - b. Size of all openings and penetrations.
 - c. Opening type.
 - d. Seal type.
 - 3. Manufacturer's installation instructions for standard manufactured products.

PART 2 - PRODUCTS

2.01 CHANGE REQUEST

- A. Submit request for substitution in accordance with Section 01 25 13 – Product Substitution.

2.02 MATERIALS

- A. Pipe Sleeves: Steel, ASTM A53, Schedule 40, black steel unless otherwise noted on Drawings.
- B. Pipe Sleeves Penetrating into Corrosive Areas (Chemical Rooms): Stainless steel, 1/4" minimum thickness.
- C. Modular Mechanical Seals:
 - 1. Acceptable manufacturers:
 - a. Link-Seal.
 - b. Approved equal.
 - 2. 316 stainless steel bolts, nuts and washers.
- D. Sheet Metal Sleeves: Black steel, ASTM A36, 12 GA.
- E. Commercial Wall Castings:
 - 1. For unclassified areas both sides of penetration:
 - a. Ductile iron, class equal to connecting piping system.
 - 2. For wet/corrosive areas either side of penetration:
 - a. Stainless steel, 316L.

PART 3 - EXECUTION

3.01 INSTALLATION AND APPLICATION

- A. Perform HVAC penetrations in accordance with NFPA 90A.
- B. Perform electrical penetrations in accordance with NFPA 70, Article 501.
- C. Install sleeves and castings in accordance with ACI 318, Chapter #6.
- D. Paint in accordance with Division 09 all steel sleeves installed.
- E. When mechanical or electrical work cannot be installed as structure is being erected, provide and arrange for building-in of boxes, sleeves, insets, fixtures or devices necessary to permit installation later.
 - 1. Lay out chases, holes or other openings which must be provided in masonry, concrete or other work.
- F. Where pipes, conduits or ducts pass through floors in wash down areas, install sleeves with top 3" above finish floors.
 - 1. In non-wash down areas, install sleeves with ends flush with finished surfaces.
- G. Size sleeves, blockouts and cutouts which will receive sealant seal such that free area to receive sealant is minimized and seal integrity may be obtained.
- H. For insulated piping and ducts, size sleeves, blockouts and cutouts large enough to accommodate full thickness of insulation.
- I. Do not cut into or core drill any beams, joists, or columns.
- J. Do not install sleeves in beams, joists, or columns.
- K. Do not install recesses in beams, joists, columns, or slabs.
- L. Field Cutting and Coring:
 - 1. Saw or core drill with non-impact type equipment.
 - 2. Mark opening and drill small 3/4" or less holes through structure following opening outline.

3. Sawcut opening outline on both surfaces.
 - a. Knock out within sawcuts using impact type equipment.
 - b. Do not chip or spall face of surface to remain intact.
 - c. Do not allow any overcut with saw kerf.
- M. Precast-Prestressed Concrete Construction:
1. Do not cut openings nor core drill vertically or horizontally through stems of members.
 2. Do not locate or install sleeves or recess sleeves vertically or horizontally through or in stems of members.
 3. Cast openings and sleeves into flanges of units.
 4. Cast openings larger than 6" in diameter or 6" maximum dimension in units at time of manufacture.
 5. Cast openings smaller than 6" in diameter or 6" maximum dimensions in flanges of units at time of manufacture or field cut.
- N. Where alterations are necessary or where new and old work join, restore adjacent surfaces to their condition existing prior to start of work.
- O. Provide waterstop plate/anchor flange for piping, ducts, castings and sleeves cast-in-place in concrete.
1. For fabricated units, weld plate to sleeve, pipe, or ductwork.
 2. For commercial castings, cast water stop/anchor with wall pipe.
 3. Plate is to be same thickness as sleeve, pipe, casting or ductwork.
 4. For fabricated units, diameter of plate or flange to be 4" larger than outside diameter of sleeve, pipe or ductwork.
 5. For commercial castings, waterstop/anchor size to be manufacturer standard.
 6. Provide continuous around entire circumference of sleeve, pipe, or ductwork.
- P. Where area is blocked out to receive sheet metal sleeve at later date:
1. If blockout size is sufficient to allow placement, utilize dowels for interface of initially placed concrete and sleeve encasement concrete placed later
 2. Size blockout based on sleeve size required plus 4" to 6" each side of sleeve for concrete encasement.
 - a. Provide #4 dowels at 12" spacing along each side of blockout with minimum of two (2) dowels required per side.
 3. If blockout size is not sufficient to allow placement of dowels, provide keyway along all sides of blockout.
 - a. Size blockout based on sleeve size required plus 2" to 4" each side of sleeve for concrete encasement.
- Q. For interior wall applications where backer rod and sealant are specified, provide backer rod and sealant at each side of wall.
- R. Use full depth expanding foam sealant for seal applications where single or multiple pipes, conduits, etc., pass through a single sleeve.
- S. Do not make duct or conduit penetrations below high water levels when entering or leaving tankage, wet wells, or other water holding structures.
- T. Modular Mechanical Seals:
1. Utilize one (1) seal for concrete thickness less than 8" and two (2) seals for concrete, 8" thick or greater.
 2. Utilize two (2) seals for piping 16" diameter and larger if concrete thickness permits.
 3. Install seals such that bolt heads are located on most accessible side of penetration.

3.02 SCHEDULES

- A. General Schedule of Penetrations through Floors, Roofs, Foundation Base Slabs, Foundation Walls, Foundation Footings, Partitions and Walls for Ductwork, Piping, and Conduit:
1. Provide the following opening and penetration types:
 - a. Type A - Block out 2" larger than outside dimensions of duct, pipe, or conduits.
 - b. Type B - Saw cut or line-drill opening. Place new concrete with integrally cast sheet metal or pipe sleeve.
 - c. Type C - Fabricated sheet metal sleeve or pipe sleeve cast-in-place. Provide pipe sleeve with water ring for wet and/or washdown areas.
 - d. Type D - Commercial type casting or fabrication.
 - e. Type E - Saw cut or line-drill opening. Place new concrete with integrally cast pipe, duct or conduit spools.
 - f. Type F - Integrally cast pipe, duct or conduit.
 - g. Type G - Saw cut or line-drill and remove area 1" larger than outside dimensions of duct, pipe or conduit.
 - h. Type H - Core drill.
 - i. Type I - Block out area. At later date, place new concrete with integrally cast sheet metal or pipe sleeve.
 2. Provide seals of material and method described as follows.
 - a. Category 1 - Modular Mechanical Seal.
 - b. Category 2 - Not used.
 - c. Category 3 - 12 GA sheet metal drip sleeve set in bed of silicon sealant with backing rod and sealant used in sleeve annulus.
 - d. Category 4 - Backer rod and sealant.
 - e. Category 5 - Full depth compressible sealant with escutcheons on both sides of opening.
 - f. Category 6 - Full depth compressible sealant and flanges on both sides of opening. Flanges constructed of same material as duct, fastened to duct and minimum 1/2" larger than opening.
 - g. Category 7 - Full depth compressible sealant and finish sealant or full depth expanding foam sealant depending on application.
 3. Furnish openings and sealing materials through new floors, roofs, partitions and walls in accordance with Schedule A, Openings and Penetrations for New Construction.
 4. Furnish openings and sealing materials through existing floors, roofs, partitions and walls in accordance with Schedule B, Openings and Penetrations for Existing Construction.

SCHEDULE A OPENINGS AND PENETRATIONS SCHEDULE FOR NEW CONSTRUCTION						
Application	Ducts		Pipes		Conduits	
	Opening Type	Seal Category	Opening Type	Seal Category	Opening Type	Seal Category
Floors in hazardous location	C F I	7 Not Req 7	D F I	Not Req Not Req 7	C F	7 Not Req
Floors on grade above water	C F I	4 Not Req 4	C F I	7 Not Req 7	C F I	4 Not Req 7
Slab on grade below water	F	Not Req	F	Not Req	F	Not Req

**SCHEDULE A
OPENINGS AND PENETRATIONS SCHEDULE
FOR NEW CONSTRUCTION**

Application	Ducts		Pipes		Conduits	
	Opening Type	Seal Category	Opening Type	Seal Category	Opening Type	Seal Category
Floors wash down areas	C I	4 4	C H I	4 3 4	F H I	Not Req 3 7
Walls in hazardous location	C F I	7 Not Req 7	D F I	Not Req Not Req 7	C F	7 Not Req
Exterior wall below grade and above water	C F I	7 Not Req 7	C D F I	1 Not Req Not Req 1	F I	Not Req 7
Wall from tank above high water level	C F I	7 Not Req 7	C D F H	1 Not Req Not Req 1	C F H I	7 Not Req 7 7
Wall from tank below water level	F	Not Req	F	Not Req	F	Not Req
Exterior wall above grade	A B C	6 6 6	A B D H	5 5 Not Req 5	C H	5 4
Roof penetration	A	2	A	2	A	2
Interior wall and slab not otherwise covered	A C	4 4	A C	4 4	A C F	4 4 Not Req

SCHEDULE B OPENINGS AND PENETRATIONS SCHEDULE FOR NEW CONSTRUCTION						
Application	Ducts		Pipes		Conduits	
	Opening Type	Seal Category	Opening Type	Seal Category	Opening Type	Seal Category
Floors in hazardous location	B E	7 Not Req	B E H	7 Not Req 7	B E H	7 Not Req 7
Floors on grade above water	B	7	B	7	B	7
Slab on grade below water	E	Not Req	E	Not Req	E	Not Req
Floors wash down areas	G	3	G H	3 3	G H	3 3
Walls in hazardous location	B E	7 Not Req	B B E H	7 1 Not Req 7	B E H	7 Not Req 7
Exterior wall below grade and above water	B	7	B E H	7 1 1	B H	7 7
Wall from tank above high water level	B E	7 Not Req	B E H	1 Not Req 1	B E H	7 Not Req 7
Wall from tank below water level	B	Not Req	E	Not Req	E	Not Req
Exterior wall above grade	G	6	G H	5 5	G H	5 7
Roof penetration	G	2	G H	2	G	2
Interior wall and slab not otherwise covered	G	4	G H	4 4	G H	4 4

END OF SECTION

SECTION 01 74 19

CONSTRUCTION WASTE DISPOSAL

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes requirements for all construction waste disposal.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 – Proposal Requirements, Contract Forms, and Conditions of the Contract.
 - 2. Division 01 – General Requirements.

1.02 MEASUREMENT AND PAYMENT

- A. No separate payment will be made for waste material disposal under this Section. Include payment in unit price for related sections.

1.03 SUBMITTALS

- A. Conform to requirements of Section 01 33 00 - Submittals.
- B. Obtain and submit disposal permits for proposed disposal sites if required by local ordinances. Submit a copy of all disposal permits to Engineer.
- C. Submit copy of written permission from property Owner(s) outside limits of Project, with description of property, prior to disposal of excess material. Submit written and signed release from property Owner upon completion of disposal work. Copies of the permission and release documents are to be submitted to Engineer.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 SALVAGEABLE MATERIAL

- A. Excavated Material: When indicated on Drawings, load, haul, and deposit excavated material at location or locations shown on Drawings outside limits of Project.
- B. Other Salvageable Materials: Conform to requirements of individual Specification Sections.
- C. Coordinate with Engineer loading of salvageable material.

3.02 EXCESS MATERIAL

- A. Remove and legally dispose of all vegetation, rubble, broken concrete, debris, asphaltic concrete pavement, rocks, excess soil, and other materials not designated for salvage from Site.
- B. Excess soil may be deposited on private property outside Project limits when written permission is obtained from property owner.
- C. Verify flood plain status of any proposed disposal site. Do not dispose of excavated materials in area designated as within 100-year Flood Hazard Area unless proper State and Federal permits have been obtained. Remove all excess material placed in “100-year Flood Hazard Area” at no additional cost to Owner.

- D. Remove waste materials from Site weekly, in order to maintain Site in neat and orderly condition, unless otherwise authorized by Owner.
- E. Burning of any construction waste is not allowed, under any condition. Remove all construction wastes from Site and properly dispose.

END OF SECTION

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Maintenance and Submittal.
 - 2. Recording.
 - 3. Submittals.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 – Proposal Requirements, Contract Forms, and Conditions of Contract.
 - 2. Division 01 – General Requirements.

1.02 SUBMITTALS

- A. At closeout, deliver Project Record Documents to Engineer.

1.03 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Maintain one record copy of documents at Site in accordance with Section 00 70 00 - General Conditions and Section 01 10 40 - Project Coordination.
- B. Store Record Documents and samples in field office when field office is required by Contract, or in secure location. Provide files, racks, and secure storage for Record Documents and samples.
- C. Label each document "PROJECT RECORD" in neat, large, printed letters.
- D. Maintain Record Documents in clean dry and legible condition. Do not use Record Documents for construction purposes.
- E. Keep Record Documents and Samples available for inspection by Engineer.
- F. Bring Record Drawings to progress review meetings for viewing by Engineer.

1.04 RECORDING

- A. Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- B. Contract Drawings: Legibly mark each item to record actual construction, or "as built" conditions, including:
 - 1. Measured depths of elements of foundation in relation to finish first floor datum.
 - 2. Measured horizontal locations and elevations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 3. Elevations of underground utilities referenced to bench mark utilized for Project.
 - 4. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of construction.
 - 5. Field changes of dimension and detail.
 - 6. Modifications made by either Work Order or Change Order.
 - 7. Details not on original Contract Drawings.
 - 8. References to related shop drawings and modifications.

- C. Maintain at Site, at all times, an instrument for accurately measuring elevations. Survey every joint of water main at time of construction and record on drawings water main invert elevation, including elevation top of manway and centerline horizontal location relative to baseline.
- D. Record information with red felt-tip marking pen on set of blue line opaque drawings.
- E. Legibly mark Record Drawings to record:
 - 1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
 - 2. Changes made by Change Order or Work Order.
 - 3. Other matters not originally specified.
- F. Legibly annotate shop drawings to record changes made after review.
- G. Provide the following record information to Engineer:
 - 1. Labeled "Project Record" in large printed letters documents.
 - 2. Record information from construction.
 - a. Depths of various elements of foundation in relation to finished first floor datum or top of walls.
 - b. Horizontal and vertical locations of underground utilities and appurtenances constructed and existing utilities encountered during construction.
 - c. Location of internal utilities and appurtenances concealed in construction. Refer measurements to permanent structure on surface. Include the following equipment:
 - 1). Piping.
 - 2). All devices requiring periodic maintenance or repair.
 - 3) Valves, unions, traps, and tanks.
 - d. Changes of dimension and detail.
 - e. Changes made by Work Order and Change Order.
 - f. Details not on original Drawings. Include field verified dimensions and clarifications, interpretations, and additional information issued in response to RFIs.
 - g. Marked Specifications and Addenda identifying products provided.
 - 1). Record product name, trade name, catalog number, and each Supplier (with address and phone number) of each product and item of equipment actually installed.
 - 2). Record changes made by Work Order and Change Order.
 - h. Marked additional Work or information in erasable pencil.
 - 1). Use red for new or revised indication.
 - 2). Use purple for Work deleted or not installed (lines to be removed).
 - 3). Highlight items constructed per Contract Documents in yellow.
 - i. Submit record documents to Engineer for review and acceptance 30 days prior to final completion of Project.
 - 1). Provide one set of marked up Drawings.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 03 30 00

CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This Section specifies cast-in-place concrete and material and mixes for other concrete.

1.02 TOLERANCES

- A. ACI 117.
- B. Slab Finishes: ACI 117, F-number method in accordance with ASTM E1155.

1.03 REGULATORY REQUIREMENTS

- A. ACI SP-66 - ACI Detailing Manual.
- B. ACI 318 - Building Code Requirements for Reinforced Concrete.

1.04 SUBMITTALS

- A. Submit in accordance with Section 01 33 00 - Submittals.
- B. Concrete Mix Design.
- C. Shop Drawings:
 - 1. Submit Steel Reinforcement Shop Drawings and Product Data to include all information necessary for fabrication and placement of reinforcement.
 - 2. Indicate grades of reinforcing steel.
 - 3. Clearly indicate splice length for every size and type of bar used.
 - 4. Indicate the type, size and location of all accessories required for proper assembly, placement and support of all reinforcement including dowels and splices.
 - 5. Provide layout drawings of all floor slabs and formed concrete indicating control and expansion joints.
- D. Manufacturer's Certificates: Air entraining admixture, chemical admixtures, curing compounds.

1.05 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this Specification to extent referenced. Publications are referenced in text by basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
- B. American Concrete Institute (ACI):
 - 117-10 Tolerances for Concrete Construction and Materials and Commentary
 - 211.1-91(R2009) Selecting Proportions for Normal, Heavyweight, and Mass Concrete
 - 301-10 Structural Concrete
 - 305R-10 Guide to Hot Weather Concreting
 - 306R-10 Guide to Cold Weather Concreting
 - SP-66-04 ACI Detailing Manual
 - 318/318M-11 Building Code Requirements for Structural Concrete and Commentary
 - 347R-04 Guide to Formwork for Concrete
- C. American Society for Testing and Materials (ASTM):
 - A185/A185M-07 Steel Welded Wire Reinforcement, Plain, for Concrete

A615/A615M-12	Deformed and Plain Carbon Steel Bars for Concrete Reinforcement
A996/A996M-09b	Rail Steel and Axle Steel Deformed Bars for Concrete Reinforcement
C31/C31M-12	Making and Curing Concrete Test Specimens in the Field
C33/C33M-13	Concrete Aggregates
C39/C39M-12a	Compressive Strength of Cylindrical Concrete Specimens
C94/C94M-13	Ready Mixed Concrete
C143/C143M-12	Slump of Hydraulic Cement Concrete
C150/C150M-12	Portland Cement
C17107	Sheet Materials for Curing Concrete
C172/C172M-10	Sampling Freshly Mixed Concrete
C173/C173M-12	Air Content of Freshly Mixed Concrete by the Volumetric Method
C192/C192M-12a	Making and Curing Concrete Test Specimens in the Laboratory
C231/C231M-10	Air Content of Freshly Mixed Concrete by the Pressure Method
C260/C260M-10a	Air Entraining Admixtures for Concrete
C494/C494M-13	Chemical Admixtures for Concrete
D175104(R2008)	Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
E1155-96(2008)	Determining FF Floor Flatness and FL Floor Levelness Numbers

PART 2 - PRODUCTS

2.01 FORMS

- A. New wood or plywood, metal, or other materials as approved by Engineer, of grade or type suitable to obtain type of finish specified. Forms shall be new material and not recycled or used on other Projects.

2.02 MATERIALS

- A. Portland Cement: ASTM C150, Type I or II.
- B. Fly Ash: Use of Fly Ash is not allowed on this Project.
- C. Coarse Aggregate: ASTM C33, Size 67. Size 467 may be used for footings and walls over 12" thick. Provide Size 7 coarse aggregate for applied topping and metal pan stair fill.
- D. Fine Aggregate: ASTM C33.
- E. Lightweight Aggregate for Structural Concrete: ASTM C330, Table 1
- F. Mixing Water: Fresh, clean, and potable.
- G. Air-Entraining Admixture: ASTM C260.
- H. Chemical Admixtures: ASTM C494.
- I. Vapor Barrier: ASTM E1745, 10 mil, unless otherwise noted on Drawings.
- J. Reinforcing Steel: ASTM A615 or ASTM A996, deformed. See structural drawings for grade.
- K. Welded Wire Fabric: ASTM A185.
- L. Expansion Joint Filler: ASTM D1751.
- M. Sheet Materials for Curing Concrete: ASTM C171.
- N. Abrasive Aggregates: Aluminum oxide grains or emery grits.

- O. Liquid Hardener and Dustproofers: Fluosilicate solution or magnesium fluosilicate or zinc fluosilicate. Magnesium and zinc may be used separately or in combination as recommended by manufacturer.
- P. Liquid Densifier/Sealer: 100% active colorless aqueous silicate solution.
- Q. Grout, Non-Shrinking: Premixed ferrous or non-ferrous, mixed and applied in accordance with manufacturer's recommendations. Grout cannot show settlement or vertical drying shrinkage at 3 days or thereafter based on initial measurement made at time of placement. Grout must produce a compressive strength of minimum 2,500 psi at 3 days and minimum 5,000 psi at 28 days.

2.03 CONCRETE MIXES

- A. Design of concrete mixes using materials specified as set forth under Option C of ASTM C94.
- B. Compressive strength at 28 days: Minimum of 4,000 psi unless otherwise noted on Drawings.
- C. Establish strength of concrete by testing prior to beginning concreting operation. Test consists of average of three (3) cylinders made and cured in accordance with ASTM C192 and tested in accordance with ASTM C39.
- D. Maximum slump for vibrated concrete is 4" tested in accordance with ASTM C143.
- E. Cement and water factor (See Table I):

TABLE I - CEMENT AND WATER FACTORS FOR CONCRETE

Concrete: Strength Min. 28 Day Comp. Str. (psi)	Non-Air-Entrained		Air-Entrained	
	Min. Cement (lbs/c. yd)	Max. Water Cement Ratio	Min. Cement (lbs/cu. yd)	Max. Water Cement Ratio
5000 ^{1,3}	630	0.45	650	0.40
4000 ^{1,3}	550	0.55	570	0.50
3000 ^{1,3}	470	0.65	490	0.55

- 1. If trial mixes are used, the proposed mix design must achieve a compressive strength 1,200 psi in excess of f'c. For concrete strengths above 5,000 psi, proposed mix design must achieve a compressive strength 1,400 psi in excess of f'c.
- 2. Lightweight Structural Concrete. Pump mixes may require higher cement values.
- 3. For concrete exposed to high sulfate content soils maximum water cement ratio is 0.44.
- F. Air-entrainment is required for all exterior concrete. Air content must conform with ACI 318 Table 4.4.1.

2.4 BATCHING AND MIXING

- A. Store, batch, and mix materials as specified in ASTM C94.
 - 1. Job-Mixed: Mix in a batch mixer in manner specified for stationary mixers in ASTM C94.
 - 2. Ready-Mixed: Comply with ASTM C94, except use of non-agitating equipment for transporting concrete to Site will not be permitted. With each load of concrete delivered to Project, ready-mixed concrete producer must furnish, in duplicate, certification as required by ASTM C94.
 - 3. Mixing structural concrete: Charge mixer with 2/3 of total mixing water and all of aggregate. Mix ingredients for not less than 30 seconds in a stationary mixer or not less than 10 revolutions at mixing speed in a truck mixer. Add remaining mixing water and

other ingredients and continue mixing. Above procedure may be modified as recommended by aggregate producer.

PART 3 - EXECUTION

3.01 FORMWORK

- A. Installation conforms to ACI 347. Sufficiently tight to hold concrete without leakage, sufficiently braced to withstand vibration of concrete, and to carry, without appreciable deflection while remaining within allowable construction tolerances, all dead and live loads to which they may be subjected.
1. Eliminate form marks, voids, bug holes, etc. from final concrete where it will be exposed to view.
- B. Treating and Wetting: Treat or wet contact forms as follows:
1. Coat plywood and board forms with non-staining form sealer. In hot weather cool forms by wetting with cool water just before concrete is placed.
 2. Clean and coat removable metal forms with light form oil before reinforcement is placed. In hot weather, cool metal forms by thoroughly wetting with water just before placing concrete.
 3. Use sealer on reused plywood forms as specified for new material.
- C. Inserts, sleeves, and similar items: Flashing reglets, masonry ties, anchors, inserts, wires, hangers, sleeves, boxes for floor hinges and other items specified as furnished under this and other sections of specifications are required to be in their final position at time concrete is placed - properly located, accurately positioned, built into construction, and maintained securely in place.
- D. Construction Tolerances:
1. Set and maintain concrete formwork to assure erection of completed work within tolerances specified to accommodate installation of other rough and finish materials.
 2. /Cast-in-place concrete installed as part of, or in complexes surrounding, columbarian or memorial wall elements to have concrete (on or above finished grade) constructed to dimensions indicated on Drawings within 1/4" of location and elevation.
 3. Engage a professional surveyor to survey form work for exposed portions of foundations for columbarian or memorial walls, including wall segments, piers and/or columns, prior to concrete being poured. If forms are not correct, they must be corrected and resurveyed. When correct, provide a written certification from the surveyor, to Engineer, that forms are set according to Drawings, within allowable tolerances for elevation, location, orientation, and dimensions called for on Drawings.
 4. Properly brace forms so the set concrete is correct within allowable construction tolerances when forms are removed.
 5. Upon removal of forms, the professional surveyor must survey the placed concrete and provide information to Engineer where work is not in conformance with Drawings, within allowable construction tolerances. Work cannot progress until exposed concrete for foundations are brought into compliance.
 6. Remedial work necessary for correcting installations that is in excess of allowable tolerances are the responsibility of Contractor.
 7. Erected work that exceeds specified tolerance limits must be remedied or removed and replaced, at no additional cost to Owner.
 8. Any remediation work is subject to approval of Engineer in advance of work.
 9. Permissible surface irregularities for various classes of materials are defined as "finishes" in specification sections covering individual materials. They are to be distinguished from tolerances specified which are applicable to surface irregularities of structural elements.

3.2 REINFORCEMENT

- A. Details of concrete reinforcement, unless otherwise shown, in accordance with ACI 318 and ACI SP-66. Support and securely tie reinforcing steel to prevent displacement during placing of concrete.

3.03 VAPOR BARRIER

- A. Place under all on-grade concrete slabs a continuous 8 mil poly vapor barrier.
- B. Place 6" of fine granular fill over the vapor barrier to act as a blotter for all concrete slabs on grade.
- C. Lap joints 6" and seal with a compatible pressure-sensitive tape.
- D. Patch punctures and tears.

3.04 PLACING CONCRETE

- A. Remove water from excavations before concrete is placed. Remove hardened concrete, debris and other foreign materials from interior of forms, and from inside of mixing and conveying equipment. Obtain approval of Engineer before placing concrete. Provide screeds at required elevations for concrete slabs.
- B. Roughen and clean set concrete free from laitance, foreign matter, and loose particles, before placing new concrete on or against concrete which has set.
- C. Convey concrete from mixer to final place of deposit by method which will prevent segregation or loss of ingredients. Do not deposit in work concrete that has attained its initial set or has contained its water or cement more than 1 1/2 hours. Do not allow concrete to drop freely more than 5 feet in unexposed work nor more than 3 feet in exposed work. Place and consolidate concrete in horizontal layers not exceeding 12" in thickness. Consolidate concrete by spading, rodding, and mechanical vibrator. Do not secure vibrator to forms or reinforcement. Provide vibration continuously with placing of concrete.
- D. Hot weather placing of concrete: Follow recommendations of ACI 305R to prevent problems in the manufacturing, placing, and curing of concrete that can adversely affect the properties and serviceability of the hardened concrete.
- E. Cold weather placing of concrete: Follow recommendations of ACI 306R, to prevent freezing of thin sections less than 12" and to permit concrete to gain strength properly, except that use of calcium chloride cannot be used without written approval from Engineer.

3.05 PROTECTION AND CURING

- A. Protect exposed surfaces of concrete from premature drying, wash by rain or running water, wind, mechanical injury, and excessively hot or cold temperature. Curing method is subject to approval by Engineer.

3.6 FORM REMOVAL

- A. Forms remain in place until concrete has a sufficient strength to carry its own weight and loads supported. Removal of forms at any time is Contractor's sole responsibility.

3.07 SURFACE PREPARATION

- A. Immediately remove loose materials, after forms have been removed and work has been examined and approved by Engineer, and patch all stone pockets, surface honeycomb, or similar deficiencies with cement mortar made with 1 part portland cement and 2 to 3 parts sand.
- B. For exposed surfaces of concrete for the columbarium and memorial walls and walls in their complexes, follow the procedures identified in Paragraph FINISHES for Exterior Exposed Areas (finished).
- C. For columbarium and memorial walls and their complexes, immediately after forms are removed, take steps to prepare and smooth all exposed (interior and exterior) portions of concrete by rubbing. Remove form marks, including joint marks, fins, burrs and similar projections to produce a smooth surface. Complete surface finish to result in a uniform textured surface with homogeneous color, unless surface is to be otherwise treated. Work must be as approved by Engineer.

3.08 FINISHES

- A. Vertical and Overhead Surface Finishes:
 - 1. Unfinished Areas: Vertical and overhead concrete surfaces exposed in unfinished areas, above suspended ceilings in manholes, and other unfinished areas exposed or concealed will not require additional finishing.
 - 2. Interior and Exterior Exposed Areas (to be painted): Fins, burrs and similar projections on surface must be knocked off flush by mechanical means approved by Engineer and rubbed lightly with a fine abrasive stone or hone. Use an ample amount of water during rubbing without working up a lather of mortar or changing texture of concrete.
 - 3. Interior and Exterior Exposed Areas (finished): Provide grout finish of uniform color and smooth finish treated as follows:
 - a. After concrete has hardened and laitance, fins and burrs have been removed, scrub concrete with wire brushes. Clean stained concrete surfaces by use of a hone or stone.
 - b. Apply grout composed of 1 part Portland cement and 1 part clean, fine sand (smaller than 600 micro-m (No. 30) sieve). Work grout into surface of concrete with cork floats or fiber brushes until all pits and honeycomb are filled.
 - c. After grout has hardened, but still plastic, remove surplus grout with a sponge rubber float and by rubbing with clean burlap.
 - d. In hot, dry weather use a fog spray to keep grout wet during setting period. Complete finish for any area in same day. Confine limits of finished areas to natural breaks in wall surface. Do not leave grout on concrete surface overnight.
- B. Slab Finishes:
 - 1. Scratch Finish: Slab surfaces to receive a bonded applied cementitious applications must be thoroughly raked or wire broomed after partial setting (within 2 hours after placing) to roughen surface and ensure a permanent bond between base slab and applied cementitious materials.
 - 2. Floating: Allow water brought to surface by float used for rough finishing to evaporate before surface is again floated or troweled. Do not sprinkle dry cement on surface to absorb water.
 - 3. Float Finish: Screen and float ramps, stair treads, and platforms, both interior and exterior, equipment pads, and slabs to receive non-cementitious materials, except as specified, to a smooth dense finish. Check for alignment using a straightedge or template after first floating and while surface is still soft. Correct high spots by cutting down with a trowel or similar tool and correct low spots by filling in with material of same

composition as floor finish. Remove any surface projections on floated finish by rubbing or dry grinding. Refloat the slab to a uniform sandy texture.

4. Steel Trowel Finish: Applied toppings, concrete surfaces to receive resilient floor covering or carpet, future floor roof and all monolithic concrete floor slabs exposed in finished work and for which no other finish is shown or specified must be steel troweled. Delay final steel troweling to secure a smooth, dense surface as long as possible, generally when the surface can no longer be dented with finger. During final troweling, tilt steel trowel at a slight angle and exert heavy pressure on trowel to compact cement paste and form a dense, smooth surface. Finished surface must be free of trowel marks, uniform in texture and appearance.
5. Broom Finish: Finish all exterior slabs, ramps, and stair treads with a bristle brush moistened with clear water after surfaces have been floated.
6. Finished slab flatness (FF) and levelness (FL) values must comply with the following minimum requirements:

Slab On Grade & Shored Suspended Slabs	Unshored Suspended Slabs
Specified overall value F _F 25/F _L 20	Specified overall value F _F 25
Minimum local value F _F 17/F _L 15	Minimum local value F _F 17

3.09 SURFACE TREATMENTS

- A. Mix and apply surface treatments in accordance with manufacturer's printed instructions.
- B. Liquid Densifier/Sealer: Use on all exposed concrete floors and concrete floors to receive carpeting except those specified to receive non-slip finish.
- C. Non-Slip Finish: Except where safety nosing and tread coverings are shown, apply non-slip abrasive aggregate to treads and platforms of all concrete steps and stairs, and to surfaces of exterior concrete ramps and platforms. Broadcast aggregate uniformly over concrete surface. Trowel concrete surface to smooth dense finish. After curing, rub treated surface with abrasive brick and water sufficiently to slightly expose abrasive aggregate.

3.10 APPLIED TOPPING

- A. Separate concrete topping with thickness and strength shown with only enough water to insure a stiff, workable, plastic mix.
- B. Continuously place applied topping until entire section is complete, struck off with straightedge, compact by rolling or tamping, float and steel trowel to a hard smooth finish.

3.11 RESURFACING FLOORS

- A. Remove existing flooring, in areas to receive resurfacing, to expose existing structural slab and to extend not less than 1" below new finished floor level. Prepare exposed structural slab surface by roughening, broom cleaning, wetting, and grouting. Apply topping as specified.

3.12 RETAINING WALLS

- A. Provide concrete for retaining walls as shown and air-entrained.
- B. Install and construct expansion and contraction joints, waterstops, weep holes, reinforcement and railing sleeves as shown.
- C. Finish exposed surfaces to match adjacent concrete surfaces, new or existing.

D. Place porous backfill as shown.

3.13 PRECAST CONCRETE ITEMS

A. Cast precast concrete items, not specified elsewhere, using 5,000 psi air-entrained concrete to shapes and dimensions shown. Finish surfaces to match corresponding adjacent concrete surfaces. Reinforce with steel as necessary for safe handling and erection.

END OF SECTION

SECTION 05 05 23

WELDING

PART 1 - GENERAL

1.01 REFERENCES

- A. Following is a list of standards which may be referenced in this Specification:
1. American Society of Mechanical Engineers (ASME):
 - a. BPVC SEC V, Nondestructive Examination.
 2. American Society of Nondestructive Testing (ASNT): SNT-TC-1A, Personnel Qualification and Certification in Nondestructive Testing.
 3. ASTM International (ASTM): A370, Standard Test Methods and Definitions for Mechanical Testing of Steel Products.
 4. American Welding Society (AWS):
 - a. A2.4, Standard Symbols for Welding, Brazing, and Nondestructive Examination.
 - b. A3.0, Standard Welding Terms and Definitions; Including Terms for Adhesive Bonding, Brazing, Soldering, Thermal Cutting and Thermal Spraying.
 - c. D1.1/D1.1M, Structural Welding Code - Steel.
 - d. D1.2/D1.2M, Structural Welding Code - Aluminum.
 - e. D1.3, Structural Welding Code - Sheet Steel. D1.4/D1.4M, Structural Welding Code - Reinforcing Steel.
 - f. D1.6/D1.6M, Structural Welding Code - Stainless Steel.
 - g. QC1, Standard for AWS Certification of Welding Inspectors.

1.02 DEFINITIONS

- A. CJP: Complete Joint Penetration.
- B. CWI: Certified Welding Inspector.
- C. DFT: Dry Film Thickness
- D. NDE: Nondestructive Examination.
- E. NDT: Nondestructive Testing.
- F. PQR: Procedure Qualification Record.
- G. PT: Liquid Penetrant Testing.
- H. UT: Ultrasonic Testing.
- I. VT: Visual Testing.
- J. WPQ: Welder/Welding Operator Performance Qualification.
- K. WPS: Welding Procedure Specification.

1.03 SUBMITTALS

- A. Shop Drawings:
1. Shop and field WPSs and PQRs.
 2. NDT procedure specifications prepared in accordance with ASME BPVC SEC V.
 3. Welding Data (Shop and Field):
 - a. Show on Shop Drawings or a weld map complete information regarding base metal specification designation, location, type, size, and extent of welds with

reference called out for WPS and NDE numbers in tails of combined welding and NDE symbols as indicated in AWS A2.4.

- b. Distinguish between shop and field welds.
- c. Indicate, by welding symbols or sketches, details of welded joints and preparation of base metal. Provide complete joint welding details showing bevels, groove angles, and root openings for welds.
- d. For pipe fittings, provide a joint weld beveling diagram. Refer to AWS D1.1/D1.1M, Annex P Local Dihedral Angle that can be used to calculate bevels for weld joint details of intersecting pipes.
- e. Welding and NDE symbols shall be in accordance with AWS A2.4.
- f. Welding terms and definitions shall be in accordance with AWS A3.0.
- g. Submit welding data together with shop drawings as a complete package.

B. Informational Submittals:

- 1. WPQs.
- 2. CWI credentials.
- 3. Testing agency personnel credentials.
- 4. CWI reports.
- 5. Welding Documentation: Submit on appropriate forms in referenced welding codes.

1.04 QUALIFICATIONS

- A. WPSs: In accordance with AWS D1.1/D1.1M (Annex N Forms).
- B. WPQs: In accordance with AWS D1.1/D1.1M (Annex N Forms).
- C. CWI: Certified in accordance with AWS QC1, and having prior experience with welding codes specified. Alternate welding inspector qualifications require approval by Engineer.
- D. Testing Agency: Personnel performing tests shall be NDT Level II certified in accordance with ASNT SNT-TC-1A.

1.05 SEQUENCING AND SCHEDULING

- A. Unless otherwise specified, all Submittals required in this Section shall be submitted and approved prior to commencement of welding operations.

PART 2 - PRODUCTS

2.01 SOURCE QUALITY CONTROL

- A. CWI shall be present whenever shop welding is performed. CWI shall perform inspection, as necessary, prior to assembly, during assembly, during welding, and after welding. CWI shall perform inspections as required in AWS D1.1/D1.1M or referenced welding code and as follows:
 - 1. Verifying conformance of specified job material and proper storage.
 - 2. Monitoring conformance with approved WPS.
 - 3. Monitoring conformance of WPQ.
 - 4. Inspecting weld joint fit-up and performing in-process inspection.
 - 5. Providing 100% visual inspection of welds.
 - 6. Supervising nondestructive testing personnel and evaluating test results.
 - 7. Maintaining records and preparing report confirming results of inspection and testing comply with Work.

PART 3 - EXECUTION

3.01 GENERAL

- A. Welding and Fabrication by Welding: Conform to governing welding codes referenced in attached Welding and Nondestructive Testing Table.

3.02 NONDESTRUCTIVE WELD TESTING REQUIREMENTS

- A. Weld Inspection Criteria:
1. Selection of welds to be tested unless 100% NDT is specified herein, shall be as agreed upon between Engineer and Contractor.
 2. Unless otherwise specified, perform NDT of welds at a frequency as shown below or in the attached table in accordance with referenced welding codes as follows. Perform UT on CJP groove welds that cannot be readily radiographed. In case there is a conflict higher frequency level of NDT shall apply:
 - a. CJP Butt Joint Welds: 10% random RT.
 - b. CJP Groove Welds: 10% random UT.
 - c. Fillet Welds and PJP Groove Welds: 10% random MT.
 - d. All Joint Welds on Water Pipes: 100% VT and PT, unless otherwise authorized in writing.
 3. Weld Acceptance:
 - a. VT:
 - 1) Structural Pipe and Tubing: AWS D1.1/D1.1M, Paragraph 6.9, Visual Inspection, Tubular Connections.
 - 2) All Other Structural Steel: AWS D1.1/D1.1M, Paragraph 6.9, Visual Inspection, Statically Loaded Nontubular Connections.
 - 3) Stud Connections: AWS D1.1/D1.1M, Paragraph 7.8.1.
 - b. UT: Perform UT of CJP groove welds in accordance with AWS D1.1/D1.1M, Paragraph 6.13.3, Class R Indications.
 - c. RT: Perform RT of CJP butt joint welds in accordance with AWS D1.1/D1.1M, Paragraph 6.12.1.
 - d. PT or MT:
 - 1) Perform on fillet and PJP groove welds in accordance with AWS D1.1/D1.1M, Paragraph 6.10.
 - 2) Acceptance shall be in accordance with VT standards specified above.

3.03 FIELD QUALITY CONTROL

- A. CWI shall be present whenever field welding is performed. CWI shall perform inspection, as necessary, prior to assembly, during assembly, during welding, and after welding. CWI shall perform inspections as required in AWS D1.1/D1.1M or referenced welding code and as follows:
1. Verifying conformance of specified job material and proper storage.
 2. Monitoring conformance with approved WPS.
 3. Monitoring conformance of WPQ.
 4. Inspecting weld joint fit-up and performing in-process inspection.
 5. Providing 100% visual inspection of all welds.
 6. Supervising nondestructive testing personnel and evaluating test results.
 7. Maintaining records and preparing report confirming results of inspection and testing comply with Work.

3.04 WELD DEFECT REPAIR

- A. Repair and retest rejected weld defects until sound weld metal has been deposited in accordance with appropriate welding codes.

3.05 WELD AREA REPAIRS

- A. All heat affected and welded areas shall be ground smooth and power tool cleaned. Those areas shall be coated with a 100% solids epoxy to 15 to 20 mils DFT. Approved paints are as follows:
1. Raven AquataPoxy A-61
 2. TNEMEC Series FC22 Epoxoline

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This Specification covers bolts, anchors, nuts, sleeves, concrete anchors, scheduled items, and other miscellaneous metal items not specifically included under other sections of these specifications.
- B. Contractor shall furnish all labor, materials, equipment, and incidentals necessary to install and make ready all miscellaneous metal items as specified by Drawings and as specified herein.

1.02 RELATED WORK:

- A. Section 01 33 00 - Submittals
- B. Section 01 60 00 – Product Requirements

1.03 MEASUREMENT AND PAYMENT:

- A. No separate payment will be made for work performed under this Section.

1.04 REFERENCED STANDARDS:

- A. ASTM A 36 – Structural Steel.
- B. ASTM A53 – Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
- C. ASTM A123 – Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- D. ASTM A153 – Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- E. ASTM A276 – Stainless and Heat-Resisting Steel Bars and Shapes.
- F. ASTM A307 – Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
- G. ASTM A325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
- H. ASTM A500 – Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
- I. ASTM A501 – Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- J. ASTM F593 – Stainless Steel Bolts, Hex Cap Screws and Studs
- K. ASTM F594 – Stainless Steel Nuts.
- L. AWS A2.0 – Standard Welding Symbols
- M. AWS D1.1 – Structural Welding Code.
- N. SSPC – Steel Structures Painting Council.

1.05 QUALITY ASSURANCE:

- A. Prepare Shop Drawings under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in State of Texas.
- B. Welders' Certificates: Submit under provisions of Section 01 33 00 – Submittals, certifying welders employed on Work, Verifying AWS qualification within previous 12 months.

1.06 SUBMITTALS:

- A. Submit under provisions of Section 01 33 00 – Submittals.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners and accessories. Include erection drawings, elevations, and details where applicable.
- C. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.
- D. Submit manufacturer's technical literature and test reports showing certified capacities for concrete anchors.

1.07 FIELD MEASUREMENTS:

- A. Verify that field measurements are as indicated on Drawings.

PART - 2 PRODUCTS

2.01 MATERIALS:

- A. Steel Shapes and Plate: ASTM A36.
- B. Stainless Steel Sections: ASTM A276, Type 316 for non-welded items and Type 316L for welded items.
- C. Steel Tubing: ASTM A500 or A501, Grade B. D. Pipe: ASTM A53, Grade B Schedule 40.
- D. Stainless Steel Bolts and Nuts: Bolts per ASTM F593, Type 316; nuts per ASTM F594, Type 316; UNC coarse threads.
- E. Concrete Anchors: Concrete anchors are inserted into holes drilled in hardened concrete and shall be one of the following types:
 - 1. Adhesive Anchors: Concrete anchors which are submerged, in splash zones, in enclosed spaces over liquids, or anchoring vibrating equipment shall be epoxy adhesive anchors. Adhesive anchors may be used at all locations where concrete anchors are required. Epoxy systems shall be Sika/FI System with Sikadur Injection Gel Epoxy, Master Builders Concrete Paste LPL, or equal. Threaded rods shall be ASTM F593, Type 316 studs. Where adhesive anchors, or connected metal, are exposed to direct sunlight, anchors shall be certified to maintain at least 90% of their rated strength when tested at 160 degrees F.
 - 2. Expansion Anchors: Where concrete anchors are indicated and adhesive anchors are not required, wedge type anchors made with ASTM A276, Type 316 Stainless Steel shall be used. Anchors shall be KWIK Bolt II by Hillti, Inc. or approved equal.
- F. Welding Materials: AWS D1.1; type required for materials being welded.
- G. Shop and Touch-Up Primer: Compatible with systems specified in Division 09.

2.02 FABRICATION:

- A. Fit and shop assemble in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FINISHES:

- A. Prepare surfaces to be primed in accordance with SSPC SP2.
- B. Do not prime surfaces in direct contact with concrete or where field welding is required

PART 3 - EXECUTION

3.01 EXAMINATION:

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Beginning of installation means erector accepts existing conditions.

3.02 PREPARATION:

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete or embedded in masonry with setting templates, to appropriate sections.
- C. All stainless steel threads to be coated with an anti-seizing compound prior to installing nuts.

3.03 INSTALLATION:

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components indicated on shop drawings.
- D. Perform field welding in accordance with AWS D1.1.
- E. Obtain Engineer approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions, and surfaces not shop primed except surfaces to be in contact with concrete.

3.04 ERECTION TOLERANCES:

- A. Maximum Variation from Plumb: 1/4" per story, non-cumulative.

B. Maximum Offset from True Alignment: 1/4".

3.05 HANDLING AND STORAGE:

A. Comply with requirements of Section 01 60 00 – Product Requirements.

END OF SECTION

SECTION 05 91 00

GALVANIZING

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Hot dip galvanizing of structural steel members, assemblies, and metal fabrications.
- B. Definitions
 - 1. Hot-Dip Galvanizing: Dipping of steel members and assemblies into molten zinc for lasting (or long-term) corrosion protection. Resultant zinc coating fuses permanently with the base metal steel material.
 - 2. Electro galvanizing: Electrode positing or electroplating with zinc by electrolysis for limited corrosion protection.
 - 3. Passivating: Chemical treatment of freshly galvanized steel materials to prevent humid storage stain (white rust or white corrosion). This treatment (passivation) consists of quenching freshly galvanized steel in water to which a chromate or a chromic-acid solution or other proprietary solution, has been added.

1.02 REFERENCE STANDARDS

- A. American Hot-Dip Galvanizers Association, Inc. (AHDGA)
 - 1. Publication, “Inspection Manual for Hot Dip Galvanized Products”
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
 - 2. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - 3. ASTM A143 – Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
 - 4. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - 5. ASTM A325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
 - 6. ASTM A384 – Standard Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies
 - 7. ASTM A385 – Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip)
 - 8. ASTM A563 – Standard Specification for Carbon and Alloy Steel Nuts
 - 9. ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
 - 10. ASTM B6 – Standard Specification for Zinc
 - 11. ASTM D2092 – Standard Guide for Preparation of Zinc-Coated (Galvanized) Steel Surfaced for Painting
- C. Certification: Furnish Certificates of Compliance with ASTM Specifications and Standards specified herein. Each certificate to be signed by Contractor and galvanizer certifying that steel materials, bolts, nuts, washers, and items of iron and steel hardware conform to specified requirements.
- D. Inspections and Tests: Inspections, tests, and samples to conform to ASTM Specifications and Standards. Inspections rights and privileges, procedures, and acceptance or rejection of galvanized steel materials to conform to ASTM A123 or A153, as applicable. Inspections and tests include the following:
 - 1. Visual examination of samples and finished products.
 - 2. Tests to determine weight or mass of zinc of coating per square foot of metal surface.

3. Tests to determine distribution and uniformity of zinc coating.

1.03 SUBMITTALS

- A. Furnish Certificates of Compliance with certified original and two copies forwarded to Engineer per Section 01 33 00 - Submittals.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Of type to prevent damage to galvanized surfaces and distortion of steel materials and components.
- B. Handling and Storage: Handle and protect galvanized materials from damage to zinc coating. To avoid humid storage stain, space surfaces of galvanized materials to permit free circulation of air.
- C. Damaged Material: Repair material showing evidence of damage to zinc coating. If not repairable, material with damaged coating will be subject to rejection.

PART 2 – PRODUCTS

2.01 STEEL MATERIALS

- A. Material for galvanizing to be geometrically suitable for galvanizing as specified in ASTM A384 and A385. Steel materials suitable for galvanizing include structural shapes, pipe, sheet, fabrications, and assemblies.
- B. Material to be chemically suitable for galvanizing.

2.02 IRON AND STEEL HARDWARE

- A. Bolts, nuts, washers, and items of iron and steel hardware furnished or galvanized to be suitable for hot dip galvanizing.
- B. Inspect iron and steel hardware before galvanizing and ascertain whether suitable for galvanizing. Replace items that are not suitable for galvanizing.

2.03 ZINC FOR GALVANIZING

- A. Conform with ASTM B6 as specified in ASTM A123.

2.04 GALVANIZING

- A. Steel members, fabrications, and assemblies to be galvanized after fabrication, by hot dip process in accordance with ASTM A123, as applicable. Weight of zinc coating to conform to requirements specified under “Weight of Coating” in ASTM A123, as applicable.
- B. Safeguard against steel embrittlement in conformance with ASTM A143.
- C. Safeguard against warpage or distortion of steel members to conform to ASTM A384. Notify Engineer of potential warpage problems that may require modification in design before proceeding with steel fabrications.
- D. Finish and uniformity of zinc coating and adherence of coating to conform to ASTM A123 or A153, as applicable.
- E. Bolts, nuts, and washers, and iron and steel hardware components to be galvanized in accordance with ASTM A153. Weight of zinc coating to conform to requirements specified under “Weight of Coating” in ASTM A153. Nuts to be taped after galvanizing to minimum diametral amounts

specified in ASTM A563. Coat nuts with waterproof lubricant, clean and dry to touch. High strength bolts for structural steel joints to be galvanized in accordance with ASTM A325.

2.05 PASSIVATING

- A. Galvanizing materials subject to extended periods of storage in open, exterior locations to be given passivating treatment or light oiling to prevent humid storage stain. Treatment, solution, and process subject to review and acceptance by Engineer. Chromate passivation should not be used on items galvanized after fabrication and are to be painted after erection.

2.06 PRESERVATIVE OILS

- A. Do not treat freshly galvanized or passivated surfaces with oils, grease, or chemicals that might interfere with adhesion of subsequent paint primers and coatings.

2.07 PAINTING

- A. Prepare galvanized metal surface to be field painted if required in accordance with ASTM D2092.
- B. Shop coat galvanized metal surfaces if painting is required with approved galvanized primer per Section 09 90 00.

PART 3 – EXECUTION

3.01 INSTALLATION OF STEEL MATERIALS

- A. Steel materials, fabrications, and assemblies are specified to be installed in various other sections under Division 05.
- B. Thoroughly clean all galvanized surfaces.

3.02 FIELD INSPECTION

- A. Inspect installed galvanized materials, fabrications, and assemblies to conform to applicable requirements of AHDGA, consisting of visual inspection.

3.03 TOUCHUP AND REPAIR

- A. Repair damaged or rusted galvanized surfaces in accordance with ASTM A780.
- B. Dry film thickness of applied repair materials to be not less than galvanized coating thickness required by ASTM A53, A123, or A153, as applicable.
- C. All metalwork shall be hot-dipped galvanized with touch-up of all damaged and rust areas using Carbozinc 11 WB by Carboline. Clean damaged surfaces first to assure proper paint adhesion.

END OF SECTION

SECTION 09 90 00

PAINTING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Contractor shall furnish all materials, labor, equipment, and incidentals required to provide a protective coating system for surfaces listed herein and not otherwise excluded. All surfaces described shall be included within scope of this Section.
- B. Work includes painting and finishing of interior and exterior exposed items and surfaces such as walls, floors, miscellaneous metal, doors, frames, construction signs, posts, pipes, fittings, valves, equipment, and all other work obviously required to be painted unless otherwise specified herein or on Drawings. Work includes both new construction and all existing facilities that will be upgraded as part of Project, including, but not limited to, walls, piping, metals, and pumps. Omission of minor items in schedule of work shall not relieve Contractor of his obligation to include such items where they come within general intent of Specifications as stated herein. The following major items of Project shall be coated, including both new and existing construction:
1. Interior of cast-in-place concrete and concrete block walls and concrete ceilings and exterior concrete block.
 2. Exterior of concrete structures including concrete supports and exposed concrete slabs.
 3. Submerged surfaces and surfaces exposed to potable water of any ferrous metal and aluminum components of equipment, piping, fittings and valves (except stainless steel).
 4. Exposed ferrous surfaces of equipment, pumps, motors, and ferrous or galvanized metal fittings and accessories.
 5. Exposed ferrous metal surfaces of Crane Rail System and ferrous or galvanized metal fittings and accessories.
 6. Exposed surfaces of PVC components of piping, fittings, valves, electrical conduit, and equipment.
 7. Exposed exterior surfaces of all metallic piping, fittings, and valves
 8. Embedded aluminum or aluminum in contact with dissimilar metals or in contact with corrosive atmospheres.
- C. "Paint" as used herein means all coating systems, materials, including primers, emulsions, enamels, epoxies, sealers and fillers, and other applied materials whether used as a prime, intermediate, or finish coats.
- D. The following items will not be painted unless otherwise noted:
1. Any code-requiring labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name or nomenclature plates.
 2. Any moving parts of operating units, such as valve and damper operators, linkages, sensing devices, and motor and fan shafts.
 3. Aluminum or fiberglass handrails, walkways, toeboards, windows, louvers, grating, checker plate, hatches, and stairways.
 4. Stainless steel angles, tube, pipe, etc.
 5. Products with polished chrome, aluminum, nickel, or stainless steel finish.
 6. Stainless steel, brass, bronze, and aluminum other than exposed utility tubing.
 7. Flexible couplings, lubricated bearing surfaces, insulation, and plastic pipe or duct interiors.
 8. Plastic switch plates and receptacle plates.
 9. Signs and nameplates.
 10. Finish hardware.
 11. Packing glands and other adjustable parts, unless otherwise indicated.
 12. Portions of metal, other than aluminum, embedded in concrete. This does not apply to the back face of items mounted to concrete or masonry surfaces which shall be painted before erection. Aluminum to be embedded in, or in contact with, concrete shall be coated to prevent electrolysis.

- E. Description of Colors and Finishes:
1. Color Selection:
 - a. Engineer reserves right to select non-standard colors for paint systems specified within ability of paint manufacturer to produce such non-standard colors. Provide such colors at no additional expense to Owner.
 2. Color Coding of Pipelines, Valves, Equipment, and Ducts:
 - a. Color-coding of pipelines, valves, equipment and ducts shall comply with applicable standards of ANSI A13.1, ANSI Z535.1, CFR 1910.144, Recommended Standards for Water Works, and Recommended Standards for Wastewater Facilities. For piping and equipment not covered by above standards, conform to Owner's color standards.
 - b. For equipment located on roofs and equipment that is exposed-to-view, color will be selected by Engineer.
 3. Color Coding of Pipelines and Equipment:
 - a. Finish coats of paint for pipelines and equipment shall be coded in basic colors. Colors shall be brilliant, distinctive shades matching the following safety and pipeline colors per ANSI Z535.1, Recommended Standards for Water Works; Recommended Standards, color specifications for safety colors and other primary colors:

<u>Material Contained</u>	<u>Generic Color</u>
<u>Water</u>	
Raw Water	Olive Green
Filtered Water	Aqua
Finished or Potable Water	Dark Blue
<u>Chemicals -</u>	
Alum or Primary Coagulant	Orange
Ammonia	White
Caustic	Yellow with Green Band
Chlorine (Gas and Solution)	Yellow
Fluoride	Light Blue with Red Band
Ozone	Yellow with Orange Band
Phosphate Compounds	Light Green with Red Band
Polymers or Coagulant Aids	Orange with Green Band
Potassium Permanganate	Violet
Soda Ash	Light Green with Orange Band
Sulfuric Acid	Yellow with Red Band
Compressed Air	Dark Green
Other Lines	Light Gray
Fire Protection	Red
 - b. Color of final coats shall match as closely as possible, without custom blending, color tabulated for specific pipeline service.
 4. After approval by Engineer of colors and Shop Drawings and prior to commencing painting Work, Engineer will furnish color schedules for surfaces to be painted.

1.02 QUALITY ASSURANCE

- A. Provide best quality grade of various types of coatings as regularly manufactured by approved paint material manufacturers. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable.
- B. Provide undercoat paint produced by same manufacturer as finish coats. Undercoat and finish coat paints shall be compatible. Use only thinners approved by paint manufacturer, and use only within recommended limits.
- C. Painting shall be accomplished by experienced painters specializing in industrial painting familiar with all aspects of surface preparations and applications required for this Project. Work shall be done in a safe and workmanlike manner.

- D. Standards
1. ASTM.
 2. OSHA.
 3. NFPA.
 4. SSPC.
 5. NACE.
 6. NSF.
 7. AWWA.
- E. Acceptable Manufacturers
1. Carboline Company.
 2. Tnemec Company, Inc.
 3. ICI Devco.
 4. Ameron.
- F. All paints and materials which comes into contact with raw water shall conform to AWWA standards and/or Texas Commission of Environmental Quality (TCEQ) regulations as they may apply to potable water and shall be NSF (Standard 61) approved. Manufacturer furnishing coating material shall furnish certification to Engineer/Owner that materials meet these agency provisions.

1.03 SUBMITTALS

- A. Materials and Shop Drawings: Submit to Engineer as provided in Division 01 – General Conditions and Section 01 33 00 – Submittals: Shop Drawings, Working Drawings, and Samples, shop drawings, manufacturer's specifications, and data on proposed paint systems and detailed surface preparation, application procedures and dry film thickness (DFT).
- B. Schedule
1. Contractor shall submit for approval a complete typewritten Schedule of Painting Operations before 60 days before painting process to begin. This Schedule is imperative so that various fabricators or suppliers may be notified of the proper prime coat to apply. It shall be Contractor's responsibility to properly coordinate fabricators' or suppliers' surface preparation and painting operations with these Specifications. This Schedule shall include for each surface to be painted not for each system (e.g.: Room No. 1 walls), brand name, application method; and paint series number, dry film thickness and color for each coat. When the Schedule has been approved, Contractor shall apply all material in strict accordance with the approved Schedule and manufacturer's instructions. Wet and dry paint film gauges may be utilized by Engineer to verify proper application while work is in progress.
 2. It is intent of this Section that as much as possible all structures, equipment, and piping utilize coating systems specified herein supplied by a single manufacturer. All exceptions must be noted on Schedule. For each coating system, only one (1) manufacturer's product shall be used.
- C. Color Samples: Manufacturer's standard color charts for color selection by Owner.
- D. Samples-Painting
1. Paint colors will be selected by Owner. Compliance with all other requirements is exclusive responsibility of Contractor.
 2. Samples of each finish and color shall be submitted to Owner or Engineer for approval before any work is started.
 3. Samples shall be prepared so that an area of each sample indicates appearance of various coats. For example, where three (3) coat work is specified, sample shall be divided into three (3) areas:
 - a. One (1) showing the application of one (1) coat only.
 - b. One (1) showing the application of two (2) coats.
 - c. One (1) showing the application of all three (3) coats.
 4. Such samples when approved in writing shall constitute a standard, as to color and finish only, for acceptance or rejection of finish work.
 5. For piping, valves, equipment and miscellaneous metal work, provide sample chips or color charts of all paint selected showing color, finish, and general characteristics.

6. Rejected samples shall be resubmitted until approved.
- E. Contractor shall submit to Owner, immediately upon completion of job, certification from manufacturer indicating that quantity of each coating purchased was sufficient to coat all surfaces, in accordance with requirements of this Section. Such certification shall make reference to square footage figures provided to manufacturer by Contractor.

1.04 DELIVERY, HANDLING, AND STORAGE

- A. Deliver all materials to Site in original, unopened packages and containers bearing manufacturer's name and label.
 1. Provide labels on each container with the following information:
 - a. Name or title of material.
 - b. Fed. Spec. number if applicable.
 - c. Manufacturer's stock number, date of manufacture and expiration date (shelf life).
 - d. Manufacturer's formula or specification number.
 - e. Manufacturer's batch number.
 - f. Manufacturer's name.
 - g. Generic type.
 - h. Contents by volume, for major pigment and vehicle constituents.
 - i. Application instructions: thinning, ambient conditions, etc.
 - j. Color name and number.
 2. Containers shall be clearly marked to indicate any hazards connected with use of paint. Steps which should be taken to prevent injury to those handling product.
- B. All containers shall be handled and stored in such a manner as to prevent damage or loss of labels or containers.
- C. Used rags shall be removed from buildings every night and every precaution taken against spontaneous combustion.

1.05 WARRANTY AND GUARANTEES

- A. Refer to Section 01 70 00 for close out requirements and procedures.
- B. All paint and coatings work performed under these Specifications shall be guaranteed by coatings applicator for 100% of total coated area for both materials and labor against failures during warranty period.
- C. Failure under this warranty shall include flaking, peeling, or delaminating of coating due to aging, chemical attack, or poor workmanship; but it shall not include areas which have been damaged by unusual chemical, thermal, or mechanical abuse.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All paint shall be manufactured by one of suppliers listed herein and shall be their highest grade of paint.
- B. The following coating systems list a product by name to establish a standard of quality; other products of same generic types may be submitted to Engineer for approval. When other than specified coating system is proposed, Contractor shall submit a typewritten list giving proposed coatings, brand, trade name, generic type and catalog number of proposed system for Engineer's approval.
- C. Paint used in successive field coats shall be produced by same manufacturer. Paint used in first field coat over shop painted or previously painted surfaces shall cause no wrinkling, lifting, or other damage to underlying paint. Shop paint shall be of same type and manufacture as used for

field painting by Contractor.

- D. Emulsion and alkyd paints shall contain a mildewcide and both paint and mildewcide shall conform to OSHA and Federal requirements, including Federal Specification TT-P- 19.
- E. Finish coats containing lead shall not be allowed. Oil shall be pure boiled linseed oil.
- F. Rags shall be clean painter's rags, completely sterilized.

2.02 COATING SYSTEMS

- A. Coat per Table at end of this Section

Type B	Epoxy-Polyamide Primer
Tnemec	Series 66
ICI Devoe	Debran 201
Carboline	893
Ameron	Amerlock 400/2

Type D	Epoxy-Polyamide Coatings
Tnemec	Series 66
ICI Devoe	Debran 224 HS
Carboline	890
Ameron	Amerlock 395FD

Type G	High Build Acrylic Polyurethane
Tnemec	Series 73 Endura-Shield
ICI Devoe	Devthane 359
Carboline	133HB
Ameron	Amercoat 450H

Type L	Epoxy Concrete Coating - HFS
Tnemec	Series 434/435 Perma-Shield System

PART 3 - EXECUTION

3.01 SHOP PAINTING

- A. Surface Preparation - All ferrous metal to be primed in shop shall have all rust, dust and scale, as well as all other foreign substances, removed by sandblasting or pickling in accordance with SSPC-SP5 or SP8, respectively. Cleaned metal shall be primed or pretreated immediately after cleaning to prevent new rusting. Under no circumstances will cleaned metal be allowed to sit overnight before priming, or pretreatment and priming. All nonferrous metals shall be solvent cleaned prior to application of primer. In addition, galvanized surfaces which are to be topcoated shall first be degreased then primed.
- B. Materials Preparation
1. Mix and prepare painting materials in strict accordance with manufacturer's recommendations and directions, stirring materials before and during application to maintain a mixture of uniform density, free of film, dirt and other foreign materials.
 2. No thinners shall be used except those specifically mentioned and only in such quantity as directed by the manufacturer in his instructions. If thinning is used, sufficient additional coats shall be applied to assure required dry film thickness is achieved. Manufacturer's recommended thinner or clean-up solvent shall be used for all clean-up. Application by brush, spray, airless spray or roller shall be as recommended by manufacturer for optimum performance and appearance.
- C. Applications
1. All painting shall be done by skilled and experienced craftsmen and shall be of highest quality workmanship. Coating systems shall be as specified herein.
 2. Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for the type of material being applied.
 3. All paint and coatings materials shall be stored under cover and at a temperature within 10°F of anticipated application temperature and at least 5°F above dew point.
 4. Apply additional coats when undercoats, stains, or other conditions show through final coat of paint, until the paint film is of uniform finish, color, and appearance.
 5. Paint shall be applied in a neat manner with finished surfaces free of runs, sags, ridges, laps, and brush marks. Each coat shall be applied in a manner that will produce an even film of uniform and proper thickness.
 6. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 7. Equipment manufacturer or supplier shall provide touch-up paint for items with shop applied finish coats.
 8. Where specified in individual Sections, primer coat(s) shall be applied in the shop by equipment manufacturer. Shop coats shall be as specified and shall be compatible with field coat or coats.
- D. Certification: Contractor shall obtain from equipment manufacturer or supplier, prior to shipment of equipment, a written certification that surface preparation, coating brand, material, DFT, and application method complied with this Section.

3.02 SURFACE PREPARATION

- A. All dirt, rust, scale, splinters, loose particles, disintegrated paint, grease, oil, and other deleterious substances shall be removed from all surfaces which are to be coated.
- B. Hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items and surfaces not to be painted which are in contact with or near surfaces to be painted shall be removed, masked, or otherwise protected prior to surface preparation and painting operations. Refer to Paragraph 3.09B.
- C. Before commencing work, painter must make certain that surfaces to be covered are in proper condition and must obtain Engineer's approval to proceed. Should painter find such surfaces impossible of acceptance, report such fact to Engineer. Application of paint shall be held as an acceptance of surfaces and working conditions and painter will be held responsible for results

reasonably expected from materials and processes specified. Reference the paint manufacturer's product data sheet for specific surface preparation requirements prior to product application.

- D. Program cleaning and painting so contaminants from cleaning process will not fall onto wet, newly-painted surfaces.
- E. Ferrous Metal Surfaces
1. Remove any oil or grease from surfaces to be coated with clean rags soaked in toluol or other solvent recommended by coating manufacturer in accordance with SSPC specifications. Any chemical contamination shall be eliminated by means of neutralization or flushing or both prior to additional surface preparation.
 2. For immersion service, all sharp edges and welds shall be ground smooth to a rounder contour, all weld splatter shall be removed, and all pits and dents shall be filled, and all imperfections shall be corrected prior to sandblasting.
 3. For non-immersion service, all sharp edges and welds shall be ground, all weld splatter shall be removed, all pits and dents shall be filled, and all imperfections shall be corrected prior to sandblasting.
 4. For immersion service, all surfaces to be coated shall be sandblasted to white metal in accordance with Steel Structures Painting Council Specification SP-5. A white metal blast is defined as removing all rust, scale, paint, etc., to a clean white metal which has a uniform gray-white appearance. No streaks or stains or rust or any other contaminants are allowed. Proper abrasive to obtain specified surface profile (anchor pattern) designated in coating manufacturer's most recent printed application instructions shall be used. After sandblasting, dust and spent sand shall be removed from surfaces by brushing or vacuum cleaning. Prime coat shall be applied as soon as possible after blasting preparation is finished and always before surface starts to rust. No sandblasted surface shall stand overnight before coating.
 5. For non-immersion service, or wherever specified in coating manufacturer's most recent printed application instructions for other services, all surfaces to be coated shall be sandblasted to near white metal in accordance with Steel Structures Painting Council Specification SP-10. A near white metal blast is defined as removing all rust, scale, paint, etc., except for very light shadows, very slight streaks or slight discolorations caused by rust stain, mill scale oxides, or slight, tight residues of paint or coatings that may remain. Proper abrasive to obtain specified surface profile (anchor pattern) designated in coating manufacturer's most recent printed application instructions shall be used. After sandblasting, dust and spent sand shall be removed from surfaces by brushing or vacuum cleaning. Prime coat shall be applied as soon as possible after blasting preparation is finished and always before surface starts to rust. No sandblasted surface shall stand overnight before coating.
 6. Where blast cleaning is done in field, only "virgin" sand, grit, or abrasive will be used.
 7. Inaccessible areas, such as skip-welded lap joints, or in between back-to-back angle iron bracing, shall be coated before assembly to prevent corrosive action from taking place in these inaccessible areas. All surface voids shall be seal-welded. Sharp corners and edges shall be ground to a smooth contour and welds prepared as described above.
- F. Concrete Surfaces
1. All efflorescence, laitance, chalk, dust, dirt, oils, grease, concrete curing agents, form release agents, sealers, old coatings and other chemical contaminants shall be removed either by steam cleaning with detergent, by scrubbing with a hot trisodium phosphate solution consisting of 2 pounds of trisodium phosphate to each gallon of hot water (160°F), or by high pressure water blasting (3,000 psi or higher). Multiple cleaning operations may be required to remove all contaminants. Repeat cleaning operation until the contamination is removed and flush the area with clean water to remove residual cleaning solution. Allow to dry thoroughly before coating.
 2. All concrete surfaces to be coated shall be clean and dry. "Dry" is defined for new concrete as free of moisture and fully cured which is a minimum of 30 days at 75°F and 50% relative humidity or some equivalent cure time at other conditions. Moisture content of concrete shall be determined by using both of the following methods.
 - a. Presence of moisture shall be checked by taping a one-foot square piece of 20 mil thick minimum plastic film on surface. Pieces of test plastic film should be placed at various locations that are likely to be slow curing, such as below grade,

low spots in floors, inside corners and lower wall areas. Plastic film should be carefully sealed with tape to prevent the escape of any moisture or vapor that would be trapped behind film. Film should be left in place overnight or longer to allow sufficient time for moisture migration. After 16 hours minimum remove and examine backside for moisture condensation and inspect concrete surface for darkened areas. Source of moisture, if present, shall be located, and cause corrected prior to coating.

- b. Presence of moisture shall also be determined with a moisture detection device such as a Delmhorst Model DLM2E. Moisture determined by this method shall be less than 14% moisture content before coating operations shall be allowed to proceed.
 3. Old paint and unremoved tar stains shall be solvent cleaned with naphtha, trichloroethylene, or perchloroethylene. Proper safety precautions shall be observed if this step is necessary. Surface shall be flushed with fresh water and dried.
 4. Do not use form oils incompatible with coating, concrete curing agents, or concrete hardeners on concrete surfaces to be coated.
 5. Concrete and/or cinder block walls to receive a coating shall be air-blasted with 100 psi clean, dry, oil-free air to remove dust, etc., and wire brushed to remove all loose and/or weak mortar. See requirements for sumps, tanks and other water-bearing structures below.
 6. Concrete floors shall be thoroughly swept clean and then acid etched. Acid etching consists of first dampening entire surface with clean water, however, excess water that will form puddles shall be avoided. Acid etch the damp floor with a 10% to 15% solution of hydrochloric (muriatic) or phosphoric acid. Allow acid to stand on floor until bubbling stops. While acid is bubbling scrub floor with stiff bristled brushes. Do not allow "spent" acid to dry on floor. Rinse surface thoroughly with fresh water. If surface does not appear as rough as medium grit sandpaper, repeat above steps. Neutralize surface with a 5% solution of soda ash, trisodium phosphate, or ammonium hydroxide in clean water. Let solution stand for 10 minutes on surface. Rinse thoroughly with water. Surface must be slightly alkaline (pH of 9.0) prior to coating.
 7. Floors or concrete sumps, tanks or other water-bearing structures should be acid etched as described above or they may be sandblasted. Walls of concrete sumps and tanks must be sandblasted. Roughen surface to a texture equivalent to that of medium grit sandpaper. Use compressed air that is oil-free. Abrasive used shall be dry silica sand with maximum particle size that will pass through a 16 mesh screen and minimum particle size retained on a 30 mesh screen. After blast cleaning is completed, sand, dust and loose particles shall be removed from surface by vacuuming or blowing off with high pressure oil-free air. Examine surface for texture and uniformity, as well as removal of dust, efflorescence and laitance. Patch voids and cracks that will cause discontinuities in coating or unsightly appearance using a patching compound compatible with coating system.
- G. Wood Surfaces: Wood shall be clean and dry. Remove surface deposits of sap or pitch by scraping and wiping clean with rags dampened with mineral spirits or VM & P Naphtha. Seal knots and pitch pockets with shellac reduced with equal parts of shellac thinner (denatured alcohol) before sandpaper and finishing with fine grit and remove sanding dust. After prime coat is dry, fill cracks and holes with putty or spackling compound. When filler is hard, sand flush with surface using fine grit sandpaper. Sand lightly between coats with fine grit, open-coated sandpaper
- H. Galvanized Steel and Non-Ferrous Metal
1. Galvanized steel and aluminum will only be coated when so specified.
 2. Surfaces shall be clean and dry. Remove dust and dirt by blowing off surface with high pressure air or wiping clean with dry rags. Oil, grease and protective mill coatings shall be removed by solvent cleaning in accordance with SSPC- SPI.
 3. White rust should be removed from galvanized steel or aluminum by hand or power brushing. Care should be taken not to damage or remove the galvanizing. Rust should be removed from old galvanized steel by Hand or Power Tool Cleaning in accordance with SSPC-SP2 or SP3.
 4. Other surface preparation as outlined in coating manufacturer's latest written application instructions shall be observed for more demanding exposures.
- I. Stainless Steel

1. Stainless steel will only be coated when so specified, or when it is adjacent to areas to be coated such as piping supports, anchor bolts or flange bolts.
 2. Stainless steel requires only solvent cleaning prior to coating using any one of methods in SSPC-SP1. Only solvents and cleaning solutions containing less than 200 ppm of halogens should be used to prevent stress corrosion cracking.
 3. Stainless steel may be whip-blasted to provide a surface profile to increase mechanical bond of the coating system. Height of the profile and texture required shall be defined for operator and as a standard for acceptance of work. Pictorial standards for surface cleanliness of carbon steel are not applicable to stainless steel, since there are no corrosion products or mill scale to remove from surface.
 4. Abrasive blast cleaning procedures outlined by Steel Structures Painting Council for carbon steel may also be used for stainless steel. Only very hard silica sand or other abrasive media shall be used for a fast cutting action and to obtain a sharp angular profile.
- J. PVC or Other Plastic Piping and Ductwork
1. Solvent clean all exposed surfaces.
 2. If recommended by manufacturer, lightly abrade surface with medium grade sandpaper. Remove dust by wiping with clean rags

3.03 MATERIALS PREPARATION

- A. Mix and prepare painting materials in strict accordance with manufacturer's recommendations and directions, stirring materials before and during application to maintain a mixture of uniform density, free of film, dirt, and other foreign materials.
- B. Except where otherwise specified, thinning shall be done only if necessary for workability of the coating material and then, only in accordance with coating manufacturer's most recent printed application instructions. Use only thinner provided by coating manufacturer. If thinning is used, sufficient additional coats shall be applied to assure required dry film thickness is achieved. Manufacturer's recommended thinner or clean-up solvent shall be used for all clean-up. Application by brush, spray, airless spray or roller shall be as recommended by manufacturer for optimum performance and appearance.

3.04 APPLICATION

- A. Paint all exposed surfaces in rooms scheduled for painting whether or not colors are designated in schedules, except where the natural finish of material is obviously intended and specifically noted as a surface that will not be painted. Where items or surfaces are not specifically mentioned, paint these same as adjacent similar materials or areas. If color of finish is not designated, Engineer will select these from standard colors available for materials systems as specified.
- B. Color Selection
 1. Colors for Multi-Coat Systems: Each coat shall be applied in a different color or shade from the preceding coat to aid in determining uniformity and coverage of the coating. Finish coat color shall be selected by Owner or Engineer. When a white finish coat is specified, last two (2) coats shall be white.
- C. All painting shall be done by skilled and experienced craftsmen and shall be of highest quality workmanship.
- D. Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for type of material being applied. All equipment shall be maintained in good working order and shall be comparable to that described in coating manufacturer's most recent application instructions. It shall be thoroughly cleaned and inspected daily. Worn spray nozzles, tips, etc., shall be replaced regularly. Effective oil and water separators shall be used and serviced on all air lines.
- E. All paints and coating materials shall be stored under cover and at a temperature within 10°F of anticipated application temperature and at least 5°F above dew point.
- F. Apply additional coats when undercoats, stains, or other conditions show through final coat of paint, until paint film is of uniform finish, color, and appearance.

- G. Paint shall be applied in a neat manner with finished surfaces free of runs, sags, ridges, laps, and brush marks. Each coat shall be applied in a manner that will produce an even film of uniform and proper thickness. Allow each coat to dry thoroughly before applying the next coat following manufacturer's recommendations taking into account temperature and relative humidity.
- H. All interior surfaces of structures shall be finish coated prior to installation of equipment, conduit, and other exposed items. Paint back sides of access panels and removable or hinged covers to match the exposed surfaces.
- I. Finish exterior doors on tops, bottoms, and side edges same as exterior faces, unless otherwise indicated.
- J. Sand lightly between each succeeding enamel or varnish coat.
- K. Omit the field primer on metal surfaces which have been shop-primed and touch-up painted, unless otherwise specified.
- L. Prime and intermediate coats as specified for the various coating systems may be applied in shop by manufacturer. Shop coats shall be of type specified and shall be compatible with field coating. Items such as pumps, motors, equipment, electrical panels, etc. shall be given at least one touch-up coat with intermediate coating material and one (1) complete finish coat in field.

3.05 APPLICATION RESTRICTIONS

- A. Environmental Requirements
 - 1. Comply with manufacturer's recommendations as to environmental conditions under which coatings and coating systems can be applied.
 - a. Conditions below shall be adhered to even if manufacturer's recommendations are less stringent. If manufacturer's recommendations are more stringent, they shall apply.
 - b. No coatings shall be applied when air, surface, and material temperature is below 55°F or above 95°F for 24 hours prior to and 24 hours after coating application. Surface temperature shall be at least 5°F above dew point for 24 hours prior to and 24 hours after coating application. Dew point shall be determined by use of a sling psychrometer in conjunction with U.S. Weather Bureau psychrometric tables. Do not apply coatings when the relative humidity exceeds 85 percent or to damp or wet surfaces, unless otherwise permitted by coating manufacturer's printed instructions. No painting shall be done when surfaces may become damaged by rain, fog or condensation or when it is anticipated that these conditions will prevail during the drying period, unless suitable enclosures to protect the surface are used. Where heat is necessary, it shall be supplied by painting applicator and shall be of such type that it will maintain an air and coated surface temperature of 55°F minimum prior to and after coating application as described above, and 90°F minimum during cure stage if hot air forced curing is recommended by coating manufacturer for special coatings. Further, this heater shall be of such type as not to contaminate surface area to be or being coated with combustion products. Contractor shall supply utilities to run electric or gas heaters. Any surface coating damaged by moisture or rain shall be removed and redone as directed by Engineer.
 - 2. Do not apply finish in areas where dust is being or will be generated during application through full cure.
 - 3. All exterior painting shall be done only in dry weather.
 - 4. Spray application shall occur only when wind velocities, including gusts, are less than 10 miles per hour. All materials, equipment, etc. in vicinity of spray application shall be protected from overspray.
- B. Application of materials shall be done only on properly prepared surfaces as herein specified. Between any two coats of material, unless specifically covered in coating manufacturer's most recent printed application instructions, if more than one (1) week passes between subsequent coats, coating manufacturer shall be contacted for his recommended preparation of surface prior to

application of the next coat. This preparation might include brush-off blasting, steam cleaning, or solvent wiping (with an indicated solvent) and shall be specified in writing by material supplier and followed by the applicator. Any surface coating damaged by moisture or rain shall be removed and redone as directed by Engineer.

- C. In no case shall paint be applied to surfaces which show a moisture content greater than 14%. Presence of moisture shall be determined prior to coating by testing with a moisture detection device such as a Delmhorst Model DLM2E.

3.06 MINIMUM COATING THICKNESS

- A. Coating thickness shall meet or exceed specified minimum dry film thickness (DFT) in all areas. Average coating thickness as determined by multiple representative DFT measurements shall meet or exceed mid-point of specified DFT range. If measured DFT is below this value, surface shall be recoated with at least minimum DFT until total DFT meets or exceeds mid-point DFT.
- B. Coverage rates are theoretical as calculated by coating manufacturer and are, therefore, maximum allowable.
- C. Apply a prime coat to material which is required to be painted or finished, and which has not been prime coated by others.
- D. On masonry, application rates will vary according to surface texture; however, in no case shall manufacturer's stated coverage rate be exceeded. On porous surfaces, it shall be painter's responsibility to achieve a protective and decorative finish either by decreasing coverage rate or by applying additional coats of paint.
- E. Recoat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

3.07 FINISHES

- A. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- B. Complete Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not in compliance with specific requirements.

3.08 FIELD QUALITY CONTROL

- A. Contractor shall request acceptance of each coat by Inspector before applying next coat; and Contractor shall provide all necessary properly calibrated gauges. All nonferrous surfaces shall be checked for number of coats and thickness by use of a Tooke gauge. All ferrous surfaces shall be checked for film thickness by use of an Elcometer or Micro-Test magnetic dry film gauge properly calibrated. In addition, submerged tank linings and metals shall be tested for freedom from holidays and pinholes by use of a Tinker-Razor or K-D Bird Dog Holiday Detector. All defects shall be corrected to satisfaction of Engineer.

3.09 PROTECTION

- A. All other surfaces shall be protected while painting.
- B. Protection of furniture and other movable objects, equipment, fittings, and accessories shall be provided throughout painting operation. Remove all electric plates, surface hardware, etc., before painting; protect and replace when completed. Mask all machinery nameplates and all machined parts not to receive paint. Lay drop cloths in all areas where painting is being done to adequately protect flooring and other work from all damage.

3.10 CLEANING

- A. Contractor shall perform the work under this Section while keeping premises free from accumulation of dust, debris, and rubbish and shall remove all scaffolding, paint cloths, paint, empty paint containers, and brushes from buildings and Site when completed.
- B. Cleaning: All paint brushed, splattered, spilled, or splashed on any surface not specified to be painted shall be removed.
- C. Contractor shall insure that all glass throughout facility is cleaned of dirt and paint before he leaves Site. Further, Contractor shall insure that all glass is thoroughly washed and polished.
- D. Upon completion of Project, Site shall be left neat and clean.

3.11 EXTRA STOCK

- A. Paint To Be Supplied To Owner: Upon completion of painting work, Owner shall be furnished at no additional cost, unopened containers providing a minimum of one (1) gallon of each type and color of finish paint for touching up. Multi-component coatings shall have each component supplied in separate containers boxed together. Paint container labels shall be complete with manufacturer's name, generic type, number, color, and location where used.

END OF SECTION

PROTECTIVE COATINGS PAINT SCHEDULE							
Prep. No.	Surface Description	App.	Vehicle Type	Sheen	# of Coats	Product Type	DFT (MILS)
SP2 or SP4	Equipment, Equipment in Vaults, Exposed and Above Grade Valves, Air Release Valves and Piping Interior and Exterior	Brush or Spray	Acrylic Polyurethane	Gloss	1 2 3	TYPE B TYPE D TYPE G	2.0 4.0 3.0
Total Dry Film Thickness							9.0 mils
SP2 or SP4	Structural Steel and Miscellaneous Metals above Water Surfaces	Brush or Spray	Acrylic Polyurethane	Gloss	1 2 3	TYPE B TYPE D TYPE G	2.0 5.0 3.0
Total Dry Film Thickness							10.0 mils
SP3	Concrete surfaces as follows: Interior surfaces and manholes and pipeline appurtenant structures.	Brush or Spray	Epoxy		1 2	TYPE L TYPE L	5.0 25.0
Total Dry Film Thickness							30.0 mils

SECTION 26 00 00

ELECTRICAL GENERAL

PART 1 - GENERAL

1.01 GENERAL

- A. This Section together with Drawings and other applicable sections of Specifications, including requirements of Instruction to Bidders, Contract Agreement, General Conditions, Supplementary General Conditions, and Special Conditions comprise Electrical portion of Work.

1.02 SCOPE OF WORK

- A. Work contemplated under this Section includes the furnishing of all supervision, labor, materials, tools, transportation, services, etc., required for the complete installation and operation of the electrical work as shown on the drawings and as specified herein.

1.03 DRAWINGS

- A. Drawings indicate general layout of complete electrical systems and show arrangements of feeders, outlets, lighting fixtures, disconnect switches, panelboards and other work. Contractor shall field verify scale dimensions since actual locations, distances, and levels are to be governed by actual field conditions.
- B. Contractor shall also check all other plans to avoid possible conflicts. Discrepancies shown on different Drawings or between Drawings and actual field conditions shall be brought to attention of Engineer promptly for resolution.

1.04 SUBMITTALS

- A. Following the award of this Contract, Contractor shall submit pdfs of manufacturer data sheets, shop drawings, wiring drawings, etc., on the following items for approval:
 1. Disconnects
 2. Panelboards
 3. Wiring devices
 4. Wiring
 5. Conduit Systems
 6. Cathodic Protection Rectifier

1.05 QUALITY ASSURANCE

- A. **Materials and Substitutions:** Materials and equipment supplied shall be new and of best quality used in this type work. Where materials, equipment, apparatus or other products are specified by brand name, manufacturer type or catalog number, such designation is to establish standards of quality and style and shall be basis of bid. Contractor shall submit any substitutions to Engineer for consideration. In making such submittal, Contractor shall bear the responsibility and all costs for any changes in design necessitated by use of substitution. All materials shall conform to NEMA or ANSI Standards, or both, where applicable.
- B. All materials shall also bear Underwriters Laboratory label where such is available for particular type product furnished. All materials shall be of domestic (U.S.A.) manufacturer.
- C. **Workmanship:** Workmanship shall be of highest grade throughout and in accordance with best standard practice. All work shall be performed by a Contractor who has had a minimum of five (5) consecutive years' experience in construction of electrical, instrumentation and controls systems in water and wastewater plants of same size and complexity as this Project.

1.06 CODES AND PERMITS

- A. Work shall be performed and materials shall be in accordance with National Electrical Code and other applicable Federal, State and local codes, regulations and ordinances. Contractor shall, at his own expense, arrange for and obtain all necessary permits, inspections and approval by proper authorities in local jurisdiction of such work. All costs in obtaining such fees shall be borne by Contractor.

1.07 TEMPORARY SERVICES

- A. Contractor shall arrange for, furnish, install and maintain temporary electrical service at Site as required and remove same after construction is completed. All temporary services shall be installed in accordance with OSHA Standards.

1.08 RELATION TO OTHER WORK

- A. Electrical work shall be coordinated with work of all associated trades and shall be installed in such a manner as to avoid conflicts with piping, structures and equipment being furnished or installed by other trades.

1.09 RECORDS FOR OWNER

- A. Keep a set of Drawings on job, noting daily all changes made in these Drawings in connection with final installation and turn over a clean, neatly marked set of sepia reproducible Drawings showing "as-installed" work to Engineer for subsequent transmittal to Owner. Accurately locate all underground utilities and services and systems and dimension on "as-built" Drawings. Contractor shall maintain a set of "blue-line" prints in Field or shall maintain a set of "blue-line" prints in Field Office for sole purpose of recording "installed" conditions.
- B. In addition to the above, Contractor shall accumulate during progress of job the following data, prepared in a neat brochure or packet folder and turn over to Engineer for review, and subsequent delivery to Owner:
 - 1. All warranties and guarantees and manufacturers' directions on equipment and material covered by Contract.
 - 2. Operating and maintenance manuals prepared in accordance with General Conditions.
 - 3. Approved wiring diagrams and control diagrams representing "as-built" conditions.
 - 4. Copies of approved Shop Drawings.
 - 5. Any and all other data and/or Drawings required during construction.
 - 6. Repair parts lists of all major items and equipment including name, address and telephone number of local supplier or agent.
 - 7. Submit all of above data to Engineer for approval at such time as Contractor asks for his last estimate.

1.10 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Prepare complete sets of operating and maintenance manuals for each item of equipment. Conform to requirements of all contract documents. Include all certified Shop Drawings.
- B. In addition to above, provide services of a competent technician acceptable to Engineer to instruct a representative of Owner in complete and detailed operation of all equipment and systems. Provide these instructions for a period of sufficient duration to fully accomplish desired results. Upon completion of these instructions, a letter of release will be required, acknowledged by Owner, stating dates of instruction and personnel to who instructions were given. Contractor is responsible for proper maintenance until instructions have been given to Owner's maintenance personnel and letter of release acknowledged.
- C. Provide additional diagrams, operating instructions, etc., as specified hereinafter in other sections of these Specifications.

1.11 MATERIAL AND EQUIPMENT SCHEDULES

- A. Refer to both Drawings and Specifications for schedules. Where reference is made to items "scheduled on Drawings", or "scheduled in Specifications", same shall include schedules contained in both Drawings and Specifications. Contractor's attention is directed to various Specification Sections and Drawings for schedules.
- B. Refer to Equipment List in these Specifications for a list of approved manufacturers of various items of electrical equipment.

1.12 FINAL INSPECTION

- A. Personally conduct a careful inspection trip as a whole, assuring that work on Project is ready for final acceptance, before calling upon Engineer to make a final inspection.
- B. In order not to delay final acceptance, Contractor shall have all necessary bonds, guarantees, receipts, affidavits, etc., called for in various articles of this Specification, prepared and signed in advance, together with a letter of transmittal, listing each paper included, and deliver same to Engineer at or before time of final inspection. Check over each bond, receipt, etc., before preparing same for submission to see that terms check with requirements of Specifications.
- C. Final inspection will be made jointly by Engineer and Owner.

1.13 GUARANTEE

- A. Guarantee, for a period of one year, electrical work installed to be free from defects of workmanship and material, and furnish and pay for all labor and materials required to fulfill this guarantee. Guarantee period shall begin with date of occupancy and use of systems.

PART 2 - PRODUCTS

2.01 GENERAL MATERIALS AND EQUIPMENT REQUIREMENTS

- A. Storage at Site: Do not receive material or equipment at Site until there is suitable space provided to properly store and protect equipment from rust, drip, humidity and dust damage.
- B. Capacities shall be not less than those indicated but shall be such that no component or system becomes inoperative or is damaged because of start-up or other overload conditions.
- C. Conformance to Agency Requirements: Where materials or equipment is specified to be approved, listed or labeled by Underwriters' Laboratories, Inc., or labeled, constructed and/or tested in accordance with standards of NEMA and ANSI, Contractor shall submit proof that items furnished under this Section conform to such requirements. Label of U.L., Inc., applied to item will be acceptable as sufficient evidence that items conform to such requirements.
- D. Manufacturer's Nameplates: Provide each major component of equipment with manufacturer's name, address and catalog number on a stainless steel plate securely attached to item of equipment. All data on nameplates shall be legible at time of Final Inspection.
- E. Verification of Dimensions: Contractor shall be responsible for coordination and proper relation of his work to structures and to work of all trades. Visit the premises and become thoroughly familiar with all details of work and working conditions. Verify all dimensions in the field, and advise Engineer of any discrepancy before performing any work. Make all adjustments to work required in order to facilitate a coordinated installation at no additional cost to Owner or Engineer.
- F. Submit additional data as requested by Engineer on items designated in each section or as requested by Engineer following award of Contract.

2.02 IDENTIFICATION AND LABELING

- A. Clearly mark all items of equipment using engraved nameplates as hereinafter specified. Use 3 ply laminated plastic nameplates, a minimum of 3/32" thick, with white letters on black background. Use Roman Gothic letters of a size that is legible and appropriate to application (3/16" minimum). Attach nameplates with a minimum of two (2) brass or stainless steel screws. Rivets or adhesives are not acceptable.
- B. Electrical equipment to be identified includes: all switchgear, distribution panels, transformers, motor control centers, panelboards, disconnect switches, starters, contactors, time switches, control panels, etc.
- C. Give voltage characteristics on nameplates on distribution panels, motor control centers and panelboards.
Example: PANEL LV
120/240V, 1 PH, 3 W
- D. Individual circuit breakers in distribution panels, individual units in motor control centers, individual disconnecting means, and individual motor starters, shall have nameplates describing load served.
- E. Provide blank nameplates mounted on each spare or bussed space in motor control centers, and on each spare or space in distribution panels.
- F. Branch circuit panelboards shall have neatly typed circuit directories behind clear plastic. Identify circuits by room numbers or floor areas. Room numbers shall be those finally selected by Owner, not necessarily those given on Contract Drawings. Spares and spaces shall be indicated with erasable pencil, not typed.
- G. Provide identification strips for all terminal blocks, marked in compliance with applicable Drawings. Identify wiring at terminal block to match same.
- H. All power wiring (120 VAC and above) shall be color coded per standard color code.
- I. Identify all lights, switches, pushbuttons and other devices on control panel and all relays and other devices inside panel with nameplates complying with this Section.

PART 3 - EXECUTION

3.01 MANUFACTURER'S RECOMMENDATIONS

- A. Follow manufacturer's published directions in delivery, storage, protection, installation, and wiring of all equipment and material. Promptly notify Engineer, in writing, of any conflict between requirements of Contract Documents and manufacturers' directions, and obtain Engineer's instructions before proceeding with work. Should Contractor perform any such work that does not comply with manufacturers' directions or such instructions from Engineer, he shall bear all costs arising in connection with deficiencies.

3.02 SPACE AND EQUIPMENT ARRANGEMENT

- A. Size of electrical equipment indicated on Drawings is based on dimensions of a particular manufacturer. While other manufacturers will be acceptable, it is the responsibility of Contractor to determine if equipment he proposes to furnish will fit in space allotted. Fabrication drawings shall be prepared when required to indicate a suitable arrangement.
- B. Install all equipment in a manner to permit access to all surfaces.

3.03 PROTECTION

- A. At all times take such precautions as may be necessary to properly protect all materials and equipment from damage from time of delivery until completion of Work. This includes erection of temporary shelters and supports where required to adequately protect any items stores from weather, ground and the surrounding work; cribbing of any items above floor of construction; and covering of items in incomplete building with tarpaulins or other protective covering; installation of electric heaters in electrical switchgear and similar equipment to prevent moisture damage. Failure on part of Contractor to comply with above will be sufficient cause for rejection of items in question.
- B. Take particular care not to damage other construction in performing work. Cover all finished floors, step treads and finished surfaces to prevent any damage by workmen or their tools and equipment during the construction of building.

3.04 ELECTRICAL WIRING OF MOTORS AND EQUIPMENT

- A. Wire all interconnecting wiring for installation of power. Unless otherwise noted, provide all disconnect switches as required for proper operation, as indicated on Drawings, and required by applicable code.
- B. Provide complete wiring diagrams indicating power wiring and interlock wiring. Submit diagrams to Engineer for review within fifteen (15) days after submittals for equipment have been reviewed. Diagrams shall be based on accepted equipment and shall be complete full phase and interlock control drawings, not a series of manufacturer's individual diagrams.
- C. Note that electrical design and Drawings are based on equipment scheduled and indicated on Drawings, and should any mechanical equipment requiring changes to electrical design be furnished, required electrical changes shall be made at no cost to Owner or Engineer.

3.05 CUTTING AND PATCHING

- A. General: Cut and patch walls, floors, etc., resulting from work in existing construction or by failure to provide proper openings or recesses in new construction.
- B. Methods of Cutting: Make openings cut through concrete and masonry with masonry saws and/or core drills and at such locations acceptable to Engineer. Do not use impact-type equipment except where specifically acceptable to Engineer. Core drill openings in precast concrete slabs exact size.
- C. Restore all openings to "as new" condition under the appropriate Specification Section for materials involved, and match remaining surrounding materials and/or finishes.
- D. Masonry: Where openings are cut through masonry walls, provide and install lintels or other structural supports to protect remaining masonry. Provide adequate supports during cutting operation to prevent any damage to masonry occasioned by operation. All structural members, supports, etc., shall be of proper size and shape, and shall be installed in a manner acceptable to Engineer.
- E. Plaster: All mechanical work in areas containing plaster shall be complete prior to application of finish plaster coat. Cutting of finish plaster coat will not be permitted.
- F. Special Note: Do not undertake any cutting, coring or excavating which will weaken the structure.

3.06 COOPERATION AND CLEANUP

- A. Cooperate fully with other trades on job to help keep Site in a clean and safe condition. At end of each day's work, properly store all tools, equipment and materials and clean all debris from job.

Upon completion of job, immediately remove all tools, equipment, and surplus materials and all debris caused by work.

3.07 CLEANING AND PAINTING

- A. Paint all equipment, conduit, etc., furnished and installed in exposed areas. Comply with Specification on painting.
- B. Equipment is to be delivered to Site with suitable factory protective finish and painted, after installation, a color hereinafter specified.
- C. No nameplates on equipment shall be painted, and suitable protection shall be afforded to plates to prevent their being rendered illegible during painting operations.
- D. Electrical switchgear, disconnect switches, panelboards, contactors, etc., with suitable factory applied finishes shall not be repainted. Where factory applied finishes are damaged in transit, storage or installation, or before final acceptance, they shall be restored to factory-fresh condition by competent refinishers using a spray process and factory-furnished paint to match.

3.08 OBSTRUCTIONS

- A. Drawings indicate certain information pertaining to surface and sub-surface obstructions which have been taken from Owner's record drawings. This information is not guaranteed, however, as to accuracy of location of complete information.
- B. Before any cutting or trenching operations are begun, verify with Owner's representative, utility companies and other interested parties that all available information has been provided, and verify locations given.
- C. Should obstruction be encountered whether shown or not, alter routing of new work, re-route existing lines, remove obstruction where permitted, or otherwise perform whatever work is necessary to satisfy purpose of new work and leave existing services and structures in a satisfactory and serviceable condition. Assume total responsibility for and repair any damage to existing utilities or construction, whether or not such existing facilities are shown on Drawings.
- D. Where obstructions encountered are beyond scope of work shown or specified in this Project, refer matter to Engineer, and a cost differential proposal will be agreed upon before added work is undertaken.

END OF SECTION

SECTION 26 64 00

CATHODIC PROTECTION SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Work of this Section includes providing a complete cathodic protection system for the following structures as outlined in this Section and on Drawings:
 - 1. Approximately 18.7 miles of new 36" diameter water transmission pipeline.
 - 2. Approximately 18.7 miles of existing (parallel) 36" diameter C-303 water transmission pipeline
- B. Electrical Isolation of above structures from adjacent metallic structures, reinforcing steel, structures of dissimilar metal, conduits, and all other metallic components that may impact operation of cathodic protection system.
- C. Electrical bonding of all non-insulated, non-welded pipe or mechanical joints on new pipeline.
- D. Installation of rectifiers, anode wells, and all other work described herein and on Drawings to be utilized on both pipeline.
- E. Provision of electrical power for rectifiers including any permits, trenching, conduits, services meters, and other items required. Not all required items are shown on Drawings.
- F. Testing of system during installation on both pipelines. Note: Existing pipeline has been bonded and has test stations but no cathodic protection system.
- G. Cleanup and restoration of Site.
- H. Testing of system installation after completion of installation and backfill (Final System Checkout).

1.02 REQUIREMENTS

- A. If products installed as part of this Section are found to be defective or damaged or if Work of this Section is not in conformance with these Specifications then products and Work shall be corrected at Contractor's expense.
- B. Any retesting required due to inadequate installation or defective materials shall be paid for by Contractor.
- C. Work also requires that one Supplier or Subcontractor accept responsibility for Work as indicated, but without altering or modifying Contractor's responsibilities under Contract Documents.
- D. Work also requires coordination of assembly, installation and testing between pipeline contractor and any cathodic protection material supplier or subcontractor, or another pipeline contractor on an adjacent section.

1.03 RELATED SECTIONS

- A. Work of the following Sections applies to Work of this Section. Other Sections of Specifications, not referenced below, shall also apply to the extent required for proper performance of this Work.
 - 1. Section 03 30 00 Concrete
 - 2. Section 09 90 00 Painting
 - 3. Section 26 00 00 Electrical General
 - 4. Section 31 23 17 Trenching

5. Section 33 11 13 Bar-Wrapped Steel Cylinder Pipe
6. Section 33 11 14 Steel Pipe and Fittings.

1.04 REFERENCED SPECIFICATIONS, CODES AND STANDARDS

- A. Work of this Section shall comply with current editions of the following codes and standards:
1. ASTM D1248 - Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
 2. ASTM D1785 - Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120.
 3. ASTM C94 - Standard Specification for Ready-Mixed Concrete
 4. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire
 5. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
 6. ASTM D2220 - Standard Specification for Polyvinyl Chloride
 7. AASHTO - H20 Specification for Highway Bridges
 8. NACE SP0169 - Recommended Practice, Control of External Corrosion on Underground or Submerged Metallic Piping Systems
 9. NACE RP0286 Pipelines - Electrical Insulation of Cathodically Protected
 10. NACE RP0375 Systems - Wax Coating Systems for Underground Piping
 11. NACE TM0497 - Measurement Techniques Related to Criteria for Cathodic Protection on Underground or Submerged Metallic Piping Systems
 12. NACE RP0572 - Design, Installation, Operation and Maintenance of Impressed Current Deep Groundbeds
 13. NFPA 70- National Electric Code (NEC)
 14. Power Company - Electric Requirement
 15. NEMA 250 - Enclosures for Electrical Equipment (1,000 Volts Maximum)
 16. NEMA TC2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit
 17. NEMA TC3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing
 18. UL 6 - Rigid Metal Conduits
 19. UL 514B - Fittings for Cable and Conduit
- B. Whenever Drawings or these Specifications require a higher degree of workmanship or better quality of material than indicated in above codes and standards, these Drawings and Specifications shall prevail.

1.05 PERMITS AND JOB ACCESS

- A. Prior to start of construction, Contractor shall apply to required authorities for permits required for installation of cathodic protection system. Including but not limited to TCEQ, TWDB, Texas railroad Commission, Guadalupe County Underground Water Conservation District, Guadalupe County, City of Cibolo, and City of Schertz.
- B. Contractor shall contact One Call and Utility Owner's prior to commencing construction to locate existing utilities in area of construction. Existing utilities include, but are not limited to, water lines, gas lines, telephone, street lights, sewer and storm drains and overhead and underground electric utilities.
- C. Contractor shall be responsible for reviewing rectifier locations to determine if there are any conflicts with obtaining power from indicated locations. Contractor shall report any conflicts to Engineer prior to proceeding with Work.
- D. If a separate meter or power source is required Contractor shall submit an application to local power company for AC power to new rectifiers. Contractor shall be responsible for all fees and expenses associated with providing power to rectifiers. Rectifiers and SSLGC's sites shall have a dedicated circuit in conduit from power panel to rectifier.

- E. Traffic control shall satisfy requirements of the governing locality and these Specifications.

1.06 QUALITY ASSURANCE

- A. Installation of cathodic protection equipment shall be performed by individuals having at least 5 years of experience in the installation of cathodic protection equipment described herein.
- B. All well drilling shall be performed by a Texas licensed Well Drilling Contractor.
- C. All deep-well installations shall be installed in accordance with State of Texas well standards and applicable sections on wells from local regulations.
- D. All testing required to be performed by a “qualified corrosion technician” shall be performed under supervision of a Corrosion Engineer. A Corrosion Engineer is a Registered Professional Corrosion Engineer with a minimum of 5 years corrosion engineering experience or a NACE Cathodic Protection Specialist.

1.07 SUBMITTALS

- A. The following shall be submitted to Engineer prior to any equipment installation.
 - 1. Catalog cuts, bulletins, brochures, or data sheets for all materials specified herein.
 - 2. Certification that equipment and materials proposed, meet the Specifications and intent of Specifications.
 - 3. Written certification of experience required.
 - 4. Copy of well drilling permits, and well drillers license.
- B. The following shall be submitted to Engineer after completion of Work.
 - 1. Wire connection testing.
 - 2. Insulating joint testing, before and after backfill.
 - 3. Casing insulator testing, before and after backfill.
 - 4. Joint bond testing, before and after backfill.
 - 5. Well completion report.
 - 6. Electrical log with anode-to-earth resistances.
 - 7. System check-out report.
 - 8. Record Drawings shall be submitted to and approved by Engineer before Work is considered complete.
- C. The following shall be included in Owner’s Manual:
 - 1. Operations and maintenance instructions.
 - 2. List of spare parts recommended for 2 years of successful operation.

1.08 INTERFERENCE AND EXACT LOCATIONS

- A. Locations of proposed cathodic protection equipment, test stations, devices, outlets and appurtenances as indicated are approximate only. Exact locations shall be determined by Contractor in field subject to approval of Engineer.
- B. Contractor shall field verify all data and final locations of work done under other Sections of Specifications required for placing of electrical work.
- C. In case of interference with other work or erroneous locations with respect to equipment or structures, Contractor shall furnish all labor and materials necessary to complete Work in an acceptable manner.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All materials installed must be new. All equipment and materials supplied shall be similar to that which has been in satisfactory service for at least 5 years.

2.02 CONDUIT AND FITTINGS

- A. Minimum conduit size shall be 1" unless otherwise indicated. Refer to NFPA 70 (NEC) for additional conduit size requirements.
- B. Conduit and fittings placed below grade shall be PVC, Schedule 80.
- C. Conduit and fittings placed above grade shall be rigid steel. Rigid Steel conduit shall be galvanized conforming to UL 6.
- D. Conduit Straps shall be a 2-hole galvanized steel conduit strap, attached with stainless screws.
- E. Fittings for use with rigid steel conduit shall be galvanized cast ferrous metal, with gasketed covers, Crouse Hinds Condulets, Appleton Unilets, or equivalent. Rigid metallic conduit fittings shall be galvanized conforming to NEMA FB 1, UL 514B listed.
- F. Union couplings for conduits shall be Erickson or Appleton type EC or 0-Z Gedney 3-piece Series 4, or equivalent.

2.03 POST MOUNTED TEST STATION

- A. Post mounted test boxes shall be Testox, as manufactured by Gerome or equivalent.

2.04 CONCRETE TRAFFIC VALVE BOXES

- A. Traffic valve boxes shall be G5 Utility Boxes as manufactured by Christy Concrete Products, Inc., No. 3RT Utility Box as manufactured by Brooks Products or approved equivalent. Traffic box covers for test stations shall be cast iron with welded bead legend and labeled "CP TEST" or "ANODE" as required.
- B. Traffic valve boxes shall be rated to withstand AASHTO H20 traffic loading.

2.05 JUNCTION BOXES

- A. Junction boxes shall be NEMA 250, Type 4, fiberglass construction. Junction boxes shall be sized as indicated on Drawings. Hinges shall be stainless steel and a neoprene gasket shall be furnished with the box to ensure a watertight seal. Junction boxes shall have a latch with a 1/4" diameter hole for installation of a pad-lock.
- B. Junction boxes shall be labeled with a black plastic tag bolted to the front panel of box. This tag shall be engraved in a contrasting color with identification of junction box. Minimum height of lettering shall be 3/4".

2.06 BOLLARD

- A. Bollard shall be 6" diameter ANSI B36.10 Schedule 40 steel pipe.
- B. Bollard shall be painted yellow.

2.07 READY-MIXED CONCRETE

- A. Ready-mixed concrete shall be in accordance with ASTM C94 and shall have a minimum compressive strength of 4,000 psi.

2.08 PANEL BOARDS

- A. Panel boards shall be made of 1/4" thick phenolic plastic sized as indicated on Drawings.
- B. Connection hardware shall be brass or bronze. All connections shall be double nutted bolts with lock washers.
- C. Copper bus bar shall be 1/8" thick and sized to fit. Copper bus bar shall be per ASTM B187, 98% conductivity.
- D. In accordance with Section 26 00 00 - Electrical General

2.09 SOLDERLESS LUG CONNECTORS

- A. Solderless lug connector shall be made of brass or copper with a brass screw. Lug shall be designed for direct burial and shall be appropriately sized for connection wire. Lug shall be ILSCO Type XT-6DB or approved equivalent.

2.10 SHUNTS FOR IMPRESSED CURRENT ANODES

- A. Shunts for impressed current anode systems shall be of ratings shown on Drawings. Shunts shall be as manufactured by Holloway or equivalent.

2.11 UTILITY WARNING AND IDENTIFICATION TAPE

- A. Warning and identification tape shall be an inert plastic film designed for prolonged underground use. Tape shall be a minimum of 3" wide and a minimum of 4 mils thick. Tape shall be continuously printed over entire length with wording "CAUTION: CATHODIC PROTECTION CABLE BURIED BELOW". Wording shall be printed using bold black letters. Color of tape shall be red.

2.12 WIRES

- A. Per Section 26 00 00 - Electrical General and as specified herein or shown on Drawings.
- B. Conductors shall consist of stranded copper of gauge indicated. Wire sizes shall be based on American Wire Gauge (AWG). Copper wire shall be in conformance with ASTM Designations B3 and B8.
- C. All wires terminating in a junction box or test station shall have a wire identifier attached within 4" from end of wire at terminal board, prior to backfill, as specified under "Wire Identification".
- D. Crosslinked polyethylene (XLPE) and high molecular weight polyethylene (HMWPE) insulating jackets shall conform to ASTM D-1248.
- E. Joint Bonds:
 1. General: Single-conductor, stranded copper wire with 600-Volt HMWPE insulation. Supply joint bonds complete with formed copper sleeve on each end of wire. Bond cable gauge shall be based on the diameter and thickness of the pipe cylinder. Two - THHN insulated No. 4 AWG bond cables shall be used for each non-welded, non-insulating pipe joint.
 2. Push-On, Mechanical, or Flanged Joints: 18" long, minimum. THHN insulated No. 4 AWG
 3. Flexible Coupling Joints: THHN insulated No. 4 AWG 24" long, with two - 12" long THHN insulated No. 10 AWG wire pigtailed, as manufactured by Erico Products Inc. (Cadweld), Cleveland, OH.
- F. Test Station: Single-conductor, No.10 AWG stranded copper with 600-Volt THWN, or THHN insulation.

G. Insulation Colors: As shown on Drawings.

2.13 WIRE IDENTIFIERS

A. Wire identifiers shall be wrap-around type with a high resistance to oils, solvents and mild acids. Wrap-around markers shall fully encircle the wire with imprinted alpha-numeric characters for pipe identification. Letters and numbers shall be printed, minimum 3/16" in size.

2.14 EXOTHERMIC WELDS

A. Exothermic welds shall be in accordance with the manufacturer's recommendations. Exothermic welds shall be Cadweld, as manufactured by Erico Products, Inc. or Thermoweld as manufactured by Continental Industries, Inc., or approved equivalent. Duxseal packing as manufactured by Johns-Manville or approved equivalent shall be used where necessary to prevent leakage of molten weld metal.

B. Shape and charge of exothermic weld shall be chosen based on the following parameters:

1. Pipe material
2. Pipe size
3. Wire material/size and requirement for sleeves
4. Number of strands to be welded
5. Orientation of weld (vertical or horizontal)

2.15 BITUMASTIC COATING

A. Bitumastic coating shall be TC Mastic, as manufactured by Tapecoat Company, Bitumastic 50 as manufactured by Kopcoat Inc., or approved equivalent.

2.16 WELD CAPS

A. Weld caps shall be Royston Handy Cap, as manufactured by Royston Laboratories, Inc. Thermite Weld Cap, as manufactured by Phillips Petroleum Co., or approved equivalent.

2.17 RECTIFIERS

A. Rectifiers shall be air cooled single phase 120/240V AC input and DC output as shown on the Drawings. Rectifiers as manufactured by Universal Rectifiers, Inc., Corppower Rectifiers, Inc., or approved equivalent.

B. Rectifiers shall be designed to operate continuously at an ambient temperature of 50°C without damage to the rectifier components.

C. Transformer:

1. Two-winding, insulating type, meeting requirements of NEMA and UL.
2. Rectifiers shall be capable of operating continuously at rated output current at any voltage from zero to 100% without damaging any rectifier components. Full rated DC output voltage shall be adjustable by not less than 25 equal steps from approximately 4% of rated voltage to full rated output voltage. This adjustment shall be accomplished with silver plated or stainless steel connectors and adjustment link bars.

D. Rectifying element shall be a full-wave bridge, silicon diode stack with efficiency filter, metal oxide thyristors, and current-limiting devices for overvoltage and over current protection of stack. Silicon stacks shall be equipped with silicon diodes rated at a minimum of 800 peak inverse Volts.

E. All rectifiers shall have overload and lightning protection for both AC and DC circuits.

- F. Both a digital voltmeter and a digital ammeter shall be provided. Voltmeter and ammeter shall be calibrated and adjusted at the factory.
- G. Rectifier cabinets shall be a NEMA 250, Type 4 enclosure.
- H. Rectifier cabinets shall be made of 10-gauge steel shall be shop coated with a baked white enamel finish.
- I. Rectifiers shall be equipped with permanent identification tags affixed to outside front door. Identification tags shall have black engraving for identification of rectifier. Minimum height of lettering shall be 3/4". Tags shall have the following legend:

SSLGC
 XXXXX XXXXXX
 Cathodic Protection Rectifier

- J. The following shall be provided for each rectifier. Each item shall be provided in a waterproof bag or container.
 - 1. One complete set of spare fuses, attached to inside of cabinet
 - 2. Spare parts
 - 3. Operations and Maintenance Manual
 - 4. Circuit Diagram
 - 5. Electrical Test Report

2.18 MIXED METAL OXIDE ANODES

- A. Anodes shall be 1.0" in outside diameter by 48" in length, mixed metal oxide coated tubes. Anode shall have a minimum life of 50 years at maximum current output of 3 Amperes.
- B. Anode wire connection shall have a pulling strength exceeding wire's tensile strength. Any damage to wire insulation or anode shall require complete replacement of wire and anode.
- C. Wire attached to the anodes shall be stranded copper wire and insulated for 600 Volts. Wire size shall be minimum AWG No. 8. Wire insulation shall be a dual extrusion type. Inner insulation jacket shall be chlorine resistant 20-mil thick chlorofluorethylene (E-CTFE) primary insulation with an outer jacket of 80-mil thick HMWPE. Wire's insulation shall be rated at 600 Volts. Wire shall be continuous from the anode connection to junction box, no splices are allowed.
- D. Anodes shall be furnished with a cable attached to center of anode using a mechanical wedge connection. Connection shall be sealed by filling tube with epoxy and the ends of anode shall then be covered with heat shrink tubing for a water tight seal. Pulling strength of connection shall exceed the tensile strength of wire.
- E. Anode wires shall be of one continuous length without splices from anode connection to junction box. Anode wires with attached anodes shall be shipped to Site with wire wound on a reel. Minimum core diameter of reel shall be 5-1/2". Anode wire insulation shall be free of surface damage such as nicks, abrasions, scratches, etc., in all respects throughout the entire length of wire. Precaution shall be taken during fabrication, transportation and installation of anodes to see that wire is not kinked or sharply bent. Bends sharper than 2-1/2" in radius are not permissible.

2.19 CALCINED FLUIDIZED PETROLEUM COKE BREEZE

- A. Backfill material for impressed current anodes shall be calcined coke breeze with a resistivity of 25 Ohm-cm or less when tested with an applied pressure of 2 psi and a bulk density of 64 to 72 pounds per cubic foot. Backfill material shall have a particle size of 200 to 20 mesh.
- B. Calcined coke breeze backfill shall have the following chemical properties:
 - 1. Fixed carbon 98% minimum

2. Ash 0.5% maximum
3. Sulfur 5.8% maximum
4. Volatile matter 1.0% maximum
5. Moisture 1.0% maximum

2.20 COKE BREEZE BACKFILL SHALL BE LORESCO SC-2, ASBURY 251 OR APPROVED EQUIVALENT ANODE VENT PIPING

- A. Plastic conduit for the impressed current anode vent piping shall be 2" diameter PVC, Schedule 80, conforming to ASTM D1785, Type 1 Grade 1, NEMA TC2 for conduit and TC3 for fittings. As manufactured by Loresco All-Vent, or approved equal.

2.21 ANODE CENTRALIZERS

- A. Centering devices shall be designed and fabricated by Contractor or Supplier and shall be submitted to Engineer for acceptance prior to use. Device shall be constructed of metal.

2.22 MONOLITHIC INSULATING JOINTS

- A. Monolithic insulating joints shall be designed to provide for permanent electrical isolation of piping sections. They shall be completely factory assembled and designed to be welded into piping section.
- B. Monolithic Insulating Joints shall be Isojoint as manufactured by Advance Products & Systems Inc., or approved equivalent.

2.23 PETROLATUM TAPE

- A. Petrolatum tape system shall be Trenton Primer and #1 Wax-tape, as manufactured by Trenton Corp., or Denso Paste and Densyl Tape by Denso North America, Inc., or approved equivalent.

2.24 WATERPROOF SPLICE KIT

- A. Splice kit shall be a resin splice kit that completely encapsulates the wire and splice connection and shall be designed for cathodic protection splices. Splice kit shall be Scotchcast 85-14 CP Resin Splicing Kit as manufactured by 3M or approved equivalent.

2.25 RUBBER SPLICING TAPE

- A. Rubber splicing tape shall meet requirements of ASTM D-4388 with a minimum thickness of 30 mils. Tape shall be Scotch Brand linerless rubber splicing tape, Model 130C or approved equal.

2.26 DIELECTRIC BARRIER

- A. Dielectric barrier at foreign pipeline crossings locations shall be installed midway between Project pipeline and foreign pipeline. Dielectric barrier shall be a 125-mil neoprene or high density polyethylene sheet. Sheet shall measure 5 feet by 10 feet square and shall extend a minimum of 4 feet on each side of crossing

2.27 ELECTRICAL TAPE

- A. Vinyl electrical tape shall meet the requirements of ASTM D 30055 with a minimum thickness of 8.5 mils. Electrical tape shall be Scotch Brand Premium Vinyl Electrical Tape, Model Super 88 or approved equal.

PART 3 EXECUTION

3.01 EXCAVATION AND BACKFILL

- A. Buried wires shall have a minimum cover of 24”.
- B. Caution tape shall be installed above buried wire. Conduits shall be installed at a maximum depth of 18” below grade over wire and conduit location.
- C. Anode wire identification tags shall be placed on wires prior to placing wire in conduit or backfilling.
- D. All buried conduit shall be encased in “red” concrete.

3.02 TEST STATIONS AND JUNCTION BOXES

- A. Flush mounted test stations and junction boxes shall be installed at approximate locations shown on Drawings. Flush mounted test stations shall be located behind curb and other areas not subject to vehicular traffic. Bollards shall not be installed in drainage channels or within road right-of-way. Contractor shall field verify final location of test stations. Wire identifiers shall be placed on all wire prior to backfill and installation of test stations.
- B. Contractor shall notify owner of foreign utility piping for which foreign pipeline crossing test stations are to be installed. Notification shall be provided at least 2 weeks in advance. Test leads to foreign pipelines shall be installed in presence and to satisfaction of a representative of foreign pipeline owner.
- C. Provide global positioning system (GPS) coordinates of each test station location with a minimum accuracy of 3 meters or 10 feet. Contractor shall submit GPS coordinates of test stations to Engineer and Owner after installation.

3.03 WIRES

- A. Buried wires shall be laid straight without kinks. Each wire run shall be continuous in length and free of joints or splices, unless otherwise indicated. Care shall be taken during installation to avoid punctures, cuts or other damage to wire insulation. Damage to insulation shall require replacement of entire length of wire at Contractor’s expense.
- B. At least 18” of slack (coiled) shall be left for each wire at each test station. Wire slack shall be sufficient to allow removal of wire extension for testing. Wire shall not be bent into a radius of less than 8 times diameter of wire.
- C. Eire conduits must be of sufficient diameter to accommodate wires. This shall be determined by number and size of wires in accordance with applicable codes and standards.

3.04 WIRE IDENTIFIERS

- A. All wires shall be coded with wire identifiers.
- B. Wire identifiers shall be placed on wires prior to backfill.

3.05 EXOTHERMIC WELD CONNECTIONS

- A. Exothermic weld connections shall be installed in manner and at locations indicated. Coating materials shall be removed from surface over an area of sufficient size to make connection. Surface shall be cleaned to bare metal by grinding or filing prior to welding conductor. Use of resin impregnated grinding wheels will not be allowed. A copper sleeve shall be fitted over conductor. Only enough insulation shall be removed such that copper conductor can be placed in welding mold.

- B. Contractor shall be responsible for testing all test lead and bond wire welds. Engineer, at his or her discretion, shall witness these tests.
- C. After weld has cooled, all slag shall be removed and metallurgical bond shall be tested for adherence by Contractor. A 22-ounce hammer shall be used for adherence testing by striking a blow to weld. Care shall be taken to avoid hitting wires. All defective welds shall be removed and replaced at Contractor's expense.
- D. After backfilling pipe, all test lead pairs shall be tested for broken welds using a standard ohmmeter. The resistance shall not exceed 150% of theoretical wire resistance as determined from published wire data.
- E. Contractor shall inspect both the interior and exterior of pipe to confirm that all coatings and linings removed or damaged as a result of welding have been repaired. Contractor shall furnish all materials, clean surfaces and repair protective coatings and linings damaged as a result of welding. Repair of any coating or lining damaged during welding shall be performed in accordance with coating or lining manufacturer's recommendations.
- F. All exposed surfaces of copper and steel shall be covered with insulating materials as indicated.
- G. For dielectrically coated pipes, a bitumastic coating shall be applied to all exothermic weld locations. Coating shall be covered with a plastic weld cap. All surfaces must be clean, dry and free of oil, dirt, loose particles, and all other foreign materials prior to application of coating.

3.06 JOINT BONDS

- A. Bond wires shall be provided across flexible couplings and all non-welded joints, as necessary to ensure electrical continuity, except where insulating joints have been installed to provide electrical isolation. Joint bonds shall be as shown on Drawings and installed as indicated. Wire shall be attached by exothermic welding. At least 2 bonds shall be provided between all discontinuous joints.
- B. For ductile iron pipe, Contractor may, at his own expense, provide weld plates, installed by pipe manufacturer, at spigot end of pipe. Provision of weld plates does not relieve Contractor from responsibility for repair of damage to coating or lining as a result of exothermic welding of pipe. Coating repairs shall be performed in accordance with coating manufacturer's recommendations.

3.07 PETROLATUM TAPE SYSTEM APPLICATION

- A. Petrolatum tape system shall be applied on insulating joints and as indicated in Drawings. Petrolatum tape system shall be applied in accordance with NACE RP0375, and these Specifications. Materials shall be applied according to Manufacturer's recommendations.
- B. All loose scale shall be removed from the surface to be coated with hand tools (wire brush, scraper, rags). Debris and moisture shall be wiped from surface with clean rag. Petrolatum tape shall be applied immediately after applying primer, using a 1" overlap. A spiral wrap shall be used and a slight tension shall be applied to ensure that there are no air pockets or voids. After applying tape, applicator shall firmly press and smooth out all lap seams and crevice areas. Tape shall be in tight intimate contact with all surfaces.

3.08 IMPRESSED CURRENT ANODE INSTALLATION

- A. Impressed current anode beds shall be installed in accordance with NACE RP0572, state and local well standards, and these Specifications.
- B. Well Drilling
 - 1. Contractor shall obtain and pay for all fees and permits required for well drilling.

2. The shall protect the well bore from intrusion of contaminants into hole at all times. Contractor is responsible for cost of all cleanup associated with contamination of well and/or Site resulting from Contractor's Work.
 3. Fresh water shall be circulated from bottom of hole to clear well of drilling mud and cuttings after well is drilled.
 4. Loading of anodes and other equipment in the well shall be done in the presence of Engineer. A minimum of 48 hours notice shall be given by Contractor to Engineer prior to loading anodes. Loading of anodes into well shall begin early enough in day to ensure completion of all loading, including backfilling, during regular working hours.
 5. Well shall be covered with a steel trench plate or other heavy device that blocks access and that cannot be removed by hand whenever well is left unattended.
- C. Well Casing
1. Contractor may elect to install well with or without a casing, as shown in Drawings. In the event that well collapses, for any reason, including elimination of casing, well shall be relocated, re-drilled and original hole abandoned at Contractor's expense. Only a metallic casing may be used in coke breeze column.
 2. Surface casing shall be installed with schedule 80 PVC pipe a minimum of 20 feet below surface, unless additional; casing is required by regulatory agency.
- D. Anodes
1. Engineer shall visually inspect the insulation on anode lead wire for abrasion or other damage to insulation and wire as anode is lowered into place. Anodes with damaged insulation or wire are not acceptable and shall not be installed. Splices are not allowed on anode wire.
 2. Anode assemblies with centralizers attached shall be lowered into hole supported by attached lead wires. All sharp edges on the centering device assembly shall be ground smooth to preclude damaging any wires while lowering anodes into place. Vent pipe shall not be attached to anode.
 3. When an anode has been placed it shall be securely fixed in that position.
 4. All anodes shall be loaded prior to coke breeze backfill. Anodes shall not be backfilled until Engineer has inspected the placement of the anodes and given permission to backfill.
- E. Vent Pipe
1. Bottom of the vent pipe shall be securely capped.
 2. Top of the vent pipe shall be temporarily sealed during coke breeze loading process. Any foreign material entering the vent pipe shall be removed.
- F. Coke Breeze Backfill.
1. Coke backfill shall be placed using a slurry pump which pumps coke into bottom of hole, allowing hole to be filled from bottom up. Coke shall not be pumped through vent pipe.
 2. Coke breeze shall be mixed with water when introduced into hole to prevent bridging or creation of voids. At time of introduction of backfill, hole shall contain sufficient water to minimize bridging and rate of introduction of backfill shall be controlled to minimize possibility of bridging. In the event that voids or bridging does occur, the Contractor shall correct the deficiency to satisfaction of Engineer.
 3. Coke shall be allowed 24 hours to settle. After 24 hours, coke column shall be topped off as required to achieve the specified coke column length.
 4. Incomplete coverage of each anode with coke breeze shall be cause for rejection of anode well.
 5. Contractor shall record the total weight of coke breeze placed in each anode well.
- G. Well Seal
1. Backfilling operations above coke breeze column shall begin no sooner than 24 hours after installation of coke breeze to allow for settling. Backfilling shall be done continuously, without interruption, until hole is sealed.

2. Collapse of hole prior to the introduction of seal material shall be cause for abandonment of well at Contractor's expense.
 3. Sealing materials shall not be allowed to drop from top of hole. All materials shall be pumped into hole from bottom of hole to top.
 4. If well casing materials are used in construction of well, then annular space between well bore and casing shall also be sealed with a conductive grout.
 5. Sealing material shall not enter vent pipe.
 6. Contractor shall record volume of sealing material installed in hole.
- H. Storage and disposal of drilling fluids, cuttings and mud:
1. During the drilling and loading process, drilling fluids, cuttings, and mud shall be stored onsite in uncontaminated, watertight, lockable debris boxes. Alternative storage methods may be utilized only with prior approval of Engineer. Drilling mud and cuttings shall be disposed of by Contractor at a suitable disposal site.

3.09 RECTIFIER

- A. Rectifier installation includes provision of AC power to rectifier by Contractor. Contractor shall furnish and install all required wiring, conduits, cables, meters, splice boxes, and equipment as necessary for operation of rectifier and as required by local power agency. Approximate locations of rectifiers and electrical power are shown on Drawings.

3.10 INSULATING JOINTS/DIELECTRIC UNIONS

- A. Insulating joints shall be installed to effectively isolate metallic piping from foreign metallic structures. Insulating joints shall be installed at all appurtenance and branch piping as indicated on Drawings. Contractor shall test performance of these insulating joints before and after backfill.
- B. Before backfill, Contractor shall test insulating joint using a Gas Electronics Model No. 601 Insulation Checker, or approved equivalent. If testing results indicate less than 100% insulation, insulating joints shall be repaired and retested at Contractor's expense.
- C. After backfill, testing shall be performed by measurement of native pipe-to-soil potentials at both sides of insulating joint. If difference in native pipe-to-soil potentials on both sides of insulating joint are within +/-50 milliVolts, then additional testing shall be performed as follows. Temporary cathodic protection current shall be applied on one side of insulating joint. "On" and "Instant Off" pipe-to-soil potentials shall be measured on other side of insulating joint. If "Instant Off" potential is more negative than native potential, insulating joint shall be considered deficient and shall be repaired and retested at Contractor's expense.

3.11 MONOLITHIC INSULATING JOINT

- A. Monolithic Insulating joints shall be installed to effectively isolate metallic piping from foreign metallic structures. Monolithic insulating joints shall be installed on main-line pipe as indicated on Drawings. Test effectiveness of Monolithic Insulating joint prior to backfill. Testing shall be performed by measurement of native pipe-to-soil potentials at both sides of insulating joint. If difference in native pipe-to-soil potentials on both sides of insulating joint are within +/-50 milliVolts, then additional testing shall be performed as follows. Temporary cathodic protection current shall be circulated on one side of insulating joint. "On" and "Instant Off" pipe-to-soil potentials shall be measured on other side of insulating joint. If "Instant Off" potential is more negative than native potential, insulating joint shall be considered deficient and shall be repaired and retested at Contractor's expense.
- B. After backfill, testing shall be performed by measurement of native pipe-to-soil potentials at both sides of insulating joint. If difference in native pipe-to-soil potentials on both sides of insulating joint are within +/-50 milliVolts, then additional testing shall be performed as follows. Temporary cathodic protection current shall be circulated on one side of insulating joint. "On" and "Instant Off" pipe-to-soil potentials shall be measured on other side of the insulating joint. If "Instant Off"

potential is more negative than native potential, the insulating joint shall be considered deficient and shall be repaired and retested at Contractor's expense.

3.12 CASING INSULATORS

- A. Casing insulators shall be installed as indicated in Drawings to effectively isolate pipeline from casing. Contractor shall test the performance of casing insulators before and after backfill.
- B. Before backfill, Contractor shall test all casing insulators using a Gas Electronics Model No. 601 Insulation Checker or approved equivalent. If testing results indicate less than 100% insulation, casing insulators shall be repaired and retested at Contractor's expense.
- C. After backfill, testing shall be performed by measurement of native pipe-to-soil potentials and native casing-to-soil. If the difference in native is greater than 20 milliVolts, casing shall be considered isolated. If difference in native potentials is less than 20 milliVolts, then additional testing shall be performed as follows. Temporary cathodic protection current shall be applied on casing. "On" and "Instant Off" pipe-to-soil potentials shall be measured on pipe. If "Instant Off" potential is more negative than native potential, insulating joint shall be considered deficient and shall be repaired and retested at Contractor's expense.

3.13 CONTINUITY TESTING

- A. Continuity testing of joint bonds shall be tested by Contractor's qualified corrosion technician as defined in this Section after backfill. Electrical continuity test may additionally be performed before backfill at Contractor's option.
- B. Pipe shall be tested for electrical continuity. Continuity shall be verified using linear resistance method. Pipe shall be tested in spans that are no less than 250 feet unless pipe is shorter than 250 feet and no more than 1,000 feet. Each test span shall have two test leads connected to pipe at each end. Existing test stations can be used. A direct current shall be applied through pipe using two of four test leads. Potential across test span shall be measured using other two test leads. Current applied and voltage drop shall be recorded for a minimum of three different current levels.
- C. Theoretical resistance of pipe shall be calculated. It shall take into account pipe wall thickness, material, and joint bonds.
- D. Acceptance of test span: Average measured resistance shall be compared to theoretical resistance of pipe and bond wires. If the measured resistance is greater than 150% of theoretical resistance, then joint bonds shall be considered deficient and shall be repaired and retested at Contractor's expense, on new pipeline. If the measured resistance is less than 100% of theoretical resistance then test and/or calculated theoretical resistance shall be considered deficient and the test span shall be retested and/or recalculated at Contractor's expense on new pipeline. If piping forms a loop which allows current to flow both in and out of test span, then consideration shall be made for current circulating through both loop and test span.
- E. Results shall be included in final commissioning report.

3.14 SYSTEM CHECKOUT

- A. Upon completion of installation, Contractor shall provide testing of completed system by a NACE certified corrosion technician and data shall be reviewed by a Corrosion Engineer to ensure conformance with Contract Documents, NACE SP0169, and NACE RP0286.
- B. Testing described herein shall be in addition to and not substitution for any required testing of individual items at manufacturer's plant and during installation.

- C. Testing shall be performed at all test leads of all test stations and at locations of exposed pipe as soon as possible after installation of cathodic protection system.
- D. Testing shall include the following and shall be conducted in accordance with NACE TM0497:
 - 1. Verify electrical isolation at all insulating joints, insulating unions, and casing insulators per NACE RP0286.
 - 2. Confirm electrical continuity of pipeline or cathodically protected structure in accordance with this Section.
 - 3. Measure and record native structure-to-soil potentials at each location.
 - 4. Measure and record "On" and "Instant Off" structure-to-soil potentials at each location.
 - 5. Measure and record the current output of each anode.
- E. Test results shall be analyzed to determine compliance with NACE SP0169.
- F. Test results shall be analyzed to determine if stray current interference is present. Stray current interference is defined as a +/-50 milliVolt shift in a pipeline's pipe- to-soil potential that is caused by a foreign current source. Stray current interference shall be tested on the project pipeline and foreign pipelines that have a reasonable chance of being affected by stray currents.
- G. Contractor shall provide a written report, prepared by the Corrosion Engineer, documenting results of testing and recommending corrective work, as required to comply with Contract Documents. Any deficiencies of systems tested shall be repaired and re-tested by Contractor at no additional cost to Owner.

END OF SECTION

SECTION 31 05 13

TOPSOIL

PART 1 - GENERAL

1.01 SUMMARY

- A. Description: This item shall consist of preparing the ground surface for topsoil application, removing topsoil from designated stockpiles or areas to be stripped on Site or from approved sources off-site, and placing and spreading topsoil on prepared areas in accordance with this Specification at locations shown on Drawings or as directed by Engineer.
- B. Section Includes:
 - 1. Topsoil materials.

1.02 UNIT PRICES

- A. Basis of Payment: All work performed as required herein and measured as provided under "Measurement" will be paid for at unit price bid. Prices shall be full compensation for furnishing all labor; for all materials; for all royalty and freight involved; for all hauling and delivering on road; and for all tools, equipment and incidentals necessary to complete work. Payment for unauthorized work will not be made.

1.03 SUBMITTALS

- A. Section 01 33 00 - Submittals
- B. Samples: Submit, in air-tight containers, 10 pound sample of each type of fill to testing laboratory.
- C. Materials Source: Submit name of imported materials source.

PART 2 - PRODUCTS

2.01 TOPSOIL MATERIALS

- A. Topsoil:
 - 1. This material shall consist of approved topsoil material and shall be clean, friable, loamy soil capable of supporting plant life
 - 2. This material can be excavated and reused material from on-site sources, or imported from an approved off-site source.
 - 3. Reasonably free of roots, rocks larger than 2", subsoil, debris, weeds, and foreign matter.
 - 4. Acidity range (pH) of 5.5 to 7.5.
 - 5. Containing minimum of 4% and maximum of 25% organic matter.
 - 6. Conforming to ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil
 - 7. Classification System). Group Symbol OH or PT.
 - 8. Limit decaying matter to 10% of total content by volume.

2.02 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements
- B. When tests and/or observations indicate materials do not meet specified requirements, change material and retest.

- C. Furnish materials of each type from same source throughout Work, unless otherwise approved by Engineer. Off-site borrow sources shall be approved by Engineer.

PART 3 - EXECUTION

3.01 STOCKPILING

- A. Stockpile materials at locations designated or approved by 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. Stockpile topsoil to only a height which yields safe slope stability.
- E. Prevent intermixing of soil types or contamination.
- F. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.02 STOCKPILE CLEANUP

- A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.
- B. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

3.03 PLACING TOPSOIL

- A. Eliminate uneven areas and low spots.
- B. Remove debris, roots, branches, and stones in excess of 2" in size.
- C. Scarify surface to depth of 4" where topsoil is scheduled.
- D. Place topsoil in areas where seeding and/or sodding is required to nominal depth of 4" (plus or minus ½ inch), or as indicated on Drawings. For areas that will receive sod, leave topsoil low. Place topsoil during dry weather.
- E. Fine grade topsoil to eliminate rough or low areas. Maintain profiles and contour of sub-grade.
- F. Remove roots, weeds, rocks, and foreign material while spreading.
- G. Manually spread topsoil close to plant material, structures, water and wastewater appurtenances, concrete paving, and curbs to prevent damage.
- H. Lightly roll placed topsoil.
- I. Remove surplus topsoil from Site.
- J. Leave stockpile area and Site clean and raked, ready to receive seeding or sodding.
- K. Prohibit construction traffic over topsoil.

END OF SECTION

SECTION 31 10 00

CLEARING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Removing and disposing of surface debris, rubbish, and other objectionable materials.
 - 2. Removing and disposing of designated building slabs, paving, curbs, driveways, miscellaneous stone, brick, concrete, sidewalks, drainage structures, headwalls, safety end treatments, manholes, inlets, and abandoned railroad tracks.
 - 3. Removing and disposing of designated fencing and signage.
 - 4. Removing and disposing of designated trees, shrubs, and other plant life.
 - 5. Removing and disposing of designated abandoned water and wastewater utilities and septic tanks.
 - 6. Herbicide treatment
 - 7. Excavating topsoil.

1.02 UNIT PRICE

- A. Clearing:
 - 1. Basis of Measurement: "Clearing," when included in Contract as a pay item, will be measured by acre.

1.03 SUBMITTALS

- A. Section 01 33 00 - Submittals
- B. Product Data: Submit data for herbicide. Indicate compliance with applicable codes for environmental protection.

1.04 QUALITY ASSURANCE

- A. Conform to applicable code for environmental requirements, disposal of debris, burning debris on site, and use of herbicides.
- B. Herbicide:
 - 1. License Requirements: Possess either a commercial pesticide applicator license from Texas Department of Agriculture, or a Texas Structural Pest Control Service License. Provide documentation of license before beginning work. Conduct on-site supervision of all mixing, transporting, handling, spraying, and disposal of materials with licensed personnel.
 - 2. Records: Document work in accordance with all Federal, State, and Local regulations. Submit a copy of herbicide records on next business day following application. Submit a final copy of all herbicide application records upon completion of work.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Herbicide: Furnish herbicide materials in accordance with Section 15 of 2017 TxDOT Herbicide Operations Manual.
- B. Pathfinder II, Transline, and Capstone are acceptable products that can be used in conjunction with each other.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify existing plant life designated to remain is tagged or identified.
- C. Identify spoils site for placing removed materials.

3.02 PREPARATION

- A. Call Texas 811 service not less than 3 working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.
- B. Prior to commencing this work, erosion control measures shall be in place.

3.03 PROTECTION

- A. Locate, identify, and protect structures and utilities indicated to remain, from damage.
- B. Areas within the construction limits or as indicated shall be cleared of all trees, stumps, brush, etc. as defined above; except trees or shrubs indicated for preservation which shall be carefully trimmed as directed, and shall be protected from scarring, barking or other injuries during construction operations. Exposed ends of pruned limbs or scarred bark shall be pruned, trimmed and treated with an approved asphaltic material within 24 hours of pruning or injury.
- C. Locate, protect, and maintain benchmarks, monuments, control points, and project engineering reference points. Re-establishment of disturbed or destroyed items shall be by a Registered Professional Land Surveyor (licensed in State of Texas), at no additional cost to Owner.
- D. Construction equipment shall not be operated within drip line of trees, unless indicated. Construction materials shall not be stockpiled under canopies of trees. No excavation or embankment shall be placed within drip line of trees until tree wells are constructed.

3.04 CLEARING

- A. Strip and remove from construction area all topsoil, organics, and vegetation to a minimum depth of 9" below existing natural ground surface.
- B. Remove trees and shrubs within construction limits unless noted otherwise in Drawings. Use a "flail" mower where possible to remove trees to preserve grasses and low-growing brush.
- C. Remove stumps, main root ball, and root system. Holes remaining after the removal of all obstructions, objectionable materials, trees, stumps, etc. shall be backfilled with Select Fill and compacted in accordance with Section 31 23 23 - Fill.
- D. Clear undergrowth and deadwood, without disturbing subsoil.
- E. Apply herbicide to remaining stumps to inhibit growth.
- G. If clearing is to be conducted during "nesting" season, Contractor request a survey of impacted area by Owner, Owner will employ a qualified biologist, at its cost, to conduct a survey no more than 5 days prior to scheduled clearing to identify any constructed nests. If active nests are observed during such surveys, a 150-foot buffer of vegetation shall remain around nests until

young have fledged or that nest is abandoned.

3.05 REMOVAL

- A. Remove surface debris and rock from Site, or as indicated on Drawings.
- B. Extracted trees, shrubs and other plant life shall be piled and left on-site if agreeable to Owner. Others wise mulch woody debris and spread along easement.
- C. Remove designated building slabs, paving, curbs, driveways, miscellaneous stone, brick, concrete, sidewalks, drainage structures, headwalls, safety end treatments, manholes, inlets, and abandoned railroad tracks as indicated on Drawings. Neatly saw cut edges at right angle to surface.
- D. Remove designated fencing and signage.
- E. Remove abandoned water and wastewater utilities and septic tanks. Indicated removal termination point for underground utilities on Record Documents.
- F. Continuously clean-up and remove waste materials from Site. Do not allow materials to accumulate on Site.
- G. Do not burn or bury materials on site. Leave site in clean condition.

3.06 HERBICIDE TREATMENT

- A. Season: Spray herbicide during active growing periods unless otherwise approved.
- B. Equipment: Furnish all equipment.
 - 1. Broadcast application: furnish self-propelled equipment tractor mounted or pulled spray rigs with a low center of gravity that allows safe traverse on a maximum 3:1 slope. Provide equipment capable of making uniform broadcast application calibrated at a rate between 20 and 40 gallons per acre (GPA).
 - 2. Basal Bark and Cut Tree applications: Furnish sprayers with low volume spray tips (spray system 5,500 adjustable spray tip X-1 or X-2, or approved equivalent).
 - 3. Personal Protection Equipment: Follow manufacturer's label requirements for personal protection of employees.
- C. Work Methods: Apply approved herbicide in accordance with the manufacturer's label recommendations, as shown on Drawings or as approved. Add surfactant and blue dye marker at the manufacturer's recommended rate unless otherwise approved. Prepare herbicide solution to recommended rates using procedures on herbicide container label. Dispose of empty containers and unused chemical mixtures in accordance with label directions and local, state, and federal regulations. Cease spraying operation immediately when wind or other environmental conditions cause off-target spray drift, leaves are wet, or rainfall is imminent. An inspection of the treated areas will be made not less than 14 days and no later than 30 days after application. Re-treat areas in which undesirable vegetation has not be controlled for no additional compensation. Repair and replace any damaged desirable vegetation or erosion as a result of negligent applications.
 - 1. Broadcast application: spray undesirable vegetation by broadcasting with spray nozzles at desired application rate. Ensure nozzles spray consistent across the area being covered.
 - 2. Basal Bark treatment: apply herbicide solution with a low-volume, low pressure sprayer which thoroughly wets lower 12"-15" of stems on all sides, including root collar area, but not to point of run-off. Perform application at any time throughout year, except when stumps are wet from rainfall or dew prevents spraying to base of plant.
 - 3. Cut-stump treatment: cut plants parallel to ground, not to exceed 2" above ground line. Apply herbicide solution with a low-volume, low-pressure sprayer which thoroughly wets area adjacent to cambium and bark around entire circumference of stump. Thoroughly wet sides of stump, but not to point of run-off. Make herbicide application

within 1 hour. from time each plant is cut. Dispose of removed materials and debris at appropriate off-site locations in accordance with local, state, and federal requirements.

- D. Engineer reserves right to pay a partial payment of 50% of lump sum price bid after initial application is performed. Final 50% of lump sum price bid will be paid after inspection and required re-treatments have been completed and accepted.

3.07 TOPSOIL EXCAVATION

- A. Excavate top 9” of topsoil from areas to be further excavated, stockpile separately from remainder of excavation. Segregated topsoil shall be used for final restoration of affected areas. Where excavated topsoil is not adequate to cover affected areas, additional topsoil per Section 31 05 13 - Topsoil shall be added.
- B. Ee-landscaped, regraded, or within construction limits of a structure without mixing with foreign materials for use in finish grading.
- C. Do not excavate wet topsoil.
 - 1. Stockpile in area designated, segregated area on Site to a height which yields safe slope stability and protect from erosion. Remove excess topsoil not intended for reuse, from project.

END OF SECTION

SECTION 31 23 15

TRENCH SAFETY SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Furnishing all equipment, materials and labor for a trench safety system meeting appropriate requirements established in Occupational Safety and Health Administration (OSHA) Safety and Health Regulations, 29 CFR Part 1926, OSHA Standards – Excavations; Final Rule, October 31, 1989. In event of conflict of published and proposed rules, more stringent requirement shall be used.

1.02 MEASUREMENT AND PAYMENT

- A. Trench Safety Plan:
 - 1. Basis of Measurement: Trench Safety Plan shall be measured by lump sum for Project.
 - 2. Basis of Payment: Payment for Trench Safety Plan shall be made at lump sum bid for “Trench Safety Plan.” Payment for all work prescribed under this item shall be full compensation for Trench Safety Plan including acquisition of soils information and design of trench safety system, by a Professional Engineer registered in State of Texas.
- B. Trench Safety Implementation:
 - 1. Basis of Measurement: Trench Safety Implementation shall be measured by linear foot for Project.
 - 2. Basis of Payment: Payment for Trench Safety Implementation shall be made at unit price bid for “Trench Safety Implementation.” Payment for all work prescribed under this item shall be full compensation for Trench Safety System including any additional excavation and backfill required, for furnishing, placing, maintaining 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 work.

1.03 REFERENCES

- A. Federal Occupational Safety and Health Administration (OSHA) Standards – 29 CFR, Part 1926, Subpart P, as amended, including Proposed Rules published in the Federal Register (Vol. 52, No. 72) on April 15, 1987; Sections 1926-650 through 1926-653.
- B. Texas Legislature House Bill No. 662 and House Bill No. 665 with regard to Trench Safety Systems.

1.04 DEFINITIONS

- A. Trench: A trench shall be defined as a narrow excavation (in relation to its length) made below surface of ground. In general, depth is greater than width.

1.05 SUBMITTALS

- A. Section 01 33 00 - Submittals
- B. Trench Safety Plan: Prior to construction the Contractor shall submit two (2) copies of a trench safety system to Engineer specifically for construction of trench excavation. Trench safety system shall be in accordance with OSHA standards governing presence and activities of individuals working in and around trench excavation. Trench safety system must be designed and sealed by a professional engineer registered in State of Texas with professional experience in Soil Mechanics. Contractor is responsible for obtaining borings and soil analysis as required for plan design. After

receiving trench safety system plans, Engineer will forward a copy of plan to Inspector, to Contractor and keep one file copy. Submittal is only for general conformance review with OSHA safety standards and review does not relieve Contractor or design professional of any or all construction means, methods, techniques and procedures. Any property damage, bodily injury or death that arises from use of trench safety system or from Owner's failure to note exceptions to system shall remain sole responsibility of Contractor. No trenching in excess of 5 feet below existing grade will be allowed until plan is submitted. Any changes in trench safety system after initiation of construction will not be cause for extension of time or change order and will require same review process. On some projects, Owner may elect to provide preliminary soil information to Contractors for bid purposes only and not as a substitute for required soil data for design use. Owner assumes no liability nor makes any guarantees by inclusion of any soil data.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with OSHA Regulations, 29 CFR Part 1926, OSHA Standards.
- B. Maintain one copy of OSHA Standards on site.

1.07 QUALIFICATIONS

- A. Prepare Trench Safety Plan under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Texas.

PART 2 - PRODUCTS

2.01 TIMBER

- A. Trench sheeting materials shall be a minimum of 2" thick, solid and sound, free from weakening defects such as loose knots and splits. Shoring timber sizes shall not be less than that called for on Trench Safety Plan.

2.02 STEEL SHEET PILING

- A. Steel sheet piling and steel for stringers and cross braces shall conform to ASTM A36 – Standard Specification for Carbon Structural Steel.

2.03 TRENCH BOXES

- A. Portable trench boxes shall be constructed of steel conforming to ASTM A36 - Standard Specification for Carbon Structural Steel. Connecting bolts shall conform to ASTM A307 – Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength. Welds shall conform to requirements of AWS Specification D1.1 – Structural Welding-Steel.

PART 3 - EXECUTION

3.01 GENERAL

- A. Trench safety systems shall be constructed, installed and maintained in accordance with design prepared by Contractor's registered Professional Engineer licensed to practice in State of Texas to prevent death or injury to personnel or damage to structures in or near these trench excavations. Materials excavated from trench to be stored no closer to edge of trench than 1/2 depth of trench.

3.02 INSTALLATION

- A. Timber Sheeting: Installed in accordance with detail shown on Drawings. Drive timber sheeting to a depth below trench bottom as shown on Drawings. Size of uprights, stringers and cross bracing to be in accordance with details shown on Drawings. Place cross braces in true horizontal position,

spaced vertically, and secured to prevent sliding, falling or kickouts.

- B. Steel Sheet Piling: Steel sheet piling of equal or greater strength may be substituted for timber trench shoring shown on Drawings. Contractor to provide certification that steel sheet piling substituted provides equal or greater protection than timber trench shoring shown on Drawings. Certification of steel sheet piling to be provided by registered Professional Engineer. Drive steel sheet piling to a minimum depth below trench bottom as recommended by Contractor's registered Professional Engineer licensed to practice in Texas providing design. Place cross braces in true horizontal position, spaced vertically and secured to prevent sliding, falling or kickouts.
- C. Trench Boxes: Portable trench box to be substituted for timber trench shoring shown on Drawings shall be designed or design checked by Contractor's registered Professional Engineer licensed to practice in Texas. Design trench box to provide equal or greater protection than timber trench shoring shown on Drawings. Certification of design of trench boxes shall be provided by Contractor prior to its use on Project. In cases where top of portable trench box will be below to top of trench, trench must be sloped to an angle greater than angle of repose for soil conditions existing on Project. In areas where sloped trench will affect integrity of existing structures, Contractor to protect structures prior to sloping trench.
- D. Trench Jacks: When trench jacks are used for cross bracing and/or stringers, Contractor shall provide certification by a registered Professional Engineer licensed to practice in Texas that trench jacks provide protection greater than or equal to timber cross bracing shown on Drawings.

3.03 SUPERVISION

- A. Contractor shall provide competent supervisory personnel at each trench while work is in progress to ensure Contractor's methods, procedures, equipment and materials pertaining to safety systems in this item are sufficient to meet requirements of OSHA Standards.

3.04 MAINTENANCE OF SAFETY SYSTEM

- A. Safety system shall be maintained in condition as shown on Drawings or as specified by Contractor's registered Professional Engineer licensed to practice in Texas. Contractor shall take all necessary precaution to ensure safety systems are not damaged during their use. If any time during its use a safety system is damaged, personnel shall be immediately removed from trench or excavation area and safety system repaired. Contractor shall take all necessary precautions to ensure no loads, except those included in safety system design, are imposed upon excavation.

3.05 REMOVAL

- A. Bed and backfill pipe to a point at least one foot above top of pipe prior to removal of any portion of trench safety systems. Bedding and backfill shall be in accordance to other applicable specification items. Backfilling removal of trench supports shall progress together from bottom of trench upward. Remove no braces or trench supports until all personnel have evacuated trench. Backfill trench to within 4 feet of natural ground prior to removal of entire trench safety systems.

3.06 FIELD QUALITY CONTROL

- A. Inspection: Contractor shall make daily inspection of trench safety systems to ensure that systems meet OSHA requirements. Daily inspection shall be made by competent personnel. If evidence of possible cave-ins or slides is apparent, all work in trench shall cease until necessary precautions have been taken to safeguard personnel entering trench. Contractor shall maintain permanent record of daily inspections.

END OF SECTION

SECTION 31 23 16

EXCAVATION FOR APPURTENANCES

PART 1 - GENERAL

1.01 SUMMARY

- A. Description: This item shall consist of excavating and properly utilizing or otherwise satisfactorily disposing of all excavated material, of whatever character, within limits of work indicated and constructing, compacting, shaping and finishing of all earthwork on entire project in accordance with Specification requirements herein outlined and in conformity with required lines, grades and typical cross sections indicated or as directed by Engineer. **All excavation shall be unclassified and shall include all materials encountered regardless of their nature or manner in which they are removed.**
- B. Section Includes:
 - 1. Soil compaction.
 - 2. Excavating for structures and foundations.
 - 3. Excavating for paving, roads, and parking areas.
 - 4. Excavating for slabs-on-grade.
 - 5. Excavating for site structures.

1.02 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Excavating Soil Materials:
 - 1. Basis of Measurement: All accepted excavation will be measured by measurement of volume of excavation in cubic yards. Plan quantities for excavation will be used as measurement for payment of this item.

1.03 SUBMITTALS

- A. Section 01 33 00 - Submittals
- B. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan.
- C. If an excavation can be defined as a “trench,” then a Trench Safety Plan must be submitted in accordance with Section 31 23 15 – Trench Safety Systems.

PART 2 - PRODUCTS – Not Used.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Erosion control and tree protection measures shall be in place prior to commencing work.
- B. Construction equipment shall not be operated within drip line of trees, unless indicated.
- C. Construction materials shall not be stockpiled under canopies of trees. No excavation or embankment shall be placed within drip line of trees until tree wells are constructed as indicated on Drawings.
- D. Call Texas 811 service at 800-344-8377 not less than three working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding

construction areas.

- E. Call Local Municipality(ies) not less than 2 weeks before performing Work.
- I. Request underground utilities to be located and marked within and surrounding construction areas.
- F. Notify utility company(ies) to remove and relocate utilities as indicated on Drawings.
- G. Protect utilities indicated to remain from damage.
- H. Protect plant life, lawns, rock outcroppings and other features remaining as portion of final landscaping.
- I. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.02 EXCAVATION

- A. All excavation shall be performed as specified herein and shall conform to established alignment, grades and cross sections.
- B. Suitable excavated “on-site” materials (Subsoil Type S3) may be utilized, insofar as practicable and when material meets criteria outlined in Section 31 23 23 - Fill in constructing required embankments and “fill” areas.
- C. Materials with a Plasticity Index (PI) greater than surrounding materials or with a moisture content greater than 2% in excess of optimum shall be classified as unsuitable and must be manipulated to meet above criteria before use or be removed.
- D. Unsuitable excavated materials or excavation in excess of that needed for construction shall be known as “Waste” and shall become property of Contractor. It shall become his sole responsibility to dispose of this material off limits of right of way in an environmentally sound manner at a permitted disposal site.
- E. When required by Engineer, Contractor will set “blue-tops” for sub-grade.
- F. Excavate subsoil to the final sub-grade elevation(s) to accommodate structural foundations, slabs-on-grade, paving, site structures, and civil site facilities.
- G. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- H. Trim excavation. Remove loose matter.
- I. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume. Remove larger material as specified in Section 31 23 23 - Fill.
- J. Notify Engineer of unexpected subsurface conditions.
- K. Correct areas over excavated with Structural Fill as specified in Section 31 23 23 – Fill.
- L. Remove excess and unsuitable material from Site.
- M. Stockpile subsoil in area designated on Site to depth not exceeding 8 feet and protect from erosion.
- O. Repair or replace items indicated to remain damaged by excavation.

3.03 SUBGRADE PREPARATION FOR STRUCTURES AND PAVEMENTS

- A. After final subgrade elevation has been achieved, the exposed subgrade soils (subsoils) shall be scarified to a minimum depth of 6". Compaction of the subsoil shall be to a minimum of 95% and less than 100% of its maximum dry density when determined in accordance with ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort, Method D, Standard Proctor. Subsoil shall be no less than its optimum moisture to no greater than 3% above its optimum moisture content at time of testing. Moisture content shall be maintained until subsequent construction activities commence.

3.04 FIELD QUALITY CONTROL

- A. Sections 01 40 00 - Quality Requirements.
- B. Request inspection of excavation, subgrade preparation, and density controlled fill operations in accordance with Section 31 23 23 - Fill.

3.05 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

SECTION 31 23 17

TRENCHING

PART 1 - GENERAL

1.01 SUMMARY

- A. Description: This work shall include furnishing of all labor, materials, tools, equipment and machinery necessary for clearing and removing from Site of work wherever located, all obstructions, trees, stumps, brush, vegetation, woods and debris; and all earth, rock and other materials to be excavated; removal of existing structures except where specifically paid for as separate contract pay items; replacement of topsoil after backfilling is completed; installation and operation of all pumping, bailing and draining necessary to keep excavation free from seepage water, water from sewer, drains, ditches, creeks and other sources, and to provide for uninterrupted flow of sewers and surface waters during progress of construction; satisfactory disposal of excess and unsuitable materials not required or which cannot be used for backfilling; compacting and refilling, after settlement of all excavated areas; restoration of all streets, alleys, rights-of-way and other lands, private or public, damaged or occupied by Contractor in performance of Contract to same (or improved) condition as they were prior to beginning of work.
- B. Section Includes:
 - 1. Excavating trenches for utilities.
 - 2. Compacted fill from top of embedment to sub-grade elevations.
 - 3. Backfilling and compaction.

1.02 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Trenching: Measurement and payment shall be considered subsidiary to pipe construction for which it pertains.

1.03 DEFINITIONS

- A. Utility: Any buried pipe, duct, conduit, or cable.

1.04 SUBMITTALS

- A. Section 01 33 00 - Submittals
- B. Trench Safety Plan: A Trench Safety Plan, which describes sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property shall be submitted in accordance with Section 31 23 15 – Trench Safety Systems.
- C. Product Data: Submit data for geotextile fabric (when specified) indicating fabric properties and manufacturing data; and construction methods.
- D. Materials Source: Submit name of imported fill materials suppliers

1.05 QUALIFICATIONS

- A. Prepare Trench Safety Plan as per Section 31 23 15 – Trench Safety Systems.

1.06 FIELD MEASUREMENTS

- A. Verify field measurements prior to construction.

1.07 COORDINATION

- A. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Embedment Material: Type of embedment to be used for water mains shall be as follows:
 - 1. Aggregate Type A2 (Crushed Stone, Modified Grade 5 gravel) gradation as follows (no exceptions):

<u>MODIFIED GRADE 5</u>	<u>PERCENT (%)</u>
Retained on 1/2" sieve	0
Retained on 3/8" sieve	0-5
Retained on No. 4 sieve	20-80
Retained on No. 10 sieve	75-100
Retained on No. 20 sieve	98-100
 - 2. Flowable Fill per Section 31 23 24 – Flowable Fill (only where indicated on Drawings).
- B. Trench Backfill:
 - 1. Backfill above embedment material (outside traffic areas): Excavated backfill material outside of traffic areas shall consist of an excavated material of gravel, fine rock cuttings, sandy loam, or clay having dimensions no greater than 2", and compacted per applicable sections of this Specification.
 - 2. Backfill above embedment material (beneath pavements):
 - a. Coarse Aggregate Type A1 (Flexible Base, TxDOT Item 247, Type A, Grade 1 or 2)
 - b. Flowable Fill per Section 31 23 24 – Flowable Fill.

PART 3 - EXECUTION

3.01 LINES AND GRADES

- A. Construct trenches to lines and grades indicated on Drawings.
 - 1. Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.
- B. Use laser-beam instrument with a qualified operator to establish lines and grades.
- C. Submit at least 6 copies of any layout plans from pipe manufacturer for review and approval at least 30 days in advance of any actual construction of Project. Engineer will forward all comments of review to Contractor for revision. Revisions shall be made and forwarded to Engineer for his acceptance. Prior to commencement of Project, reviewed layout plans will be sent to Contractor marked for construction.
- D. Should Contractor's procedures not produce a finished pipe placed to grade and alignment, pipe shall be removed and relayed and Contractor's procedures modified to satisfaction of Engineer. No additional compensation shall be paid for removal and relaying of pipe required above.

3.02 PREPARATION

- A. Call Texas 811 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 locations.
- C. Protect plant life, lawns, rock outcropping and other features remaining as portion of final

landscaping.

- D. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- E. Maintain and protect above and below grade utilities indicated to remain.
- F. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.03 TRENCHING

- A. Site Preparation: Construction site shall be prepared for construction operations by removal and disposal of all obstructions and objectionable materials from designated construction area. Such obstructions and objectionable materials shall include removal of designated trees, bushes, grass, miscellaneous stone, brick, concrete, scrap iron and all rubbish and debris whether above or below ground level. It is intent of this Specification to provide for removal and proper disposal of all objectionable materials not specifically provided for elsewhere by Drawings and Specifications. Removal of such items shall be accomplished prior to grading and excavation operations. Removal and disposal of such items shall not be measured or paid for as a separate contract pay item. Such items shall be considered as incidental work and the cost thereof shall be included in such contract pay item as provided in proposal and Contract.
- B. Maintenance of Streets During Construction:
 - 1. Maintain surfaces of streets being worked on at all times. Maintenance required shall include filling of holes, blading or otherwise smoothing of street surfaces (particularly trench area), cleaning and removal of surplus excavation material, rubbish, etc., sprinkling of streets with water or abate dust nuisances and elimination of interference resulting from blocking street to residents thereon. Any or all such operations shall be performed by Contractor upon demand by Owner, but Contractor shall not wait for instruction from Owner before performing maintenance work obviously in need of being done to meet requirements of these Specifications. All costs of work covered by this paragraph shall be included in prices bid for various items of work; and no separate payment shall be made.
 - 2. In event Contractor fails or refuses to properly maintain surfaces of streets on which he is working or has worked, Owner, after due notice to Contractor, shall perform necessary maintenance. All costs to Owner incurred in performance of such work shall be deducted from any monies due or to become due to Contractor for work performed, or Contractor shall be billed for such costs directly as Owner shall elect. Notice to Contractor to be given by Owner shall be in writing, and it shall be delivered to Contractor or his authorized agent. Except in emergency cases, where immediate action is required, Contractor shall have 24 hours in which to comply with instructions of Owner. Should Contractor fail to do so, Owner shall proceed with work as set forth above.
 - 3. Where traffic must cross open trenches, such as street intersections and driveways, Contractor shall provide suitable backfill bridges, protective barricades and such other safety equipment as required. Use of machinery must be so regulated as to preclude any unnecessary interference with traffic, utilities, etc. Contractor shall abide by all applicable federal, state or local laws governing excavation work.
- C. Soil Borings: Whenever Owner has caused certain test borings to be made on Site, or when any information pertaining of character or depth of materials is found from observations, records or otherwise, such information revealed thereby may be provided to Contractor. Action of Owner in revealing such information shall not, in any manner, be construed as a warranty on part of Owner of exact nature of subsurface conditions that shall be encountered during construction of Work. Although information is shown as accurately as possible Owner does not guarantee that any materials to be encountered at any point or points are even approximately same, either in character or elevations, as those shown on Drawings. information thus furnished by Owner is intended only

as a guide to Contractor in making his own investigations preliminary to submitting a bid for work.

D. Existing Structures:

1. All existing structures, improvements and utilities shall be adequately protected, at expense of Contractor, from damage that might otherwise occur due to construction operations. Where construction comes in close proximity to existing structures or utilities, or if it becomes necessary to move services, poles, guy wires, pipe lines or other obstructions, Contractor shall notify and cooperate with utility or structure Owner. The utility lines and other existing structures shown on Drawings are for information only and are not guaranteed by Owner to be complete or accurate as to location and/or depth. Contractor shall be liable for damage to any utilities resulting from his operation. During construction, all fire hydrants, valve boxes and other existing utility controls shall be left intact, unobstructed and accessible.
 - a. Relocation or Replacing Utilities: Unless noted on Drawings that utilities are to be moved by others, any cost of temporarily or permanently relocating utilities shall be borne by Contractor. Cost of these replacements shall be included in Contractor's bid price for various items of work; and no separate payment shall be made. In case damage to an existing structure or utility occurs, whether such damage results directly or indirectly from Contractor's operations, Contractor shall be responsible to restore structure or utility to its original condition and position without extra compensation. Temporary shut down of water and/or sewer services shall not extend overnight, holidays or weekends. Owner shall approve all shut downs and may assist in shut down operations.
 - b. Sewer Services: All sewer services damaged during construction shall be replaced by Contractor at his expense. Sewer service reconnections, including necessary adjustments to a sanitary sewer replacement, shall not require the services of a master plumber, if being replaced by a utility Contractor; however, in all cases, repair shall be inspected by Owner. It shall be the responsibility of Contractor to maintain such services throughout construction process.
 - c. Water Services: Service lines shall not be removed during excavation; and Contractor shall provide adequate support for services across open ditch.
 - d. Interrupted Service: Cuts or breaks in sewer mains and laterals, or service connections, shall be restored at the earliest practicable moment in order to give least possible interruption in service. Contractor shall be responsible for notifying customers of temporary interruption of service.
 - e. Other Utilities: All water mains, water services, sanitary sewers, sanitary sewer house laterals, storm sewers, power conduits, gas mains, gas service laterals and other appurtenances damaged during construction shall be repaired or replaced. Where exact depth of any utility or obstruction is not shown, excavation shall be made prior to reaching obstruction in order to determine adjustments in grade if needed to prevent interference. Redesign to eliminate conflicts may be necessary. Extra compensation shall not be paid for such delays. When it is necessary to remove or adjust another utility, a representative of that utility shall be notified to decide method and work to be done. Contractor shall make satisfactory arrangements with other utilities for required cutting or adjustments at Contractor's own expense. Other than for items that may be provided in Contract for such work. No extra compensation shall be paid due to delays caused by removal of public utility structures.
 - f. Street Sign Posts and Signs: Contractor shall be responsible for all damage to street sign posts and signs within the limits of his operations that remain in place or are removed and replaced. In event that street sign posts and signs are damaged or destroyed by Contractor's operations, they shall be replaced at the Contractors' expense.
 - g. Methods of Removal and Disposal: Materials or parts of structures which are to be broken up, dismantled or removed, and which are to be salvaged, shall be removed, loaded, cleaned and unloaded at sites designated by Owner. Materials

which are not designated to be salvaged shall become property of Contractor; and he shall dispose of material at his own cost and expense.

- E. Do not advance open trench more than 300 feet ahead of installed pipe, unless pre-approved by Engineer. All open holes must be protected by an orange safety fence at end of each days work.
- F. Trench Width
1. Trenches for pipes less than 20" in diameter shall have a minimum width of 10" and a maximum width of 1 foot on each side beyond outside surfaces of pipe bell or coupling.
 2. Trenches for pipes between 21" and 48" in diameter shall have a minimum width of 12" and a maximum width not to exceed one pipe diameter on each side beyond outside surfaces of pipe.
 3. Trenches for pipes 54" in diameter and larger shall have a minimum width of 15" and a maximum width of one pipe diameter beyond outside surfaces of pipe.
 4. If trench width within pipe zone exceeds this maximum, entire pipe zone shall be refilled with approved backfill material, thoroughly compacted to a minimum of 95% of maximum density and then re-excavated to proper grade and dimensions. Excavation along curves and bends shall be so oriented that trench and pipe are approximately centered on centerline of curve, using short links for pipe and/or bend fillings.
 5. For all utilities to be constructed in fill above natural ground, embankment shall first be constructed to an elevation not less than 1 foot above top of utility after which excavation for utility shall be made as indicated.
- G. Alternative Trench Width for Use with Free-Flowing Granular Embedment Material
1. Based upon pre-approval by Engineer, Contractor may use alternative trench widths in conjunction with free-flowing granular embedment material. Minimum and maximum alternative trench widths are specified below; however, in most instances minimum trench width shall be that width which is sufficient to insure working space between outside surface of pipe and the trench wall to safely place trench safety equipment and to properly place and compact embedment materials.
 - a. Trenches for pipes less than 18" in diameter shall have a minimum width of 8" and a maximum width of 24" on each side beyond outside surfaces of pipe bell or coupling.
 - b. Trenches for pipes 18" in diameter or greater shall have a minimum width of 6" and a maximum width not to exceed one pipe diameter on each side beyond outside surfaces of pipe.
- H. Trench Depth and Depth of Cover
1. All pipe and in-line appurtenances shall be laid to grades indicated. Depth of cover shall be measured from established finish grade, natural ground surface, sub-grade for staged construction, street or other permanent surface to top or uppermost projection of pipe.
 - a. Where not otherwise indicated, all water piping shall be laid to the following minimum depths:
 - 1) Water piping installed in undisturbed ground in easements of undeveloped areas which are not within existing or planned streets, roads or other traffic areas shall be laid with at least 42" of cover.
 - 2) Water piping installed in existing streets, roads or other traffic areas shall be laid with at least 42" of cover below finish grade.
 2. Provide uniform and continuous bearing and support for bedding material and pipe.
- I. Classification of Excavation: Excavation will not be considered or paid for as a separate item of work, so excavated material will not be classified as to type or measured as to quantity. Full payment for all excavation required for construction shall be included in various unit or lump sum contract prices for various items of work installed, complete in place. No extra compensation, special treatment or other consideration will be allowed due to rock, pavement, caving, sheeting and bracing, falling or rising water, working under and in proximity of trees or any other handicaps to excavation.

- J. Dewatering Excavation: Underground piped utilities shall not be constructed or pipe laid in presence of water. All water shall be removed from excavation prior to pipe placing operation to insure a dry firm granular bed on which to place underground piped utilities and shall be maintained in such unwatered condition until all concrete and mortar is set. Removal of water may be accomplished by bailing, pumping or by a well-point installation as conditions warrant. In the event that excavation cannot be dewatered to point where pipe bedding is free of mud, a seal shall be used in bottom of excavation. Such seal shall consist of lean concrete with a minimum depth of 3”.
- K. Trench Conditions:
1. Before attempting to lay pipe, all water, slush, debris, loose material, etc., encountered in the trench must be pumped or bailed out and trench must be kept clean and dry while pipe is laid and backfilled. Where needed, sump pits shall be dug adjoining the trench and pumped as necessary to keep excavation dewatered.
 2. Backfilling shall closely follow pipe laying so that no pipe is left exposed and unattended after initial assembly. All open ends, outlets or other openings in pipe shall be protected from damage and shall be properly plugged and blocked watertight to prevent entrance of trench water, dirt, etc. Interior of pipeline shall at all times be kept clean, dry and unobstructed.
 3. Where the soil encountered at established footing grade is a quicksand, saturated or unstable material, the following procedure shall be used unless other methods are indicated:
 - a. All unstable soils shall be removed to a depth of 2 feet below bottom of piped utility. Such excavation shall be carried out to trench widths above.
 - b. All unstable soil so removed shall be replaced with concrete seal foundation rock for the entire trench width or coarse aggregate materials placed in uniform layers not to exceed 6”, loose measure and compacted by mechanical tamping or other means which will provide a stable foundation for utility.
 - c. All forms, concrete seals, sheathing and bracing, pumping, additional excavation and backfill required shall be done at Contractor’s expense.
- L. Trench sidewalls shall be sloped, or sheeting and/or shoring shall be used in accordance with Trench Safety Plan in order to provide safety and protection in, and of excavation.
- M. Trim excavation. Remove loose matter.
- N. Correct over excavated areas with compacted backfill as specified for authorized excavation or replace with lean concrete, or Flexible Base as directed by Engineer.
- O. Removing Old Structures: When out of service masonry structures or foundations are encountered in the excavation, such obstructions shall be removed for full width of trench and to a depth of 1 foot below bottom of trench. When abandoned inlets or manholes are encountered and no plan provision is made for adjustment or connection to new sewers, such manholes and inlets within construction limits shall be removed completely to a depth of 1 foot below bottom of trench. In each instance, bottom of trench shall be restored to grade by backfilling and compacting by methods provided above. Where trench cuts through storm or wastewater sewers which are known to be abandoned, these sewers shall be cut flush with sides of trench and blocked with a concrete plug in a manner satisfactory to Engineer. When old structures are encountered, which are not visible from existing surface and are still in service, they shall be protected and adjusted as required to finished grade.
- P. Excess material or material which cannot be made suitable for use in embankments will be declared surplus by Engineer and shall become property of Contractor to dispose of off-site at a permitted fill site, without injury to Owner or any individual. Such surplus material shall be removed from work area promptly following completion of portion of utility involved.

- Q. Stockpile subsoil in work area designated on site to only a height which yields safe slope stability and protect from erosion.

3.04 SHEETING AND SHORING

- A. All excavations for trenches, structures, etc. 5 feet in depth or greater are required to have a Trench Safety Plan prepared and sealed by a Registered Professional Engineer in State of Texas in accordance with OSHA requirements and Section 31 23 15 – Trench Safety Systems of Specifications.
- B. Submit Trench Safety Plan prior to any excavation.
- C. When specified in the Drawings, sheeting and shoring to be left in place as part of completed Work, cut off minimum 18” below finished grade. Otherwise, sheeting and shoring shall be removed at completion of excavation work.
- D. Repair damage caused by failure of sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.
- F. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.05 PIPE BEDDING AND EMBEDMENT

- A. Where not otherwise provided, all piping shall be installed in a continuous envelope of embedment material meeting requirement of materials specified herein.
- B. Embedment material shall extend from 6” below (bedding) to 12” above outer parts of pipe (unless indicated otherwise), fittings and accessories for pipe.
- C. All bracing, struts, etc., installed by pipe manufacturer (or temporary replacements by Contractor) shall be kept in place in pipe, undisturbed, until trench has been backfilled at least to top of pipe. When installing mortar lined and mortar coated steel pipe, all bracings, struts, etc., installed by pipe manufacturer shall be kept in pipe, undisturbed until pipe has been backfilled.

3.06 BACKFILLING

- A. Backfill Procedure: Backfill procedure is that procedure required to return trenched or excavated areas to a condition satisfactory to Engineer. Such backfilling occurs in two general areas as follows:
 - 1. Areas not subjected to vehicular traffic;
 - 2. Areas subjected to, or influenced by vehicular traffic.
- B. Methods of backfilling to be used shall vary with width of trench, character of materials excavated, method of excavation, type of conduit and degree of compaction required. Placing of backfill shall not begin until pipe structure has been properly bedded and jointed.
 - 1. Trench backfill material is material required to fill trench from top of embedment to ground elevation or sub-grade of a pavement or structure.
- C. Backfill trenches to contours and elevations with unfrozen fill materials.
- D. Do not backfill over porous, wet, frozen, or spongy sub-grade surfaces.
- E. Place geotextile fabric when specified in Drawings.
- F. Place fill material in continuous layers and compact to density specified herein.

- G. Employ placement method that does not disturb or damage utilities in trench.
- H. Maintain optimum moisture content of fill materials to attain required compaction density.
- I. Do not leave more than 50 feet of trench open at end of working day, unless pre-approved by Engineer.
- J. Protect open trench to prevent danger to Owner, public, and users of Site.

3.07 COMPACTION

- A. Compaction of all bedding, embedment, and backfill materials shall be performed in a manner that shall not crack, crush and/or cause installed pipe to be moved from established grade and/or alignment, as shown on Drawings. Satisfactory density shall be obtained at various depths on all backfill material as indicated from random selected test points prior to required exfiltration or pressure tests that are to be performed on lines being constructed. Required moisture content shall be at not less than 2% below nor more than 4% above optimum moisture of material or as specified by Engineer.
- B. Densities for Bedding and Embedment:
 1. Coarse Aggregate Type A1 (Flexible Base) embedment shall be mechanically compacted in 6" lifts to a minimum of 95% Standard Proctor Density (ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³)), unless indicated otherwise on Drawings.
 2. Coarse Aggregate Type A2 (Crushed Stone) embedment shall be mechanically compacted in 6" lifts to a minimum of 95% of Maximum Dry Density in accordance with TEX-113-E – Laboratory Compaction Characteristics and Moisture-Density Relationship of Base Materials, unless indicated otherwise on Drawings.
 3. Coarse Aggregate Type A4 (Gravel Trench Backfill) embedment shall be mechanically compacted in 6" lifts to a minimum of 95% Standard Proctor Density (ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³)), unless indicated otherwise on Drawings.
- C. Backfill Densities – Areas Subjected to or Influenced by Vehicular Traffic: Trench backfill shall be mechanically compacted to top of subgrade in 6" loose lifts to at least 95% of maximum density as determined by ASTM D698 -Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³), at, or above, optimum moisture content.
- D. Backfill Densities – Areas Not Subjected to or Influenced by Vehicular Traffic: Trench backfill shall be placed in layers not more than 10" loose depth and shall be compacted by mechanical means. Compaction methods to at least 95% of maximum density as determined by ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³), at, or above, optimum moisture content.

3.08 TOLERANCES

- A. Top Surface of Backfilling Under Paved Areas: Plus or minus 1" from required elevations.
- B. Top Surface of General Backfilling: Plus or minus 1" from required elevations.

3.09. FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Perform laboratory material tests in accordance with ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³).

- C. Perform in place compaction tests in accordance with the following:
 - 1. Density Tests: ASTM D2922 – Standard Test Methods for Density of Soil and Soil-Aggregate in Plane by Nuclear Methods.
 - 2. Moisture Tests: ASTM D3017 – Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods.
- D. Frequency of Tests: In-place density/moisture content shall be tested and verified at an average frequency of once per 300 linear feet per lift for trenches in traffic areas, and an average of once per 1,000 linear feet per lift for trenches in non-traffic areas.
- E. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.

3.10 PROTECTION OF FINISHED WORK

- A. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION

SECTION 31 23 23

FILL

PART 1 - GENERAL

1.01 SUMMARY

- A. Description: This item shall consist of placing and compacting of suitable materials obtained from approved sources for utilization in construction of Project.
- B. Section Includes:
 - 1. Fill under structural foundations.
 - 2. Fill for embankment for construction of highways, streets, and pavements.
 - 3. Fill for the construction of earthen embankments, berms, levees, dikes, and structures.
 - 4. Fill for over-excavation.
 - 5. Backfilling of structural foundations, manholes, and utility structures to subgrade elevations.
 - 6. Backfilling site structures to subgrade elevations.
 - 7. Backfilling pipeline trenches.

1.02 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Basis of Measurement: All accepted fill (of the Type specified), when included in Contract as a separate pay item, will be measured by cubic yard in its final position based upon an average of end areas taken from pre-construction cross sections and plan grades. Plan quantities will be used as measurement for payment for this item.
- B. Basis of Payment: This item is usually subsidiary to excavation and/or subsoils and is not paid for separately. However, when included in Contract as a separate pay item, it shall be paid for at the contract unit price bid for "Fill," which price shall be full compensation for all work herein specified, including furnishing of all materials (except "Subsoils" when paid as a separate bid item), compacting, equipment, tools, labor, water for sprinkling, proof rolling and incidentals necessary to complete work. Payment, when included in the contract as a separate pay item.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittals
- B. Product Data: Submit data for geotextile fabric indicating fabric and construction.
- C. Samples: Submit, in air-tight containers, 50 pound sample of each type of fill to testing laboratory.
- D. Materials Source: Submit name of imported fill materials suppliers.

PART 2 - PRODUCTS

2.01 FILL MATERIALS

- A. Subsoil Fill: All subsoil fill shall conform to the following material types:
 - 1. Select Type S1 (Select Fill, or Select Borrow): This material shall consist of sand or other suitable granular material, free from vegetation or deleterious or objectionable matter reasonably free from lumps of earth and when tested by standard TxDOT laboratory methods, shall meet the following requirements:
 - a. Liquid Limits shall not exceed 35.
 - b. Plasticity Index shall not be less than 4 nor more than 15.
 - c. Minimum and maximum passing No. 200 sieve: 10% and 70%, respectively.

- d. No rocks greater than 2” in diameter.
 - 2. Subsoil Type S2 (Borrow):
 - a. This material shall consist of suitable nonswelling (soils with Plasticity Index less than 20) earth material such as loam, clay or other such materials that will form a stable embankment.
 - b. This material shall be free of lumps larger than 3” in diameter, and rocks larger than 4” in diameter.
 - 3. Subsoil Type S3 (On-Site Material):
 - a. This material shall be excavated from on-site and re-used for fills (embankment).
 - b. This material shall be free of lumps larger than 3” in diameter, and rocks larger than 4” in diameter.
 - c. On site material shall not be used for embedment of pipe.
 - 4. Structural Fill: Coarse Aggregate Type A1 (Flexible Base). Coarse Aggregate Type A1 (Flexible Base, TxDOT Item 247, Type A, Grade 1 or 2)
- B. Flowable Fill: As specified in Section 31 23 24 – Flowable Fill.

2.02 ACCESSORIES

- A. Geotextile Fabric: Non-biodegradable, woven or non-woven, from the following manufacturers:
 - 1. Alkzo Nobel Geosynthetic Co.
 - 2. Huesker, Inc.
 - 3. TC Mirafi.
 - 4. Tenax Corp.
 - 5. Tensar Earth Technologies, Inc.

PART 3 - EXECUTION

3.01 SUBGRADE PREPARATION FOR STRUCTURES AND PAVEMENTS

- A. Strip and remove from construction area any topsoil, organics, and vegetation to a minimum depth of 6” below existing, natural ground surface in accordance with Section 31 10 00 - Clearing.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with structural fill and compact to density specified herein.
- C. Compact the subgrade (subsoil) in accordance with Section 31 23 16 - Excavation prior to commencing with subsequent “fill” operations.
- D. Proof roll to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.

3.02 EMBANKMENT/FILLING

- A. Prior to placing any embankment (fill), all tree protection, tree wells and erosion control devices shall be in place and all “Clearing” operations shall have been completed on the areas over which embankment (fill) is to be placed. Stump holes or other small excavations in limits of embankments shall be backfilled with suitable material and thoroughly tamped by approved methods before commencing embankment construction. Surface of ground, including plowed loosened ground or surface roughened by small washes, shall be restored to approximately its original slope and ground surface thus prepared shall be compacted by sprinkling and rolling.
- B. Construction equipment shall not be operated within drip line of trees, unless indicated. Construction materials shall not be stockpiled under canopies of trees. No excavation or embankment shall be placed within drip line of trees unless indicated.

- C. Unless otherwise indicated, the surface of ground of all unpaved areas, other than rock which are to receive embankment (fill), shall be loosened by scarifying or plowing to a depth of not less than 4". Loosened material shall be recompacted with new embankment as hereinafter specified.
- D. Surface of hillsides to receive embankment (fill) shall be loosened by scarifying or plowing to a depth of not less than 4" and benches cut before embankment materials are placed. Embankment shall then be placed in layers, as hereinafter specified, beginning at low side in partial width layers and increasing widths as embankment is raised. Material which has been loosened shall be recompacted simultaneously with embankment material placed at same elevation.
- E. Where embankments are to be placed adjacent to or over existing roadbeds, roadbed slopes shall be plowed or scarified to a depth of not less than 6" and embankment built up in successive layers, as hereinafter specified, to level of old roadbed before its height is increased. Then, if indicated, top of old roadbed shall be scarified and recompacted with next layer of new embankment. Total depth of scarified and added material shall not exceed permissible layer depth.
- F. Trees, stumps, roots, vegetation or other unsuitable materials shall not be placed in embankment (fill).
- G. All embankment shall be constructed in layers approximately parallel to finished grade and unless otherwise indicated.
- H. Embankment (fill) shall be continuously maintained at its finished section and grade until that portion of work is accepted. After completion of embankment to finished section and grade, the Contractor shall proof roll subgrade and revegetation procedures must commence immediately to minimize soil loss and air pollution.
- I. Except as otherwise indicated, embankments (fills) shall be constructed in successive 6" layers, loose measure, for the full width of the individual cross section and in such length as are best suited to sprinkling and compaction methods utilized.
- J. Minor quantities of rocks not larger than 4", encountered in constructing earth embankment may be incorporated in earth embankment layers, provided such placement of rock is not within 10 feet of any structure.
- K. Each layer of embankment shall be uniform as to material, density and moisture content before beginning compaction. Where layers of unlike materials abut each other, each layer shall be feathered on a slope of 1:20 or material shall be so mixed as to prevent abrupt changes in soil. No material placed in embankment by dumping in a pile or windrows shall be incorporated in a layer in that position, but all such piles or windrows shall be moved by blading or similar methods. Clods or lumps of material shall be broken and embankment material mixed by blading, harrowing, discing or similar methods to end that a uniform material of uniform density is secured in each layer.
- L. Water required for sprinkling to bring material to moisture content necessary for optimum compaction shall be evenly applied and it shall be the responsibility of Contractor to secure a uniform moisture content throughout layer by such methods as may be necessary.
- M. All cuts, whether full width or partial width cuts in side of a hill, which are not required to be excavated below subgrade elevation shall be scarified to a uniform depth of at least 6" below grade and material shall be mixed and reshaped by blading and then sprinkled and rolled in accordance with requirements outlined above for earth embankments and to same density as that required for adjacent embankment.
- N. Compaction of embankments (fills) shall be to a minimum of 95% and less than 100% of its maximum dry density when determined in accordance with ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³),

Method D, Standard Proctor, unless indicated otherwise on Drawings. The subsoil shall be no less than its optimum moisture to not greater than 3% above its optimum moisture content at time of testing. After each layer of earth embankment (fill) is complete, density tests as necessary will be made. If material fails to meet density specified, course shall be reworked as necessary to obtain specified compaction.

- O. Embankment (fill) shall slope away from building minimum 5% slope for minimum distance of 10 feet, unless noted otherwise.
- P. Grade changes in embankment (fill) shall be made with gradual grade changes. Blend slope into level areas.
- Q. Remove surplus fill materials from Site.

3.03 BACKFILLING

- A. As soon as practicable, all portions of excavation not occupied by permanent structure shall be backfilled. Backfill material shall comply with "Subsoil Fill" as specified herein.
- B. That portion of backfill which will not support any portion of completed structure, roadbed, or embankment shall be placed in layers not more than 10 inches in depth (loose measurement) and shall be compacted.
- C. That portion of backfill which will support any portion of the structure, roadbed, or embankment shall be placed in uniform layers not more than 8" in depth (loose measurement) and shall be compacted in accordance with Paragraph 3.5, "Compaction" for "Subsoil Fill" and shall be compacted to that density by means of mechanical tampers or rammers, except that use of rolling equipment of type generally used in compaction embankments will be permitted on portions which are accessible to such equipment. All portions of embankment too close to any portion of a structure to permit compaction by the use of the blading and rolling equipment used on adjoining sections of embankment, shall be placed and compacted in same manner as specified above for backfill material. Unless otherwise indicated, hand tamping will not be accepted as an alternate for mechanical compaction. As a general rule, material used in filling or backfilling portions described in this paragraph shall be "Subsoil Fill," free of any appreciable amount of gravel or stone particles larger than 4" in greater dimension and of a gradation that permits thorough compaction. When required by Drawings or by written order of Engineer, structural fill or coarse aggregate material shall be used for backfilling.
- D. Surface of hillsides to receive embankment (fill) shall be loosened by scarifying or plowing to a depth of not less than 4" and benches cut before embankment materials are placed. Embankment shall then be placed in layers, as hereinafter specified, beginning at low side in partial width layers and increasing widths as the embankment is raised. Material which has been loosened shall be recompacted simultaneously with embankment material placed at same elevation.
- E. Where embankments are to be placed adjacent to or over existing roadbeds, roadbed slopes shall be plowed or scarified to a depth of not less than 6" and embankment built up in successive layers, as hereinafter specified, to level of old roadbed before its height is increased. Then, if indicated, top of old roadbed shall be scarified and recompacted with next layer of new embankment. Total depth of scarified and added material shall not exceed permissible layer depth.

3.04 COMPACTION

- A. Subsoil Fill:
 - 1. Select Fill, or Select Borrow: Compaction shall be to a dry density of at least 95% Standard Proctor maximum dry density (ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³)) and shall be within range of materials optimum moisture content to 3% above materials

optimum moisture content. Placement shall be in lifts not exceeding 8" before compaction.

2. On-Site Material: Compaction shall be to a dry density of at least 95% Standard Proctor maximum dry density (ASTM D698 – Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³)) and shall be within range of materials optimum moisture content to 3% above materials optimum moisture content. Placement shall be in lifts not exceeding 8" before compaction.
- B. Structural Fill, (Flexible Base): Flexible Base material used as structural fill beneath foundations and for backfilling structures shall be placed in loose lifts not exceeding 8" before compaction, and shall be compacted mechanically to a minimum 98% of Standard Proctor dry density (ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³)) and within 2% of materials optimum moisture content, unless indicated otherwise on Drawings.
- C. Coarse Aggregate (Crushed Stone): Compaction shall be a minimum of 95% of maximum dry density in accordance with TxDOT Test Method TEX-113-E – Laboratory Compaction Characteristics and Moisture-Density Relationship of Base Materials, unless indicated otherwise on Drawings.
- D. Coarse Aggregate (Gravel Base Course): Gravel Base Course used as structural fill beneath foundations and for backfilling structures shall be placed in loose lifts not exceeding 8 inches before compaction, and shall be compacted mechanically to a minimum 95% of Standard Proctor dry density (ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³)) and within 2% of materials optimum moisture content, unless indicated otherwise on Drawings.
- E. Coarse Aggregate: Trench Embedment shall be placed in loose lifts not exceeding 8" before compaction, and shall be compacted mechanically to a minimum 95% of Standard Proctor dry density (ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³)) and within 2% of materials optimum moisture content.

3.05 TOLERANCES

- A. Top Surface of Fill Under Paved Areas: Plus or minus 0.50" from required elevations.
- B. Top Surface of General Grading of Fill: Plus or minus 0.10 feet from required elevations.

3.6 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements.
- B. Perform laboratory material tests in accordance with ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³).
- C. Perform in place compaction tests in accordance with the following:
 1. Density Tests: ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method, ASTM D2167 – Standard Test Method for Density and Unit Weight of Soil in Place by Rubber Balloon Method, ASTM D2922 – Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods, or TEX-115-E – Field Method for Determining In-Place Density of Soils and Base Materials as appropriate for material being tested.
 2. Moisture Tests: ASTM D3017 – Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods.
- D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

- E. Proof roll compacted fill surfaces under structural foundations, pavers, paving, and sidewalks. Soft spots shall be removed, replaced, and retested.
- F. Reshape and re-compact fills subjected to vehicular traffic.
- G. Reshape and re-compact fills subjected to erosion
- H. Quality assurance shall be, as a minimum, as outlined below:

Type of Work	Item	Sample Frequency	Sample Size	Minimum Testing
Select Fill	Select Fill or Select Borrow Compaction	1 per soil Type 1 per 5000 sq.ft. per lift (min. of 3 per lift)	50 lbs.	- Gradation - P.I. - Moisture-Density Relationship - Field Density Tests
Subsoil for Fill and Backfill	On-Site Compaction	1 per soil Type 1 per 5000 sq.ft. per lift (min. of 3 per lift)	50 lbs.	- Gradation - P.I. - Moisture-Density Relationship - Field Density Tests
Structural Fill	Flexible Base Compaction	1 per type per 1000 cu. yds. 1 per 2500 sq.ft. per lift (min. of 3 per lift)	50 lbs.	- Sieve - P.I. - Moisture-Density - Field Density Tests

END OF SECTION

SECTION 31 23 24

FLOWABLE FILL

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Flowable fill for:
 - a. Structure backfill.
 - b. Utility bedding.
 - c. Utility backfill.
 - d. Filling abandoned utilities

1.02 SUBMITTALS

- A. Section 01 33 00 - Submittals.
- B. Materials Source: Submit name of flowable fill materials suppliers.
- C. Manufacturer's Certificate:
 - 1. Certify Product meets or exceeds specified requirements.
- D. Mix Design:
 - 1. Submit flowable fill mix design for each specified strength. Submit separate mix designs as required for the following:
 - a. Flowable fill work during hot and cold weather.
 - b. Air entrained flowable fill work.
 - 2. Identify design mix ingredients, proportions, properties, admixtures, and tests.
 - 3. Submit test results to certify flowable fill mix design properties meet or exceed specified requirements.
- E. Delivery Tickets:
 - 1. Submit duplicate delivery tickets indicating actual materials delivered to Site.

1.03 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section.

1.04 ENVIRONMENTAL REQUIREMENTS

- A. Do not install flowable fill during inclement weather or when ambient temperature is less than 40 degrees

1.05 FIELD MEASUREMENTS

- A. Verify field measurements before installing flowable fill to establish quantities required to complete Work

PART 2 - PRODUCTS

2.01 FLOWABLE FILL

- A. Flowable Fill - Excavatable Type: Lean cement concrete fill used where future excavation may be required such as fill for utility trenches, bridge abutments, and culverts.

- B. Flowable Fill - Non-excavatable Type: Lean cement concrete fill used where future excavation is not anticipated such as fill below structure foundations and filling abandoned utilities.

2.02 MATERIALS

- A. Portland Cement: ASTM C150 (Standard Specification for Portland Cement) Type I - Normal; Type IA - Air Entraining; Type II - Moderate.
- B. Fine Aggregates: ASTM C33 – Standard Specification for Concrete Aggregates.
- C. Water: Clean, potable, not detrimental to concrete.

2.03 MIXES

- A. Mix and deliver flowable fill in accordance with ASTM C94 - Standard Specification for Ready-Mixed Concrete, Option C.

ITEM	EXCAVATABLE	NON-EXCAVATABLE
Cement Content	75-100 lbs/cy	100-150 lbs/cy
Water Content	Per mix design	Per mix design
28 Day Compressive Strength	Maximum 150 psi.	Minimum 250 psi
Unit Mass (Wet)	80-110 pcf	100-125 pcf
Temperature, Minimum at point of delivery	50 degrees F	50 degrees F

- B. Provide water content in design mix to produce self-leveling, flowable fill material at time of placement.

2.03 SOURCE QUALITY CONTROL

- A. Test and analyze properties of flowable fill design mix and certify results for the following:
 1. Design mix proportions by weight of each material.
 2. Fine Aggregate: ASTM C33 – Standard Specification for Concrete Aggregates - for material properties and gradation.
 3. Properties of plastic flowable fill design mix including:
 - a. Temperature.
 - b. Slump.
 - c. Wet unit mass.
 - d. Yield.
 - e. Cement factor.
 4. Properties of hardened flowable fill design mix including:
 - a. Compressive strength at 1 day, 7 days, and 28 days. Report compressive strength of each specimen and average specimen compressive strength.
 - b. Unit mass for each specimen and average specimen unit mass at time of compressive strength testing.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify excavation and trenching is complete.
- C. Verify utility installation is complete and tested before placing flowable fill.
- D. Verify excavation is dry and dewatering system is operating.

3.02 PREPARATION

- A. Support and restrain utilities to prevent movement and flotation during installation of flowable fill.
- B. Protect structures and utilities from damage caused by hydraulic pressure in flowable fill before fill hardens.
- C. Protect utilities and foundation drains to prevent intrusion of flowable fill.

3.03 INSTALLATION - FILL, BEDDING, AND BACKFILL

- A. Place flowable fill by chute, pumping or other methods approved by Engineer.
 - 1. When required, place flowable fill under water using tremie procedure.
 - 2. Do not place flowable fill through flowing water.
- B. Place flowable fill in lifts to prevent lateral pressures from exceeding structural capacity of structures and utilities.
- C. Place flowable fill evenly on both sides of utilities to maintain alignment.
- D. Place flowable fill to elevations indicated on Drawings without vibration or other means of compaction.

3.04 INSTALLATION - FILLING ABANDONED UTILITIES

- A. Verify pipes and conduits are not clogged and are sufficiently empty to permit gravity installation of flowable fill for entire length indicated to be filled.
- B. Seal lower end of pipes and conduits by method to contain flowable fill and to vent trapped air caused by filling operations.
- C. Place flowable fill using method to ensure there are no voids.
 - 1. Fill pipes and conduits from high end.
 - 2. Fill manholes, tanks, and other structures from grade level access points.
- D. After filling pipes and conduits seal both ends.

3.05 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements.
- B. Defective Flowable Fill: Fill failing to meet the following test requirements or fill delivered without the following documentation.
 - 1. Test Requirements:
 - a. Minimum temperature at point of delivery.
 - b. Compressive strength requirements for each type of fill.
- C. Submit delivery tickets indicating actual materials delivered on Site. Delivery tickets shall contain

project description, date, time, class and quantity of mix, actual batch proportions, free moisture content of aggregate and quantity of water withheld.

3.06 CLEANING

- A. Remove spilled and excess flowable fill from Site.
- B. Restore facilities and site areas damaged or contaminated by flowable fill installation to existing condition before installation.

END OF SECTION

SECTION 31 25 12

STORM WATER POLLUTION PREVENTION PLAN

PAET 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Documentation to be prepared and signed by Contractor before conducting construction operations, in accordance with Texas Pollutant Discharge Elimination System (TPDES) Construction General Permit Number TXR 150000, latest issue date (Construction General Permit).
 - 2. Implementation, maintenance inspection, and termination of storm water pollution prevention control measures including, but not limited to, erosion and sediment controls, storm water management plans, waste collection and disposal, off-site vehicle tracking, and other appropriate practices.
 - 3. Review of Storm Water Pollution Prevention Plan (SWP3) implementation in a meeting with Engineer prior to start of construction.

1.02 PAYMENT

- A. Storm Water Pollution Prevention Plan:
 - 1. Basis of Measurement: Lump Sum.
 - 2. Basis of Payment: Payment for Storm Water Pollution Prevention Plan shall be made at the lump sum bid for "Storm Water Pollution Prevention Plan." Payment for all work prescribed under this item shall be full compensation for Storm Water Pollution Prevention Plan including all preparation, submittals, notices, updates, and revisions.
- B. Storm Water Pollution Prevention Plan Implementation:
 - 1. Basis of Measurement: Lump Sum.
 - 2. Basis of Payment: Includes all aspects of implementing SWP3, from Notice of Intent through Notice of Termination.

1.03 REFERENCES

- A. Construction General Permit (TPDES No. TXR 150000).
- B. Clean Water Act.

1.04 SUBMITTALS

- A. Section 01 33 00 - Submittals.
- B. Submit one copy of SWP3 to Engineer for record retention purposes only. Engineer will not review or approve SWP3

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with SWP3 as per submission of Notice of Intent.
- B. Maintain one copy of SWP3 document on Site.

PART 2 - PRODUCTS – NOT USED.

PART 3 - EXECUTION

3.01 SITE SPECIFIC STORM WATER POLLUTION PREVENTION PLAN (SWP3)

- A. Fulfill all TPDES Construction General Permit (TXR 150000) requirements.
- B. Contractor shall fulfill the role of Primary Operator as defined by TPDES Construction General Permit (TXR 150000) for this Project.
- C. Prepare and submit all required documentation and pay all applicable fees to TCEQ required by TPDES Construction General Permit (TXR 150000). This includes but is not limited to
 - 1. Notice of Intent,
 - 2. Site Notices,
 - 3. Notice of Termination,
 - 4. Notification of MS4 Operator.
- D. SWP3:
 - 1. Prepare a SWP3 following Part III of TPDES Construction General Permit (TXR 150000).
 - 2. Update or revise SWP3 as needed during construction following Part III, Section E of TPDES Construction General Permit (TXR 150000).
 - 3. Submit SWP3 and any updates or revisions to Engineer for review and address comments prior to commencing, or continuing, construction activities.
 - 4. Conduct inspections in accordance with TPDES Construction General Permit (TXR 150000).
 - 5. Maintain copies of SWP3, inspection reports, and other documentation as required by TPDES Construction General Permit (TXR 150000).

3.02 SWP3 IMPLEMENTATION

- A. Implement SWP3 utilizing state of the art Best Management Practice controls as required by Construction General Permit, site specific SWP3, and local government.
- B. Inspect and maintain controls throughout course of construction per Construction General Permit requirements.
- C. Remove controls per Construction General Permit requirements.
- D. On-Site Waste Material Storage:
 - 1. Self-contain on-site waste material storage and satisfy appropriate location, state, and federal rules and regulations.
 - 2. Prepare list of waste material to be stored on-site. Update list as necessary to include up-to-date information. Keep a copy of updated list with SWP3.
 - 3. Prepare description of controls to reduce pollutants generated from on-site storage. Include storage practices necessary to minimize exposure of materials to storm water, and spill prevention and response measures consistent with best management practices. Keep a copy of description with SWP3.

END OF SECTION

SECTION 31 25 14

SOIL EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 DESCRIPTION

- A. This Section includes the provisions for installation and removal of soil erosion and sediment controls in compliance with requirements of Texas Commission on Environmental Quality (TCEQ) Texas Pollutant Discharge Elimination System (TPDES) program.
- B. Develop, implement, and maintain a storm water pollution prevention plan in compliance with Local, State, and Federal requirements. Provide preventive measures to keep sediment and other pollutants from construction activity from entering any storm water system, including open channels. Comply with Texas Commission on Environmental Quality General Permit (TXR150000) for storm water discharges from construction activities under Texas Pollutant Discharge Elimination System (TPDES) program.
- C. This Specification provides guidelines and Best Management Practices (BMPs) information for Contractor to use in adhering to all Local, State, and Federal environmental regulations with respect to storm water pollution prevention during construction activity.
- D. Related Sections
 - 1. 31 05 13 - Topsoil
 - 2. 31 23 17 - Trenching
 - 3. 31 25 12 - Storm Water Pollution Prevention Plan
 - 4. 32 92 13 - Site Restoration

1.02 QUALITY ASSURANCE

- A. Contractor is solely responsible for and must implement all stormwater controls prior to any work within project area. Controls must remain in place until after completion of permanent restoration and erosion control measures.
- B. Referenced Standards: TPDES General Permit Number TXR150000 – General Permit to Discharge Waste, Issued by Texas Commission on Environmental Quality, March 5, 2003.
 - 1. Erosion control standards specified in TCEQ General Permit relating to discharges from construction activities.
 - 2. Refer to the permit for a complete discussion of the associated requirements.
- C. Comply with applicable requirements of all governing authorities having jurisdiction. Specifications and Drawings are not represented as being comprehensive, but rather to convey intent to provide complete slope protection and erosion control for both Owner's and adjacent properties.
- D. Erosion control measures shall be established at beginning of construction and maintained during 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.
- E. All land-disturbing activities shall be planned and conducted to minimize size of area to be exposed at any one time and to minimize time of exposure. Areas where work is completed shall be stabilized, restored and re-vegetated as soon as possible, as work continues in other areas.
- F. Surface water runoff originating upgrade of exposed area shall be controlled to reduce erosion and sediment loss during period of exposure.

- G. 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 receiving ditch or stream, Contractor shall install measures to control both velocity and rate of release so as to minimize accelerated erosion and increased sedimentation of a stream.
- H. All land-disturbing activities shall be planned and conducted so as to minimize off-site sedimentation.
- I. Contractor shall be responsible for periodically cleaning out and properly disposing of all sediment once the storage capacity of the drainage feature or structure receiving the sediment is reduced by one-half. For silt fences, sediment accumulations shall be removed when sediment depth reaches 6". Contractor shall also be responsible for cleaning out and properly disposing of all sediment at time of final completion of Work.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 0, Submittals and shall include:
 - 1. Stormwater Pollution Prevention Plan (SWPPP) following EPA SWPPP template, Version 1.1 signed and sealed by an engineer licensed in State of Texas.
 - 2. Record data for the erosion and sediment control devices.
 - 3. Notice of Intent for NPDES permitting
 - 4. Notice of Change (if necessary)
 - 5. TPDES General permit number for project
 - 6. Record Data – Inspection Reports: Provide inspection procedure and example inspection form to be used on weekly basis and after all 1/2" or greater storm event within 24 hours. Provide inspection form to document any major grading activities or periods when construction activity ceases for fourteen (14) calendar days or more.
 - 7. Certification of Completed Plan
 - 8. Notice of Termination
 - 9. Record Data and samples for Turf Reinforcement Mat.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Sediment control fence welded wire mesh: 12.5 GA (min), opening size 2" x 4" (nominal) as follows:
 - 1. Silt fence shall be "Enviro Fence" preassembled silt fence, AMXCO Silt Stop prefabricated silt fence, AMOCO Style 2155 preassembled silt fence or approved equal.

Sediment Control Fence Fabric Requirements		
Physical Property	Test Method	Requirements
Tensile Strength, N (lb.)	ASTM D 4632	445 (100) Minimum
Elongation @ Yield, %	ASTM D 4632	10-40
Trapezoidal Tear, N (lb.)	ASTM D 4533	222 (50) Minimum
Apparent Opening Size	ASTM D 4751	20-50
Permittivity, 1/sec	ASTM D 4491	0.1 Minimum
Ultraviolet Stability original tensile strength retained after 500 hrs. exposure, %	ASTM D 4355	80 Minimum

- B. Pipe Riser and Barrel: 16 GA corrugated metal pipe (CMP) of size indicated.
- C. Grass seeding per Division 32 requirements.
- D. Silt Fence Posts: Painted or galvanized steel TEE or Y-posts with anchor plates, not less than five (5') feet in length with a minimum weight of 1.3 pounds per foot with a minimum Brinell Hardness of 143.
- E. 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", width shall be 16" to 18" and thickness shall be 6" to 8" 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.
- F. 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.
- G. Erosion Control Mat: Mat to hold seed and soil in place until vegetation is established on disturbed areas are subject to the following design criteria:
 - 1. Type and class of erosion control mat must be specified as appropriate for slope of the area to be protected and the anticipated length of service.
 - 2. Erosion control mat must meet applicable Texas Department of Transportation (TxDOT) Minimum Performance Standards for TxDOT as provided in its Erosion Control Report and/or be listed on most current annual Approved Products List for TxDOT applicable to TxDOT Item 169 Soil Retention Blanket and its Special Provisions.
- H. Turf Reinforcement Mat: Woven fabric consisting of U.V. stabilized polypropylene. Turf reinforcement mat shall be installed in drainage channels and in steep slope areas with 3:1 or greater slopes as shown on the plans and details.
 - 1. Acceptable Manufacturers: Propex Pyramat or equal product as approved by Engineer.
 - 2. Design Criteria:
 - a. Turf reinforcement mat fabric shall be inert to commonly encountered chemicals, hydrocarbons, mildew, and shall be rot resistant, resistant to ultraviolet light exposure, insect and rodent resistant, and shall conform to properties in table below.
 - b. Average roll minimum value (weakest principal direction) for strength properties of any individual roll tested from manufacturing lot or lots of a particular shipment shall be in excess of average roll minimum value (weakest principal direction) stipulated herein.
 - c. Test Requirements:

Property	Minimum Value
Mass/Unit Area (ASTM D-6566)	13.5 oz/SY
Thickness (ASTM D-6525)	0.4 in
Light Penetration (% Passing) (ASTM D-6567)	15%
Color	Green
Grab Tensile Strength (ASTM D-6818)	4000 x 3000 lb/ft
Elongation (ASTM D-6818)	40 x 35%
Resiliency (ASTM D-6524)	80%
Flexibility (ASTM D-6575)	0.534 in-lb
UV Resistance @ 3000 hours	90% (6000 hrs)

3. Packing and Identification Requirements: Provide turf reinforcement mat in rolls wrapped with protective covering to protect turf reinforcement mat from mud, dirt, dust, and debris. Turf reinforcement mat shall be free of defects or flaws which significantly affect its physical properties. Label each roll of turf reinforcement mat in shipment with a number or symbol to identify that production run.
4. Sampling and Compliance Requirements – A competent laboratory must be maintained by producer of turf reinforcement mat at point of manufacture to insure quality control in accordance with ASTM testing procedures. Laboratory shall maintain records of its quality control results and provide a manufacturer’s certificate upon request to Engineer prior to shipment. The certificate shall include:
 - a. Name of manufacturer
 - b. Chemical composition
 - c. Product description
 - d. Statement of compliance to Specification requirements
 - e. Signature of legally authorized official attesting to information required.

- I. Filter Aggregate: Class 1 Aggregate Fill consisting of durable particles of crushed stone free of silt, clay, or other unsuitable materials and have a percentage of wear of not more than 40% when tested in accordance with ASTM C131 or C535. When material is subjected to five (5) cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, weighted percentage of loss shall not exceed 12%. Source of material shall be approved by Engineer and meet the following gradation in accordance with ASTM D448, size number 57:

Sieve Size Square Opening	Percent Passing
1-1/2"	100
1"	95-100
1/2"	25-60
No.4	0-10
No. 8	0-5

- J. Concrete Masonry Units (CMU): Nominal 8" x 8" x 16" hollow concrete masonry units unless indicated otherwise. CMU shall meet requirements of ASTM C-90, Grade N.
- K. Fasteners: Fasteners shall conform to requirements of various soil retention blanket and turf reinforcement mat manufacturers.

- L. Stone Stabilization: Class 4 Aggregate Fill consisting of durable particles of crushed stone free of silt, clay, or other unsuitable materials and have a percentage of wear of not more than 40% when tested in accordance with ASTM C131 or C535. When material is subjected to five (5) cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12%. The source of the material shall be approved by the Engineer and meet the following gradation in accordance with ASTM D448, size number 467:

Sieve Size Square Opening	Percent Passing
2"	100
1-1/2"	95-100
3/4"	35-70
3/8"	10-30
No. 4	0-5

- M. Geotextile - Erosion Control: Geotextile shall be in accordance with the following criteria:
1. Geotextile fabric shall be inert to commonly encountered chemicals, hydrocarbons, mildew and rot resistant, resistant to ultraviolet light exposure, insect and rodent resistant, and conform to the properties in the following table.
 2. Average roll minimum value (weakest principal direction) for strength properties of any individual roll tested from manufacturing lot or lots of a particular shipment shall be in excess of average roll minimum value (weakest principal direction) stipulated herein.

Physical Properties	Average Roll Minimum Value (Weakest Principal Direction)
Grab Tensile Strength ASTM D4632 (Lbs)	200
Elongation at Failure ASTM D4632 (%)	15
Water Flow Rate (gal/min/ft ²) ASTM D4491	320
Water Flow Rate (gal/min/ft ²) ASTM D4491	60
AOS(095) mm, ASTM D4751	0.25
Trapezoid Tear Strength ASTM D4533 (Lbs.)	50
Permeability – k (cm/sec) ASTM D4491	0.1
Puncture Resistance ASTM D4833 (modified) (Lbs.)	90

- N. Mulch Sock: Furnish materials as follows, unless otherwise shown on Drawings.
1. Posts. Furnish metal or wooden posts to be installed for anchoring the mulch socks in place.
 2. Mulch Sock. Furnish sock material that is 100% biodegradable, photodegradable, or recyclable such as burlap, twine, UV photodegradable plastic, polyester, or any other acceptable material.
 3. Mulch. Furnish wood chips produced from a 3" minus screening process (equivalent to TXDOT Item 161 Section 1.6.2.B Wood Chip Requirements)

- a. Mulch consists primarily of organic material, separated at point of generation, and many include: shredded bark or stump grindings. No compost will be accepted.
- b. Mulch material must be free of refuse, physical contaminants, and material toxic to plant growth; it is not acceptable for mulch material to contain ground construction debris, biosolids, or manure.
- c. Large portions of silt, clays, or fine sands are not acceptable in mulch.

PART 3 EXECUTION

3.01 PREPARATION

- A. Prior to General Stripping of Topsoil and Excavating:
 - 1. Install perimeter dikes and swales.
 - 2. Excavate and shape sediment basins and traps.
 - 3. Construct pipe spillways and install stone filter where required.
 - 4. Install sediment control fences and rock filter dams.
 - 5. Machine compact all berms, dikes and embankments for basins and traps.
- B. Construct sediment traps where indicated on Drawings during rough grading as grading progresses.
- C. Temporarily seed basin slopes and topsoil stockpiles:
 - 1. Rate: 1/2 LB/1000 SF
 - 2. Reseed as required until good stand of grass is achieved.
- D. Install construction entrances.

3.02 INSTALLATION

- A. Silt Fence
 - 1. Purpose of a silt fence is to intercept and detain water-borne sediment from unprotected areas to a limited extent. Contractor shall excavate a 6" by 6" trench for site fence bedding along lower perimeters of each location where necessary to prevent sediment from entering any drainage system. Contractor shall install the silt fence in accordance with manufacturer's recommendations and instructions. Silt fence is used during period of construction near perimeter of a disturbed area to intercept sediment while allowing water to percolate through.
 - 2. This fence shall remain in place until 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 areas of concentrated flow.
- B. Sand Bag Berm
 - 1. 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. Berm shall be a minimum height of 18", measured from top of existing ground at upslope toe to top of berm. Berm shall be sized to have a minimum width of 48" measured at bottom of berm and 18" measured at top of berm.
 - 3. Sand bag berm shall be inspected after each rain. Sand bags shall be reshaped or replaced as needed during inspection. Additional inspections shall be made daily by responsible party and when silt reaches 6", accumulated silt shall be removed and disposed of at an

approved site in a manner that will not contribute to additional siltation. Sand bag berm shall be left in place until all upstream areas are stabilized and accumulated silt removed; removal must be done by hand to avoid damage to sand bags.

C. Soil Retention Blankets

1. A soil retention blanket (SRB) is a geotextile or biodegradable fabric placed over disturbed areas to limit 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. 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. Prior to placing 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 close contact of blanket with soil. Area shall be smooth and free of ruts and other depressions. If as a result of rain, prepared bed becomes crusted or eroded or if any eroded places, ruts or depressions exist for any reason, Contractor shall be required to rework soil until it is smooth and to reseed or resod the area at Contractor's expense.
3. Installation and anchorage of soil retention blanket shall be in accordance with manufacturer's recommendations.

D. Turf Reinforcement Mats

1. Site Preparation – Grade surface of installation areas so that the ground is smooth and compact. All gullies, rills, and any other disturbed areas must be fine graded prior to installation. Remove all large rocks, dirt clods, stumps, roots, grass clumps, trash, and other obstructions from soil surface to allow for intimate contact between the soil surface and mat.
2. Exposure of turf reinforcement mats to the elements between laydown and cover shall be a maximum of 7 days to minimize damage potential. Install turf reinforcement mat fabric in accordance with Drawings. Construction vehicles will not be allowed to traffic directly on fabric. Place and anchor turf reinforcement mat on a smooth graded surface approved by Engineer. Turf reinforcement mat shall be placed so that placement of overlying materials will not excessively stretch or tear fabric. Anchoring of the terminal ends of turf reinforcement mat shall be accomplished through use of key trenches or aprons at crest and the toe of slope. Successive turf reinforcement mat sheets shall be overlapped so that the upstream sheet is placed over downstream sheet and/or upslope over downslope. In underwater applications, turf reinforcement mat and required thickness of backfill material shall be placed same day. Turf reinforcement mat shall be placed so that placement of overlying materials will not excessively stretch or tear fabric. Overlaps when necessary shall be 12" minimum except when placed under water where overlap shall be a minimum of 36". Use securing pins to insure proper anchoring of the fabric, with securing pins spaced at 5' centers. Securing pins shall be 3/16" steel bars, pointed at one end and fabricated with a head to retain a steel washer having an outside diameter of not less than 1-1/2". Pin length shall not be less than 19". U-shaped pins or special staples shall be an acceptable option, if approved by Engineer.
3. Overlapping shall join turf reinforcement mat. Seams shall be subject to approval of Engineer. Damaged turf reinforcement mat shall be repaired with turf reinforcement mat patch, placed over damaged area and extended 3 feet beyond perimeter of tear or damage.
4. Contractor shall submit installation instructions from Manufacturer. Engineer shall have final authority on installation procedures. Following laydown of turf reinforcement mat, 4" of topsoil shall be spread on top of mat and then hydromulch seeding shall be applied. Irrigation of seeding shall be necessary until grass is established.

E. Protection of Bare Areas

1. Apply seeding and soil retention blanket and turf reinforcement mats where specified in Drawings and details, to bare areas including new embankment areas, fills, striped 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 or turf reinforcement mats 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 slope to form the effect of small "terraces" with the tracks of dozer. Apply a minimum of three (3) coverages to each area with the dozer tracks.
3. Route runoff from the areas through appropriate silt fence system and other controls as necessary.
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 disturbed area or prevent sediment-laden runoff from leaving construction site or disturbed area. Outflow from a swale must be directed to a stabilized outlet or sediment trapping device. Swales should remain in place until disturbed area is permanently stabilized.
2. Stone Stabilization shall be used when grades exceed 2% or velocities exceed 6 feet per second and shall consist of a layer of crushed stone 3" thick, or flexible channel liner soil retention blankets or turf reinforcement mats as shown on Drawings and details. Stabilization shall extend across bottom of swale and up both sides of channel to minimum height of 3" above 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 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 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 proper functioning of the swale.
5. 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. On-site location may need to be adjusted to meet field conditions in order to utilized most suitable outlet.
9. Minimum compaction for swale shall be 90% of maximum density as determined by Standard Proctor compaction test (ASTM D698).

G. Diversion Dike

1. A diversion dike intercepts runoff from small upland areas and diverts it away from exposed slopes to a stabilized outlet, such as a rock berm, sandbag berm, or stone outlet structure. Dikes are generally used for duration of construction to intercept and reroute runoff from disturbed areas to prevent excessive erosion until permanent drainage features are installed and/or slopes are stabilized.
2. Stone Stabilization (required for velocities in excess of 6 fps) shall consist of Class 4 aggregate fill and shall be placed in a layer of at least 3" thickness and shall extend a minimum height of 3" above design water surface up existing slope and upstream face of dike.
3. Geotextile shall be placed under all stone stabilization.

4. Diversion dikes shall be installed prior to and maintained for the duration of construction and should intercept no more than ten (10) acres of runoff. Dikes shall have a minimum top width of 2'-0" and a minimum height of compacted fill of 18" measured from top of the existing ground at the upslope toe to top of the dike and having side slopes of 3:1 or flatter. Soil for dike shall be placed in lifts of 8" or less and be compacted to 95% standard proctor density. Channel which is formed by dike must have positive drainage for its entire length to an outlet. When slope exceeds 2%, or velocities exceed 6' per second (regardless of slope), stabilization is required. Situations in which velocities do not exceed 6 fps, vegetation may be used to control erosion.
5. Diverted runoff from a protected or stabilized area shall have its outlet flow directed to an undisturbed stabilized area or into a level spreader or grade stabilization structure.
6. Diverted runoff from a disturbed or exposed area shall be conveyed to sediment trap such as a rock berm, temporary sediment trap or sediment basin or to an area protected by any of these measures.

H. Temporary Stabilized Construction Entrance

1. Work shall consist of constructing temporary stabilized construction entrances at all entry points to site and shall remain in place for duration of construction period to prevent sediment from leaving site and becoming a nuisance in a public right-of-way. This includes all labor and materials associated with installation and maintenance of entrance and a sediment trap.
2. Rock for the stabilized entrance shall meet gradations shown on Drawings. Geotextile shall be placed under all stone stabilization.
3. A temporary construction entrance shall be installed at any point where traffic will be entering or leaving a construction site to or from a public right-of-way, street, alley, sidewalk or parking area. Purpose of a stabilized construction entrance is to reduce or eliminate tracking or flowing of sediment into graded or incorporate a drainage swale to prevent runoff from leaving construction site.
4. Temporary construction entrance shall be maintained in a condition which will prevent tracking or flowing of sediment into public right-of-way. This may require periodic top dressing with additional stone as conditions demand. All sediment spilled, dropped, washed or tracked into public rights-of-way must be removed immediately by Contractor.
5. When necessary, vehicles must be cleaned to remove sediment prior to entrance onto public right-of-way. When washing is required, it shall be done on an area stabilized with crushed stone which drains into an approved sediment trap or sediment basin or other sedimentation/filtration device. All sediment shall be prevented from entering any storm drain, ditch or watercourse using approved methods.

I. Concrete Truck Wash-Out Facility

1. Install sand filter bed of at least 50 square feet in area and at least 12" in depth. Bottom of filter bed shall allow filtered wash water to percolate into subgrade.
2. Install 12" high berm around periphery of filter bed to prevent stormwater runoff contamination of filter sand.
3. Remove, dispose, and replace filter sand that becomes clogged to such a degree that wash water does not immediately percolate down into filter bed.
4. Maintain sand filter bed until all concrete has been placed on project site.
5. Upon completion of all concrete placements on project site remove and dispose filter sand, backfill bed with compacted select fill to 90% Standard Proctor Density and restore disturbed surface.

J. Location of Erosion and Sediment Control Structures

1. Locate erosion and sediment control structures as required to prevent erosion and removal of sediment from project site. Controls shall be generally placed in accordance with Sediment and Erosion Control Plan prepared by Owner. 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'. 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 silt fence installation.
3. Install silt traps at inlet (upstream) end of 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. System shall be modified by Contractor from time to time to effectively control erosion and sediment during construction.
5. Install concrete truck wash-out facility within staging area.

3.03 DURING CONSTRUCTION PERIOD

- A. Inspect at least every 7 days, and no more than 24 hours after all rainfall events of 1/2" or greater.
- B. All erosion and sediment control measures and other protective measures identified in SWPPP must be maintained in effective operating condition.
- C. Contractor shall ensure that sedimentation and erosion that occur due to work activities are minimized and contained within designated project work areas. Erosion and sedimentation occurring outside work area will be resolved by and coordinated by Contractor with impacted landowners as required.
- D. Maintain Basins, Dikes, Traps, Stone Filters, Straw Bales, Etc.:
 1. Inspect regularly especially after rainstorms.
 2. Repair or replace damaged or missing items.
- E. After rough grading, sow temporary grass cover over all exposed earth areas not draining into sediment basin or trap.
- F. Construct inlets as soon as possible. Excavate and tightly secure straw bales completely around inlets as detailed on Drawings.
- G. Provide necessary swales and dikes to direct all water towards and into sediment basins and traps.
- H. Do not disturb existing vegetation (grass and trees).
- I. Take appropriate measures to minimize materials transported or tracked by construction vehicles onto any roadway.
- J. Excavate sediment out of basins and traps when capacity has been reduced by 50%. Remove sediment from behind bales to prevent overtopping.
- K. Topsoil and Fine Grade Slopes and Swales, Etc. - Seed and mulch as soon as areas become ready.

3.04 NEAR COMPLETION OF CONSTRUCTION

- A. Eliminate basins, dikes, traps, etc.
- B. Grade to finished or existing grades.
- C. Fine grade all remaining earth areas, then seed and mulch.

END OF SECTION

SECTION 31 31 26

WIRE FENCE AND GATES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Furnish and construct fence of barbed or smooth wire.
 2. On utility projects:
 - a. When existing fence is within Site (i.e. parallel to or crosses utility trench and/or within utility easement) and is directly disturbed by construction activities, fencing will be paid for as listed in Article 1.02 below.
 - b. When existing fence is outside of limits of project Site or is identified as protected on Drawings and is disturbed and/or by construction activities, replacement will be at sole expense of Contractor and no other compensation will be allowed.
- B. Related Specification Sections include, but are not necessarily limited to:
1. Division 00 - Proposal Requirements, Contract Forms, and Conditions of Contract
 2. Division 01 - General Requirements

1.02 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
1. Wire Fence
 - a. Measurement
 - 1) Measurement for this Item shall be by linear foot of Wire Fence, excluding gates.
 - b. Payment
 - 1) Work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at unit price bid per linear foot of Wire fence installed for various:
 - a) Post types
 - b) Wire types
 - c) Number of Strands as specified in Drawings
 - c. Price bid shall include:
 - 1) Removal of existing fence and/or, unless specifically defined as a separate pay item on Drawings
 - 2) Furnishing, preparing, hauling, and installing Wire Fence
 - 3) Excavation, backfilling, and disposal of surplus material
 - 4) Removal and trimming of brush and tree limbs
 2. Steel Gates
 - a. Measurement
 - 1) Measurement for this Item shall be per each Steel Fence.
 - b. Payment
 - 1) Work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at unit price bid per each Steel Gate by height.
 - c. Price bid shall include:
 - 1) Removal of existing fence and/or gates, unless specifically defined as a separate pay item on Drawings
 - 2) Furnishing, preparing, hauling, and installing Steel Gates
 - 3) Excavation, backfilling, and disposal of surplus material
 - 4) Removal and trimming of brush and tree limbs

1.03 REFERENCES

- A. Reference Standards
 - 1. Reference standards cited in this Specification refer to current reference standard published at the time of Bid.
 - 2. American Society for Testing and Materials (ASTM):
 - a. A 702, Standard Specification for Steel Fence Posts and Assemblies, Hot Wrought
 - b. A 121, Standard Specification for Metallic-Coated, Carbon Steel Barbed Wire
 - c. A 116, Standard Specification for Metallic-Coated, Steel Woven Wire Fence Fabric
 - d. F 1083, Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures
 - 3. American Wood Protection Association (AWPA)
 - a. P8/P9, Standard for Oil-Borne Preservatives
 - b. C5, Fence Posts - Preservative Treatment by Pressure Processes

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Furnish materials in accordance with details shown on Drawings and with requirements specified herein.
- B. Metal Posts and Braces
 - 1. Steel Pipe: ASTM F 1083
 - 2. T posts: ASTM A 702
 - 3. Use only new steel. Do not use rerolled or open-seam material.
 - 4. Furnish galvanized steel sections in ASTM F 1083.
 - 5. Painting
 - a. Use an approved anticorrosive coating.
 - b. After installation of painted posts and braces, spot-coat damaged areas with same paint color.
 - c. Use paint with at least same anti-corrosive properties as original paint.
 - 6. Use size, weight, and area of posts, braces, and anchor plates shown on Drawings.
- C. Wood Posts and Braces
 - 1. Untreated Wood: cedar or juniper timber
 - 2. Treated Wood
 - a. AWPA standards govern materials and methods of treatments including seasoning, preservatives, and inspection for treatment.
 - b. Each piece or bundle of other treated-timber products must have:
 - 1) Legible brand mark or tag indicating name of treater
 - 2) Date of treatment or lot number
 - 3) AWPA treatment specification symbol
 - c. Provide 0.4 pounds per cubic foot of preservative per AWPA standard for treatment C5.
 - 3. Use sound timber that is free from decay, shakes, splits, or other defects that would weaken posts or braces or otherwise make them structurally unsuitable for purposes intended.
 - 4. Knots that are sound, tight, trimmed flush, and not in clusters will be allowed, provided they do not exceed 1/3 of small diameter or least dimension of posts and braces.
 - 5. Remove spurs and splinters, cutting ends square.
 - 6. Use wood posts where shown on Drawing and of minimum size as shown.
- D. Gates and Gateposts: Furnish materials to required dimensions. Construct gates from 2" O. D., 16 gauge steel tubing. Gate shall be a 6 rail design and be fitted with a chain latch and heavy duty 12" all thread J-bolt post attachments with an adjustable 3/4" top hinge clamp. Each vertical stay is a single piece fitted through drilled rails, to increase gate's strength and durability. Gates and

appurtenance shall be hot dipped galvanized. Furnish galvanized steel in accordance with ASTM F 1083.

- E. Barbed and Smooth Wire: ASTM A 121, Class 1
 - 1. Use wire consisting of 2 strand, 12 1/2 gauge, twisted wire
 - 2. Barbed Wire: 2-point 14 gauge barbs spaced no more than 5" apart
- F. Wire Mesh: ASTM A 116, Class 1
 - 1. Top and bottom wires: at least 10 gauge wire
 - 2. Intermediate wires and vertical stays: 12 1/2 gauge wire
- G. Miscellaneous
 - 1. Furnish galvanized bolts, nuts, washers, braces, straps, and suitable devices for holding barbed wire and wire mesh firmly to metal posts.
 - 2. Use material of good commercial quality and design.
 - 3. Provide galvanized staples, at least 1-1/2" long.
- H. Concrete
 - 1. Minimum 28 day compressive strength of 3,000 psi
 - 2. Bagged concrete allowed for backfill around posts.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Space fence posts as shown on Drawings or to match existing.
- B. Set fence posts plumb and firm at intervals, depth, and grade shown on Drawings or to match existing.
- C. Brace corner and pull posts in 2 directions.
- D. Brace end posts and gateposts in 1 direction.
- E. Install a corner post where alignment changes 30 degrees or more.
- F. At alignment angles between 15 and 30 degrees, brace angle post to adjacent line posts with diagonal tension wires.
- G. At grade depressions where stresses tend to pull posts out of the ground, snub or guy fencing at critical point with a double 9 gauge galvanized wire.
- H. Connect the wire to top horizontal line of barbed wire or to top and bottom wire or wire mesh fabric, and to a deadman weighing at least 100 pounds.
- I. Stretch fence before guying and snubbing.
- J. Install number stands at spacing shown in Drawings.
- K. Install corner, end, or angle post assembly before stretching wire between posts.
- L. Connect existing cross fences to new fences and corner posts at junctions with existing fences.
- M. While drawing barbed wire and wire fabric taut, fasten to posts using galvanized ties or staples, or as shown on Drawings.
- N. Install pull post assemblies at 500 feet intervals for steel posts and at 1,000 feet intervals for wood posts.

- O. Drive metal line posts provided driving does not damage posts.
- P. Set metal corners, ends, pull posts, and braces in concrete footings a minimum of 24" and crowned at top to shed water.
- Q. Thoroughly tamp backfill in 4" layers.
- R. Notch timber posts.
- S. All metalwork shall be hot-dipped galvanized with touch-up of all damaged and rust areas using Carbozinc 11 WB by Carboline.

END OF SECTION

SECTION 31 37 00

STONE RIP-RAP

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Stone rip rap for protection of slopes against erosion.
 - a. Drainage outflow area.
 - b. Slope rip rap.
 - c. Areas indicated and shown on Drawings.
- B. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 00 - Proposal Requirements, Contract Forms, and Conditions of Contract.
 - 2. Division 01 - General Requirements.

1.02 MEASUREMENT AND PAYMENT

- A. Stipulated Price (Lump Sum). If Contract is a Stipulated Price Contract, payment for Work in this Section is included in total Stipulated Price.

1.03 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Association of State Highway and Transportation Officials (AASHTO):
 - a. T103, Soundness of Aggregates by Freezing and Thawing.
 - 2. ASTM International (ASTM):
 - a. C88, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
 - b. C127, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
 - 3. Corps of Engineers (COE):
 - a. CRD-C100, Method of Sampling Concrete Aggregate and Aggregate Sources, and Selection of Material for Testing.

1.04 SUBMITTALS

- A. Shop Drawings:
 - 1. Specification 01 33 00 - Submittals for requirements for submittal process.
 - 2. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - 3. Certifications.
 - 4. Test reports.
 - 5. Submit all tests and certification in a single coordinated submittal.
 - a. Partial submittals will not be accepted.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Bedding Material and Stone:
 - 1. Durable broken quarry run stone.
 - 2. Does not disintegrate on exposure to water or weathering.
 - 3. Free from structural fractures and defects.
 - 4. Not containing shale, unsound sandstone, or other material which will disintegrate.

5. Graded within limits specified.
6. Breadth and thickness of any stone: Not less than one-third of its length.
7. Ensure that dirt and fines accumulated from interledge layers or from blasting or handling operation is less than 2% by weight.
8. Gradation of the material:
 - a. Size rock so as to permit its interlocking.
 - b. Bedding material shall have a gradation as given below when tested in accordance with ASTM C136. Material shall not be skip graded, scalped of certain sizes, or have other irregularities which would be detrimental to proper functioning of bedding. Acceptance of bedding material shall be based on in-place gradations
 - 1) Bedding gradation shall be per TxDOT Item 432, Protection Riprap Bedding Material.
 - c. Riprap gradation shall be as given below. Acceptance of riprap shall be based upon in-place gradations.
 - 1) Riprap gradation shall be per TxDOT Item 432, Type R.

2.02 MANUFACTURED PRODUCTS

- A. Filter Cloth: Filter Cloth shall be Tyvar manufactured by DuPont, Supra manufactured by Phillips Fibers Corporation, Bidim manufactured by Monsanto, or other approved equal. Weight of material shall be at least 6 ounces per square yard. Material shall be manufactured by a spinning process and shall have 85% of its pore sizes smaller than 0.15 mm.

2.03 SOURCE QUALITY CONTROL

- A. Perform all tests at an approved independent laboratory.
- B. Obtain samples in conformance with COE CRD-C100.
- C. Source Tests:
 1. Supply certified tests and service records to determine acceptability and application of stone materials.
 2. In event suitable test reports or a service record that is satisfactory are not available, as in case of newly operated sources, subject material to tests necessary to determine its acceptability for use.
 3. Tests to which materials are to be subjected include:
 - a. Specific gravity.
 - b. Soundness in magnesium sulfate.
 - c. Soundness in freezing and thawing.
- D. Material Acceptability Tests:
 1. Initial test:
 - a. On material from each ledge sampled prior to start of construction.
 - b. Specific gravity.
 - c. Soundness in magnesium sulfate.
 - d. Soundness in freezing and thawing.
 2. Control tests:
 - a. Perform control tests including one specific gravity, one soundness in magnesium sulfate, and one soundness in freezing and thawing for each type of stone revetment material.
- E. Specific Gravity Test:
 1. Conform with ASTM C127.
 2. Not less than 2.40 minimum.
- F. Soundness in Magnesium Sulfate:

1. Conform with ASTM C88, except maintain samples immersed in solution at a temperature of 80 DegF (26 DegC) +2 DegF.
 2. Not more than 12% loss at five cycles.
- G. Soundness of Aggregates in Freezing and Thawing:
1. Conform with AASHTO T103 method as modified herein.
 2. Ensure loss at 12 cycles of not more than 10%.
 3. Maintain temperature of cold liquid in range of -5 to 0 DegF (-20 to -18 DegC).
 4. Maintain thaw fluid temperature in range of 45 to 50 DegF (7 to 10 DegC).
 5. Permit length of freezing and of thawing cycles of 2 hours with 1 hour of freezing following by 1 hour of thawing.
 6. Perform thawing by circulating thaw fluid around pan containing stone immersed in a depth of 1/4" rather than by total immersion.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Trim and dress all areas to required cross sections.
- B. Bring areas that are below allowable minus tolerance limit to grade by filling with material similar to adjacent material.
- C. Compact to density specified for backfill.
- D. Do not place any filter cloth, bedding material or stone material on prepared base prior to inspection by Engineer.

3.02 PLACING OF FILTER CLOTH

- A. Store and place filter cloth as specified by Manufacturer. Place filter cloth after foundation is prepared and cover immediately with bedding material. Make a minimum 24" lap on all joints. Repair or replace any damaged filter cloth as specified by Manufacturer.

3.03 PLACING OF BEDDING MATERIAL

- A. Uniformly spread bedding material on prepared surface, in a satisfactory manner, to slope lines and grades indicated on Drawings.
- B. Placing of material by dumping from top of slope or by any method which tends to segregate particle sizes within blanket shall not be permitted.
- C. Repair any damage to prepared surface (or filter cloth) during placing of blanket before proceeding with work.
- D. Compaction of the blanket will not be required, but it shall be finished to present a reasonably even surface free from mounds or windrows.

3.04 PLACING OF STONE REVETMENT (RIP RAP)

- A. Place stone revetment material on filter cloth or bedding material within limits indicated.
- B. Place on prepared base to produce a well-graded mass of stone with minimum percentage of voids.
- C. Place to required thickness and grades.
- D. Place to full thickness in a single operation to avoid displacing the underlying material.

- E. Distribute entire mass to conform to gradation specified.
 - 1. Do not place stone by dumping into chutes or by similar method likely to cause segregation.
- F. Keep finished stone revetment free from objectionable pockets of small stones or clusters of larger stone.
 - 1. Hand place as necessary to obtain a well-graded distribution.
- G. Ensure a final tolerance of within 3" from indicated slope and grade lines.
- H. Place stone revetment in conjunction with embankment construction to prevent mixture of embankment and stone revetment materials.
- I. Maintain stone revetment until accepted.
- J. Replace any displaced material to lines and grades shown on Drawings.

END OF SECTION

SECTION 31 75 00

PAVEMENT REPAIR

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A Repairing road crossings, and existing parking lot that have been cut, broken, or otherwise damaged during construction.
- B Repairing areas of failed paving in preparation for resurfacing.
- C References to Technical Specifications:
 - 1. Section 01 33 00 – Submittals
 - 2. Section 01 50 00 – Temporary Controls

1.02 REFERENCES

- A. AASHTO: American Association of State Highway and Transportation Officials
 - 1. AASHTO MP1: Standard Specification for Performance-Graded Asphalt Binder
 - 2. AASHTO T099: Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop
 - 3. AASHTO T180: Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
- B. ASTM: American Society for Testing and Materials
 - 1. ASTM D2041: Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
 - 2. ASTM D2397: Standard Specification for Cationic Emulsified Asphalt
- C. TXDOT: Texas Department of Transportation – Standard Specifications, latest edition.
 - 1. TXDOT Item 247 - Grade 2 Flex Base
 - 2. TXDOT Item 334 - Type D Fine Grade Asphalt
 - 3. TXDOT Item 302 - Aggregates for Surface Treatment
- D. COA: City of Austin - Standard Specifications, latest edition
 - 1. COA Item No. 302S

1.03 SUBMITTALS

- A. At least 14 days prior to beginning material placement, submit documentation confirming that materials and mix designs for aggregate base, hot mix asphalt concrete, and portland cement concrete meet the requirements specified herein.

1.04 PROTECTION OF PEOPLE AND PROPERTY

- A Contractor shall conduct all construction operations under this Contract in conformance with practices described in Section 01 50 00 – Temporary Controls.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Subgrade: On street crossings provide compacted embedment material to within 9.5” of repair section above per Section 31 23 17 - Trenching.
- B. Base: Base shall be TXDOT 247, Grade 2 crushed limestone base material (CLBM).

- C. Asphalt Pavement Repair: Provide new Hot-Mix Asphaltic Concrete Surface Course per TXDOT 334 Type D for asphalt pavement repair
- D. TxDOT Approved Cold Mix: DMS-9202, "Asphaltic Concrete Patching Material (Stockpile Storage or Bagged).
- F. Gravel Paving Repair: Provide aggregate materials conforming to COA Item No. 302S, "Aggregate for Surface Treatments" as follows:
 - 1. First Course Grade 3,
 - 2. Second Course Grade 4

PART 3 - EXECUTION

3.01 EXAMINATION

- A Verify backfill is complete before repairing pavement over installed utilities or structures.
- B Verify remaining subgrade is ready to support imposed loads before repairing areas of failed paving.
- C. For installation of utilities and utility appurtenances, saw cut all edges and remove pavement (including base material for asphalt paving) a minimum of 24" beyond width of excavation, unless otherwise indicated on Drawings.
- D. For installation of structures, saw cut and remove pavement (including base material for asphalt paving) 5 feet beyond width of excavation, unless otherwise indicated on Drawings.
- E. For repair of areas of failed paving, saw cut and remove pavement (including base material for asphalt paving) where indicated in field or as directed by Engineer. Remove subgrade that is soft and yielding, or to depth as directed by Engineer.
- F. If removed pavement is greater than one-half of pavement lane width, or within 18" of a longitudinal joint, on concrete pavement, replace pavement for full lane width or to nearest longitudinal joint as approved by Engineer.
- G Protect edges of existing pavement to remain from damage during removals, utility placement, backfill, and paving operations. For concrete pavement, leave and protect minimum of 18" of undisturbed subgrade on each side of trench to support replacement slab.

3.02 EXAMINATION

- A Verify backfill is complete before repairing pavement over installed utilities or structures.
- B Verify remaining subgrade is ready to support imposed loads before repairing areas of failed paving.

3.03 INSTALLATION

- A Replace subgrade with material to a minimum density of 95%. Place and compact for areas under future paving to match lines and grade of surrounding subgrade.
- B Backfill above embedment with CLBM compacted to 95% density to match lines and grade of surrounding base course.
- C Replace pavement with material specified and according to Specifications of particular surface course treatment so that a smooth, hard, well cemented surface, conforming to lines and grade of surround pavement is secured

- D For concrete pavement, install size and length of reinforcing steel and pavement thickness indicated on Drawings. Place types and spacing of joints to match existing or as indicated on Drawings.
- E Where existing pavement consists of concrete pavement with asphaltic surfacing, resurface with minimum 2" depth asphaltic pavement.
- F Repair state highway crossings in accordance with highway department permit and within 1 week after utility work is installed.

3.4 ASPHALT CONCRETE SURFACING

- A. Obtain Engineer's acceptance of base before beginning surface placement.
- B. Where adjacent surface pavement has been undermined, saw cut edges back to a firm base course. Where adjacent surface pavement edges have been rolled over, are irregular, or otherwise damaged, saw cut pavement back to expose a clean, sound surface.
- C. Tack coat pavement surfaces that will be in contact with new asphalt concrete.
- D. Place asphalt surface material in compacted layers. In multi-layer construction, place in approximately equal depth layers.
- E. Compact pavement to a minimum of 92% of laboratory density as determined by ASTM D2041.
- F. Asphalt and sand seal all edges where new asphalt concrete meets existing pavement.
- G. Finished joint between new and existing pavement surfaces shall be within 1/4" when tested with a 6-foot straightedge. Patch shall be removed and replaced if any area exceeds 3/8" or area fails to drain properly as a result of patch.
- H. Sweep up and properly dispose of loose material off property.
- I. Clean up loose material with a regenerative-air vacuum sweeper and properly dispose of off property.

3.5 CLEAN-UP AND RESTORATION

- A Perform clean-up and restoration in and around construction zone. Then disposal of excess materials in accordance with Section 01 74 19 - Construction Waste Disposal.
- B. Protect and maintain all pavement in good condition until completion of Work. Replace pavement damaged by Contractor's operations at no cost to Owner.

END OF GENERAL

SECTION 31 75 10

CONCRETE PAVING REPAIR

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Concrete pavement repair to include, but not limited to:
 - a. Utility cuts (water, sanitary sewer, drainage, etc.)
 - b. Repairs of damage caused by Contractor
 - c. Any other concrete pavement repair needed during course of construction
- B. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 00 - Proposal Requirements, Contract Forms, and Conditions of Contract
 - 2. Division 01 - General Requirements
 - 3. Section 31 23 17 - Trenching
 - 4. Section 31 75 00 - Asphalt Pavement Repair

1.02 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Concrete Pavement Repair
 - a. Measurement
 - 1) Measurement for this Item shall be by linear foot of Concrete Pavement Repair.
 - b. Payment
 - 1) Work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" shall be paid for at unit price bid per linear foot of Concrete Pavement Repair
 - c. Price bid shall include:
 - 1) Shaping and fine grading placement area
 - 2) Furnishing and applying all water required
 - 3) Furnishing, loading and unloading, storing, hauling and handling all concrete
 - 4) Furnishing, loading and unloading, storing, hauling and handling all base material
 - 5) Mixing, placing, finishing and curing all concrete
 - 6) Furnishing and installing reinforcing steel
 - 7) Furnishing all materials and placing longitudinal, warping, expansion and contraction joints, including all steel dowels, dowel caps and load transmission units required, wire and devices for placing, holding and supporting steel bar, load transmission units, and joint filler in proper position; for coating steel bars where required by Drawings
 - 8) Sealing joints
 - 9) Monolithically poured curb
 - 10) Cleanup

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Permitting
 - 1. Obtain Permit to make utility cuts in streets.
 - 2. Transportation and Public Works Department may inspect paving repair.

1.04 FIELD CONDITIONS

- A. Weather Conditions: Place concrete as specified in Section 03 30 00.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Embedment and Backfill: Section 31 23 17.
- B. Base material: Coarse Aggregate Type A1 (Flexible Base, TxDOT Item 247, Type A, Grade 1 or 2)
- C. Concrete: Section 03 30 00.
- D. Concrete paving: 3,000 psi.
 - 1. Replace concrete to a minimum thickness of 6" or as shown on Drawings.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Replace a continuous section if multiple repairs are closer than 10 feet apart from edge of one repair to edge of a second repair.
- B. If cut is to be covered, use steel plates of sufficient strength and thickness to support traffic.
 - 1. Construct a transition of hot-mix or cold-mix asphalt from top of steel plate to existing pavement to create a smooth riding surface.
 - a. Hot-mix or cold-mix asphalt: conform to the requirements of Section 31 75 00.
- C. Surface Preparation: Mark pavement cut repairs for approval by Engineer.

3.02 INSTALLATION

- A. Sawing
 - 1. General
 - a. Saw cut perpendicular to surface to full pavement depth.
 - b. Saw cut edges of pavement and appurtenances damaged subsequent to sawing to remove damaged areas.
 - c. Such saw cuts shall be parallel to original saw cut and to neat straight lines.
 - 2. Sawing equipment
 - a. Power-driven
 - b. Manufactured for the purpose of sawing pavement
 - c. In good operating condition
 - d. Shall not spall or fracture concrete adjacent to the repair area
 - 3. Repairs: In true and straight lines to dimensions shown on Drawings
 - 4. Utility Cuts
 - a. In a true and straight line on both sides of the trench
 - b. Minimum of 12" outside trench walls
 - 5. Prevent dust and residues from sawing from entering the atmosphere or drainage facilities.
- B. Removal
 - 1. Use care in removing concrete to be repaired to prevent spalling or fracturing concrete adjacent to repair area.
- C. Base: as specified in Drawings
- D. Concrete Paving
 - 1. Concrete placement: in accordance with Section 03 30 00.
 - 2. Reinforce concrete replacement: as specified in Drawings

END OF SECTION

SECTION 32 92 13
SITE RESTORATION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope:
1. Contractor shall furnish all labor, materials, equipment and incidentals required to provide site restoration as shown and specified.
 2. Extent of the Site Restoration Work includes:
 - a. Restore soils to original grade along roadways and pipelines. Seed all restored areas.
 - b. As required for other Work.
 - c. Seeding for native pastures shall be seeded in accordance with Section 32 92 15, Native Grassland Seeding and Planting for Vegetation Restoration.

1.02 QUALITY ASSURANCE

- A. Reference Standards: Comply with applicable provisions and recommendations of the following, except where otherwise shown or specified.
1. Association of Official Analytical Chemists, Official Methods of Analysis.
 2. ASTM D 2487, Classification of Soils for Engineering.
 3. FSO-F-241D, Fertilizer, Mixed, Commercial.

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery of Materials:
1. Deliver materials in proper containers. Protect materials from deterioration during delivery.
 2. Submit certification from supplier that each type of seed conforms to Specification requirements and requirements of Texas Seed Law. Certification shall accompany seed delivery.
 3. Submit a certificate stating the fertilizer complies with Specification requirements and requirements of Texas Fertilizer Law.
 4. Remove unacceptable material immediately from jobsite.
- B. Storage of Materials: Store and cover materials to prevent deterioration. Remove packaged materials which have become damaged or show deterioration from Site.

1.04 JOB CONDITIONS

- A. Environmental Requirements: Proceed with and complete the Work as rapidly as portions of site become available, working within any seasonal limitations for site restoration Work required.
- B. Scheduling: Complete site restoration after final grades are established.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Topsoil:
1. Provide topsoil, fertilizer, mulch and other planting amendments as required to assure successful site restoration. Where appropriate, stripped soil may be used as topsoil.

2. Grass Seed: Conform to U.S. Department of Agriculture rules and regulations of Federal Seed Act and Texas Seed Law. Seed shall be certified 90% pure and furnish 80% germination and meet the following requirements:
 - a. Rye: Fresh, clean, Italian rye grass seed (*Lolium multi-florum*), mixed in labeled proportions. As tested, minimum percentages of impurities and germination must be labeled. Deliver in original unopened containers.
 - b. Bermuda: Extra-fancy, treated, lawn type common bermuda (*Cynodon dactylon*). Deliver in original, unopened container showing weight, analysis, name of vendor, and germination test results.
 - c. Wet, moldy, or otherwise damaged seed will not be accepted.
 - d. Seed requirements, application rates and planting dates are:

Grass Type	Application Rate (pounds/acre)	Planting Date
Hulled Common Bermuda 98/88 Unhulled Common Bermuda 98/88	1	Jan 1 to Mar 30
Hulled Common Bermuda 98/88	40	Apr 1 to Sept 30
Hulled Common Bermuda 98/88 Unhulled Common Bermuda 98/88 Annual Rye Grass (Gulf)	40/40/30	Oct 1 to Dec 31

3. Mulch: Virgin wood cellulose fibers from whole wood chips having a minimum of 20% fibers 0.42" in length and 0.01" in diameter. Mulch shall be dyed green for coverage verification purposes. Straw mulch or hydromulch may be used in lieu of wood mulch if accepted by Engineer. Contractor shall demonstrate comparable performance of straw mulch or hydromulch to wood mulch for acceptance.
4. Hydraulically Applied Flexible Growth Medium (FGM): Composed of long-strand, thermally refined wood fibers, crimped, interlocking fibers, and performance-enhancing additives. All components of the FGM shall be pre-packaged by manufacturer and in compliance with the following values. Under no circumstances will field mixing of additives or components be accepted.
 - a. Thermally Processed Wood Fibers: 74.5% plus 3.5%.
 - b. Cross-linked Hydro-Colloid Tackifiers and Activators: 10% plus 1%.
 - c. Crimped, Interlocking Fibers: 5% plus 1%.
 - d. Moisture Content: 10.5% plus 1.5%.
5. Fertilizer: Dry and free flowing, inorganic, water soluble commercial fertilizer, which is uniform in composition. Deliver in unopened containers, which bear manufacturers guaranteed analysis. Caked, damaged, or otherwise unsuitable fertilizer will not be accepted. Fertilizer shall contain minimum percentages of the following elements:
 - a. Nitrogen: 10%.
 - b. Phosphoric Acid: 20%.
 - c. Potash: 10%.

PART 3 - EXECUTION

3.01 REQUIRED AREAS

- A. Any top soils that have been disturbed or fill material that has been placed, and not covered by an impervious surface (i.e. road or concrete pad), will be restored according to this Section.
- B. Use Bermuda seeding in developed lawns and native grass seed in pastures in accordance with Section 32 92 15, Native Grassland Seeding and Planting for Vegetation.

3.02 INSPECTION

- A. Examine subgrade, verify elevations, observe conditions under which Work is to be performed, and notify Owner of unsatisfactory conditions. Do not proceed with Work until unsatisfactory conditions have been corrected in a manner acceptable to Owner.

3.03 PREPARATION

- A. Seeded Grass Areas: Assure that areas to receive grass seed are graded smooth and free of sharp rocks or other objects which may tear erosion control blankets or turf reinforcing mats. Level and smooth as needed with top soil as specified herein.

3.04 INSTALLATION

- A. Placing Topsoil:
 1. Place topsoil in areas where seeding is required. Place topsoil during dry weather.
 2. Fine grade topsoil to eliminate rough or low areas. Maintain profiles and contour of subgrade.
 3. Remove roots, weeds, rocks, and foreign material while spreading.
 4. If not otherwise shown, place at least 6" of topsoil on areas to be seeded. Where applicable, existing topsoil may be stripped, stockpiled and respread for planting. Respread topsoil shall be free of debris, roots, exposed rock and weeds.
- B. Erosion Control Blankets/Turf Reinforcement Mats: Place erosion control blankets or turf reinforcement mats over all areas to be revegetated. Erosion control blankets and turf reinforcement mats shall be installed per manufacturer's instructions.
- C. Seeding and Mulching:
 1. Seed: Apply uniformly at rates specified herein for type of seed and planting date.
 2. Mulch: Apply uniformly at a rate of 50 pounds 1,000 square feet.
 3. Fertilizer: Apply uniformly at a rate of 500 pounds per acre.
 4. Suspend all operations under conditions of drought, excessive moisture, high winds, or extreme or prolonged cold. Obtain Owner's approval before resuming operations.
- D. Flexible Growth Medium (FGM):
 1. FGM shall be installed per manufacturer's installation instructions and recommendations. For optimum pumping and application performance, use approved mechanically agitated, hydraulic seeding/mulching machines with a fan-type nozzle (50-degree tip). Apply FGM from opposing directions to achieve a minimum of 95% of soil surface coverage. Slope interruption devices or water diversion techniques are recommended when slope lengths exceed 100 feet. Install materials at the following minimum application rates:

Slope Gradient/Condition	Application Rate (pounds/acre)
<3H to 1V	3,000
>3H to 1V and <2H to 1V	3,500
>2Hto1Vand<1Hto1V	4,000
>1H to 1V	4,500
Below ECB or TRM	1,500
As infill for TRM	3,500

2. FGM shall not be applied in channels, swales, or other areas where concentrated flows are anticipated, unless installed in conjunction with a temporary erosion control blanket or non-degradable turf reinforcement mat.
3. Apply FGM using a one- or two-step process as recommended by manufacturer. Mix and apply FGM at a rate of 50 pounds per 125 gallons of water over freshly seeded surfaces. Confirm loading rates with equipment manufacturer. Do not leave seeded surfaces unprotected, especially if precipitation is imminent.

3.05 CLEANUP, WATERING, AND PROTECTION

- A. During site restoration Work, store materials and equipment where directed. Keep pavements clean and Work area in an orderly condition.
- B. Protect site restoration Work and materials from damage due to site restoration operations, operations by other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged site restoration Work as directed.
- C. Remove all rubbish, equipment and rejected materials from Site.
- D. Protection includes all temporary fences, barriers and signs and other work incidental to proper maintenance.
- E. Protect landscaping and other features remaining as final Work.
- F. Provide watering of newly planted grass seed for at least 60 days from planting at a rate of 1" of water per week, or until grass is established, if longer. Watering shall be provided by installation of a temporary irrigation system of sufficient size and with enough sprinklers to irrigate total revegetated areas.
- G. Do not allow newly seeded areas to be trafficked or subjected to grazing until grass is established.
- H. Any areas that are damaged or fail to establish grass after 60 days shall be reseeded and maintained until grass is established.

3.06 FENCING AND SITE IMPROVEMENTS REPAIR

- A. Repair all damage to fences, drives, roadways, mailboxes and other improvements resulting from Work to original or better condition. Where existing materials cannot be repaired to original condition, Contractor shall replace damaged fences, drives, roadways, mailboxes and other improvements with new materials at no additional cost to Owner.

END OF SECTION

SECTION 32 92 15

NATIVE GRASSLAND VEGETATION RESTORATION

PART 1 - GENERAL

1.01 SCOPE

- A. This item shall govern preparation of a seeding and planting area to lines and grades indicated on Drawings. This item shall include seedbed preparation, sowing of seeds, planting of rooted plants, watering, hydromulch, compost, and management practices necessary for maintenance of a sustainable native grassland area.

1.02 SUBMITTALS

- A. Submittal requirements for this Specification item shall include:
 - 1. Identification of species, source, mixture, and rate of application of seeding.
 - 2. Type of mulch or compost.
 - 3. Watering frequency and amount.
 - 4. Type of management practices.
 - 5. Integrated Pest Management weed control and fertilizer application.

PART 2 - PRODUCTS

MATERIALS

- A. Seed furnished shall be of previous season's crop and date of analysis shown on each bag shall be within 12 months of time of delivery to project. Each variety of seed shall be furnished and delivered in separate bags or containers. A sample of each variety of seed shall be furnished for analysis and testing when directed by Engineer.
- B. Amount of seed planted per 1,000 square feet shall be of type specified.
- C. Water used in irrigation shall be free of substances harmful to growth of vegetation in restored and area irrigated.
- D. Topsoil: see Specification 31 05 13 - Topsoil
- E. A least toxic, integrated pest management (IPM) approach shall be used to control weeds. A written request for approval of weed control product(s) and/or materials shall be submitted to Engineer for approval.

2.02 NATIVE GRASSLAND SEEDING AND PLANTING

- A. Seeding and planting shall be performed in accordance with the requirements hereinafter described. Optimum depth for seeding shall be from 1/16" to 1/8". Grass, Wildflower, and Winter Cover seed shall be applied by a method that achieves consistent distribution and proper seed to soil contact (i.e., hand broadcasting, hydromulch, mixed with compost, or drill method). Mulching is not required.
- B. Planting shall be a 1-gallon size rooted species of native grass from Table 1 spaced on 5-foot centers or an equivalent number of rooted grasses spaced closer in areas approved by Engineer.
- C. Species substitution, when necessary due to availability, shall be approved by Engineer. Only native species adapted for designated environmental conditions shall be allowed as substitutes.

- D. If native grassland is being installed during cool season (November 1 to February 15), cool season cover crop species (as listed) shall be included in mix.
- E. Rooted plants shall be applied in accordance with appropriate “growing environments” (UFS = Upland Full Sun; USD = Upland Shade-Dappled; and FHM = Facultative, Moderate to High Moisture).

Table 1 Native Grass Planting Options			
Select Rooted Grasses For Appropriate Environments On Project Site			
Common Name	Spacing (feet)	Size	Preferred Environment
Buffalo Grass	5	16” x 24” sod pieces	UFS
Sideoats Grama	5	1 gallon	UFS
Green Sprangletop	5	1 gallon	UFS
Little Bluestem	5	1 gallon	UFS
Blue Grama Grass	5	1 gallon	UFS
Big Bluestem	5	1 gallon	UFS or FHM
Indiangrass	5	1 gallon	UFS or FHM
Bushy Bluestem	5	1 gallon	FHM
Big Muhly (Lindheimer's)	5	1 gallon	FHM
Eastern Gama Grass	5	1 gallon	FHM
Switchgrass	5	1 gallon	FHM
Inland Sea Oats	5	1 gallon	UFS
Canada Wild Rye	5	1 gallon	UFS
Caric Sedges	5	1 gallon	UFS
Canada Wild Rye	5	1 gallon	UFS

- F. Seed mixture and rate of application shall be as follows for both native grasses and wildflowers:

Table 2 Native Grasses	
Common Name	Application Rate (pounds/1,000 sq. ft)
Indiangrass	0.2

Table 2 Native Grasses	
Common Name	Application Rate (pounds/1,000 sq. ft)
Sideoats grama	0.2
Green sprangletop	0.2
Buffalo Grass	0.1
Little Bluestem	0.05
Blue Grama Grass	0.2
Canada Wild Rye	0.2
Eastern gamagrass	0.2
Switchgrass	0.1
Big Bluestem	0.05
Total Grass Seeding Rate	1.5

Table 3 Native Grasses	
Common Name	Application Rate (pounds/1,000 sq. ft)
Wheat	0.5
Oats	0.5
Cereal Rye Grass	0.5
Total Cool Season Cover Crop Seeding Rate	1.5
Total Cool Season Seeding Rate (Grass plus Cover Crop)	3.0

- G. Species substitution as necessary due to availability shall be approved by Engineer. Watering and fertilizer application shall follow procedures outlined above or as otherwise specified on Drawings.
- H. Seed shall be applied by broadcast or drill method and shall be distributed evenly over the topsoil. Mulching shall immediately follow seed application.
- I. September 15 to March 1.
- J. Add 1.5 pounds per 1000 square feet of cool season cover crop to grass and wildflower mixture.

PART 3 - EXECUTION

3.01 GENERAL

- A. Replace top soil prior to seeding
- B. Contractor shall limit preparation to areas that will be immediately seeded. All noxious weeds shall be eliminated by application of a herbicide and/or by physical removal (by roots) prior to and/or during seeding operation.

3.02 SEED BED PREPARATION

- A. After designated areas have been rough graded, a suitable seedbed shall be prepared. In areas where cut or fill is required, a minimum of 6" of topsoil shall be placed or existing soil that is not infested with weeds or weed rootstock stockpiled over entire planting area.
- B. In areas with no soil disturbance, weeds shall be eliminated and a minimum of 2" of topsoil, if none currently exists, shall be placed. An even seedbed shall be prepared with limited irregularities, lumps, or soil clods and surface shall be raked to facilitate seed to soil contact.

3.03 WATERING

- A. Coordinate with Owner for water for irrigation. Seeded areas shall immediately be watered with a minimum of 5 gallons of water per square yard or as needed and in manner and quantity as directed by Engineer.
- B. Watering applications shall be by temporary irrigation systems and insure that seedbed is maintained in a moist condition favorable for growth of grass. Watering shall continue until minimum coverage is achieved and accepted by Engineer. Watering may be postponed immediately after a 1/2" or greater rainfall on Site but shall be resumed before soil dries out.

3.04 MANAGEMENT PRACTICES

- A. Weeds, as defined in Weed List (Table 5), shall be controlled in most efficient manner possible. Timing of weed control may occur prior to soil disturbance, just before installation of seed, and/or during period of grassland establishment. Weed control shall be introduced at one or all of these times, so that greatest control is achieved. Preferred method of control is to remove weeds, either by physical or mechanical means, when site is conducive (e.g., when ground is moist) to this approach.
- B. Entire root system of perennial weeds shall be removed to prevent re-sprouting. Weeds may be controlled with an approved contact, systemic herbicide provided product is used with appropriate care and is applied in accordance with label instructions and the following guidelines:
 - 1. Herbicide shall not be applied when the wind is greater than 8 mph.
 - 2. Herbicide shall not be applied when rainfall is expected within 24 hours.
 - 3. Herbicide shall not contact surface water, i.e., creeks, rivers and lakes.
 - 4. Herbicide shall not contact desirable vegetation (a wicking method shall be used, if necessary, to accurately contact target weed only during application).
- C. Engineer shall be consulted to determine appropriate weed control management when weeds are located in an environmentally sensitive location (e.g., near water or creek).

END OF SECTION

SECTION 33 01 30

FRAMES, GRATES, RINGS, AND COVERS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes
 - 1. Iron castings for manhole frames and covers, inlet frames and grates, catch basin frames and grates, meter vault frames and covers, adjustment rings, and extensions and ring grates.
 - 2. Ring grates.
- B. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 00 – Proposal Requirements, Contract Forms, and Conditions of Contract.
 - 2. Division 01 – General Requirements.
 - 3. Section 33 05 14 - Precast Concrete Manholes.

1.02 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Association of State Highway and Transportation Officials (AASHTO)
 - a. Standard Specification for Highway Bridges
 - 2. ASTM International (ASTM):
 - a. A 48 - Standard Specification for Gray Iron Castings
 - b. A 615 - Standard Specification for Deformed and Plain Carbon- Steel Bars for Concrete Reinforcement
 - 3. American Welding Society (AWS).
 - a. D 12.1 Welding Reinforcing Steel.

1.03 SUBMITTALS

- A. Conform to requirements of Section 01 33 00 - Submittals.
- B. Submit copies of manufacturer's specifications, load tables, dimension diagrams, anchor details, and installation instructions.
- C. Submit shop drawings for fabrication and installation of casting assemblies. Include plans, elevations, sections, and connection details. Show anchorage and accessory items. Include setting drawings for location and installation of castings and anchorage devices.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with Contract Documents, the following manufacturers are acceptable:
 - 1. Neenah Foundry
 - 2. Deeter Foundry
 - 3. EJ, formerly East Jordan Iron Works

2.02 MATERIALS

- A. Castings
 - 1. Use castings for frames that conform to ASTM A48, Class 35B or better.
 - 2. Use castings for covers that conform to ASTM A536, Grade 65-45-12 or better.
 - 3. Use clean casting capable of withstanding application of AASHTO HS-20 vehicle loading with permanent deformation.

4. Covers
 - a. Size to set flush with frame with no larger than a 1/8" gap between frame and cover
 - b. Provide with 2" wide pick slots in lieu of pick holes.
 - c. Provide gasket in frame and cover.
 - d. Standard Dimensions
 - 1) Provide a minimum clear opening of 30" for all frames and cover assemblies unless otherwise specified in Contract Documents.
 - e. Standard Labels
 - 1) Water: Cast lid with word "WATER" in 2" letters across lid.
 - 2) Sanitary Sewer: Cast lid with word "SANITARY SEWER" in 2" letters across lid.
 - f. Hinge Covers
 - 1) Provide water tight gasket on all hinged covers.
 - 2) Water: Provide hinged covers for all water structures.
 - 3) Sanitary Sewer: Provide hinged covers for all manholes or structures constructed over 24" sewer lines and larger and for manholes where rim elevations are greater than 12" above surface.
- B. Grade
 1. Provide grade rings in sizes from 2" up to 8".
 2. Use concrete in traffic loading areas.
 3. In non-traffic areas concrete or HDPE can be used.
- C. Joint Sealant
 1. Provide a pre-formed or trowelable bitumastic sealant in an extrudable or flat tape form.
 2. Provide sealant that is not dependent on a chemical action for its adhesive properties or cohesive strength. Fabricate castings to conform to shapes, dimensions, and with wording or logos shown on Drawings.

2.02 BEARING SURFACES

- A. Machine bearing surfaces between covers or grates and their respective frames so that even bearing is provided for position in which casting may be seated in frame.

2.03 SPECIAL FRAMES AND COVERS

- A. Where indicated on Drawings, provide watertight manhole frames and covers with minimum of four bolts and gasket designed to seal cover to frame. Bolts, nuts, and washers used on manholes and covers shall be 316 stainless steel. Supply approved watertight manhole covers and frames.

2.0-4 FINISH

- A. Unless otherwise specified, uncoated cast iron.

2.05 FABRICATED RING GRATES

- A. Fabricate ring grates from reinforcing steel conforming to ASTM A 615.
- B. Conform to welds connecting bars to AWS D 12.1.

2.06 ADJUSTMENT RINGS FOR ASPHALT OVERLAYS

- A. Use castings conforming applicable sections of this Specification.
- B. One piece casting with dimensions to fit frame and cover.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install castings according to approved shop drawings, instructions in related specifications, and applicable directions from manufacturer's printed materials.
- B. Set castings accurately at required locations to proper alignment and elevation. Keep castings plumb, level, true, and free of rack. Measure location accurately from established lines and grades. Brace or anchor frames temporarily in form work until permanently set.
- C. Fabricate ring grates in accordance with standard detail. Set in mortar in mouth of pipe bell.
- D. Patch areas where water is observed infiltrating manhole from outside with approved non-shrink plugging material.
- E. Install adjustment rings in existing frames with clean bearing surfaces that are free from rocking.

END OF SECTION

SECTION 33 05 01

RCP STORM SEWER PIPE

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Low-head reinforced concrete pipe (RCP)
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Proposing Requirements, Contract Forms, and Conditions of Contract.
 - 2. Division 01 - General Requirements.
 - 3. Section 31 23 17 – Trenching,

1.02 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to install reinforced concrete pipe and/or conduits or drainage lines, including pipe fittings, connecting drain lines to curb inlets, joints, connections to new or existing pipe or headwalls, manholes etc., to lines and grades indicated. Pipe and fittings shall be of classes, sizes, and dimensions indicated.

1.03 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. ASTM International (ASTM):
 - a. C76, Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
 - b. C361, Standard Specification for Reinforced Concrete Low-Head Pressure Pipe.
 - c. C443, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
 - d. C497, Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
 - e. C506, Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe.
 - f. C507, Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe.
 - g. C655, Standard Specification for Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe.
 - 2. American Water Works Association (AWWA):
 - a. C302, Standard for Reinforced Concrete Pressure Pipe, Noncylinder Type.
 - b. C651, Standard for Disinfecting Water Mains.
 - c. M9, Installation of Concrete Pipe.
- B. Conduct testing methods to evaluate physical properties of pipe in full compliance with ASTM C497.
 - 1. Report full results test showing compliance with referenced standard.
- C. Conduct crushing test, as specified on cured concrete cylinders.
 - 1. Achieve specified 28 day design compressive strength prior to shipment date of lot tested.
- D. Physical Test Requirements:
 - 1. Acceptability of pipe shall be determined by results of the three edge bearing test for load to produce the 0.01” crack and ultimate load; by such material tests as are required in ASTM C76, ASTM C506, or ASTM C507; by absorption tests on selected samples from wall of pipe; and by inspection of finished pipe to determine its conformance with design prescribed in Specifications and its freedom from defects. Three-edge bearing tests for the 0.01” crack shall be performed on 0.8% of pipe joints. Only three-edge bearing tests

for both 0.01" crack and ultimate load shall be performed on 0.2% of pipe on two joints. Pipe which has been tested only to the formation of a 0.01" crack and accepted for use shall be marked "TEST" or otherwise appropriately identified so that such may be used at end of structure or other location not subject to impact loads. Methods of testing shall conform to ASTM C76, ASTM C506, ASTM C507 as appropriate, and ASTM C497.

- E. Protection: Protect storm drainage pipe from damage before, during, and after installation until backfill is complete. Protect Work and materials of other trades. In event of damage, make all necessary repairs and replacements at no additional cost to Owner.
- F. Workmanship and Finish:
 - 1. Pipe shall be free from fractures, large or deep cracks, defects that indicate imperfect manufacturing, surface defects indicating honeycombed or open texture, damaged ends that would prevent making a satisfactory joints, any continuous crack having a surface width of 0.01" or more and extending for a length of 12" or more. Ends of pipe shall be perpendicular to walls and centerline of pipe within limits of variations.
 - 2. Pipe shall be subject to rejection on account of failure to conform to any of Specification requirements. Rejected pipe shall be plainly marked by Engineer and shall be replaced by Contractor with pipe which meets requirements of Specifications. Remove rejected pipe immediately from Site. In the event of damage, make necessary repairs and replacements at no additional cost to Owner.

1.04 SYSTEM DESCRIPTION

- A. Provide each pipe, fitting, special appurtenance with a plainly and permanently waterproofed, marked identification.
 - 1. Include but not necessarily limit markings to the following:
 - a. Size and class of pipe, pressure rating in compliance with referenced standards.
 - b. Date of manufacture.
 - c. Manufacturer's trademark.
 - d. Manufacturer's name.
 - e. Full details on fittings and pipe schedule regarding angles of change, reduction.
 - f. Special notations and tagging of special items in regard to line location.
 - g. Diameter of pipe,

1.05 SUBMITTALS

- A. Shop Drawings:
 - 1. Specification 01 33 00 - Submittals for requirements for submittal process.
 - 2. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 - c. Concrete materials:
 - 1) Chemical and physical properties.
 - 2) Mix design.
 - d. Reinforcement cage and steel cylinders for special designs not utilizing table values contained in references standards.
 - 1) Chemical and physical properties.
 - 2) Area of steel.
 - 3) Cage configuration.
 - e. Joint details.
 - f. Connection details.
 - g. Tabulated laying schedule.
 - 1) Reference to project stationary and invert elevations.
 - 2) Identify pressure zones, each of design pressure or transient loading zones applicable, and point of change from one zone to another.
 - 3) Pipe diameter.

- 4) Pipe wall thickness.
- h. Test reports: Include six (6) copies of D (0.01) - Load and Failure Test Reports, cylinder compression test results, and joint tests (if required).

1.06 STANDARDS

- A. Comply with local governing regulations if more stringent than specified herein. Piping shall meet the following standards and shall be a part of this Section as if written herein their entirety:
 - 1. American Society for Testing and Materials (ASTM) Standards:
 - a. ASTM C76 Standard Specification for Reinforced Concrete Circular Culvert, Storm Drain, and Sewer Pipe.
 - b. ASTM C497 Standard Methods of Testing Concrete Pipe, Manhole Sections, or Tile.
 - c. ASTM C506 Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe.
 - d. ASTM C507 Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Culvert Pipe.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, manufacturers listed in applicable Articles below are acceptable.

2.02 MATERIALS

- A. General: Except as modified herein, materials, manufacture, and design of concrete pipe shall conform to ASTM C76 for Circular Pipe.
- B. Jointing Materials:
 - 1. Cold applied preformed plastic gaskets. Gasket sealing joint shall be produced from blends of refined hydrocarbon resins and plasticizing compounds reinforced with inert mineral filler and shall contain no solvents, irritating fumes, or obnoxious odors. Gasket joint sealer shall not depend on oxidizing, evaporating, or chemical action for its adhesive or cohesive strength, and shall be supplied in extruded rope-form of suitable cross-section and size as to fill joint space when pipes join. Size of plastic gasket joint sealer shall be in accordance with manufacturer's recommendations and sufficient to squeeze out gasket materials on inside or outside around the complete pipe joint circumference. Gasket joint sealer shall be protected by a suitable removable two piece wrapper.
 - 2. Expanded cellular rubber gaskets shall be produced from a blend of nitrile and vinyl polymers meeting the physical requirements of ASTM D1056, Class 2C1.

2.03 MIXES

- A. Mix concrete in a central batch plant or other approved batching facility from which quality and uniformity of concrete can be assured. Transit-mixed concrete shall not be acceptable for use in precast concrete pipe.

2.04 FABRICATION

- A. Provide non-pressure service or gravity drainage piping meeting or exceeding ASTM C76, Class III with varying lengths a minimum of 7 feet long.
 - 1. Each lot shall consist of a single diameter and strength designation manufactured by essentially same process.
 - 2. Provide RCP for non-pressure service or gravity drainage with sealed joints using continuous rubber gaskets conforming to requirements of ASTM C443 or ASTM C361.
 - 3. Type of joint shall be spigot groove type joint with O-ring gasket (R/C).

- a. United States Bureau of Reclamation Type R/4.
 - b. Ensure that rubber gasket will perform as sole element to make joint watertight.
- B. Pipe shall be of Class indicated. Shell thickness, amount of circumferential reinforcement, and strength of pipe shall conform to requirements of ASTM C76 for Circular Pipe Wall B, except as modified herein.
- C. Pipe shall be machine-made by a process which provides uniform placement of zero slump concrete in form and compaction by a mechanical device to provide a dense concrete in pipe.
- D. Variations in diameter, size, shape, wall thickness, reinforcement, placement of reinforcement, laying length, and permissible underrun of length shall be in accordance with applicable ASTM specification for each type of pipe.
- E. Pipe sizes larger than 60" in diameter shall be manufactured using two lines of circular reinforcement.
- F. Minimum Wall Thickness: Where Class III pipe of sizes larger than 60" in diameter are specified, manufacturer may furnish pipe manufactured with either Wall "B" or Wall "C" minimum thicknesses and applicable minimum Steel area as listed for circular cages in Table II of Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe, ASTM C76 (C76M), provided tests strength requirements for Class III pipe are satisfactorily met.
- G. Joints: Pipe to be placed along curves shall consist of whatever pipe lengths or beveled end joints of pipe or combination thereof that are required to place pipe on designated centerline curve with no more than one-half of tongue length of pipe exposed from its normally closed joint position. Amount of bevel, "drop" or shortening of pipe length by bevel shall not exceed amount shown below for pipe sizes indicated, or manufacturers recommendation (whichever is less).

Pipe Diameter	Maximum Amount of Bevel or Drop
12" to 27" inclusive	3.1875"
30" to 51" inclusive	5"
54" to 84" inclusive	6"
90" to 96"	6.5"

- H. Jointing Materials:
 - 1. Two piece wrapper shall be designed so that 1/2 may be removed longitudinally without disturbing other 1/2 to facilitate application as noted below.
 - 2. Chemical composition of the gasket joint sealing compound shall meet following requirements when tested in accordance with test methods shown.

Composition	Test Method
Bitumen (Petroleum plastic content) (% by weight) ASTM D4	50-70
Ash-Inert Mineral Matter (% by weight) AASHTO Designation T-111	30-50
Volatile Matter at 325 F (% by weight) ASTM D6	2.0 Max.

3. Gasket joint sealing compound when immersed for 30 days at ambient room temperature separately in 5% solution of caustic potash, a mixture of 5% hydrochloric acid, a 5% solution of sulfuric acid, and a saturated H₂S solution shall show no visible deterioration.
4. Physical properties of gasket joint sealing compound shall meet following requirements:

Property	Test Method	Typical Analysis
Specific Gravity at 77 F	ASTM D71	1.20 Min. 1.35 Max.
Ductility at 77° F (cm) Min.	ASTM D113	5.0 Min.
Softening Point at 77 F Min	ASTM D36	320 F Min.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Observe all recommendations in accordance with AWWA M9 for installation, delivery, and storage of pipe material.
- C. Furnish and place in position necessary batter boards, string lines, plummets, graduated poles, laser equipment, targets and incidentals for establishing and maintaining lines and grades. Batter boards and location stakes must be protected from possible damage or change of location.
 1. Lay pipe and fittings and joint in a dry trench. Excavate trenches to lines, grades, and alignment indicated in accordance with Section 33 05 10 - Trenching, Backfilling and Compacting for Utilities. Unless otherwise authorized by Engineer, start laying pipe on the prepared foundation at outlet or downstream end with spigot or tongue end of pipe joint pointing downstream and proceed with laying pipe toward inlet or upstream end with each abutting section of pipe properly matched, true to established lines and grades. Approved facilities shall be provided for hoisting and lowering sections of pipe into trench without disturbing prepared bedding foundation or sides of trench. Carefully clean ends of pipe before pipe is placed in trench. As each length of pipe is laid, protect open end and prevent entrance of earth or bedding material. Fit and match pipe so that when laid in prepared bedding it forms a smooth, uniform conduit. When elliptical pipe with circular reinforcing, or circular pipe with elliptical reinforcing, is used, lay pipe in trench so that markings "Top" or "Bottom" are not be more than 5 degrees from vertical plane through longitudinal axis of the pipe. Remove and re-lay, without extra compensation, pipe that is not in alignment or that shows excessive settlement after laying.
 2. When conduit lines terminate at locations which do not include connection to drainage structures, plug end of pipe with a field cast or precast unit.

3.02 CURING

- A. Cure pipe in accordance with applicable ASTM Specification for each type of pipe.

3.03 CONCRETE PIPE JOINING

- A. Make joints using cold-applied preformed plastic gaskets as follows:
1. Apply, with brush, a suitable primer of a type recommended by gasket joint sealer manufacturer to tongue and groove joint surfaces and end surfaces and allow to dry and harden. Do not apply primer over mud, sand, or dirt, or sharp cement protrusions. Clean and dry surfaces prior to application of primer.
 2. Before laying pipe in trench, attach plastic gasket sealer around tapered tongue or tapered groove near shoulder or hub of each pipe joint. Remove paper wrapper from one side only of two piece wrapper on gasket and press it firmly clean, dry pipe joint surface. Do not remove outside wrapper until immediately before pushing pipe into its final position.
 3. When tongue is correctly aligned with flare of the groove, remove outside wrapper on gasket and pull or push pipe home with sufficient force and power (back hoe shovel, chain hoist, ratchet hoist, or winch) to cause evidence of squeeze out of gasket material on inside or outside around complete pipe joint circumference. Remove any joint material that pushed out into interior of pipe that would tend to obstruct flow. (Pipe shall be pulled home in a straight line with all parts of pipe on line and grade at all times). Backfilling of pipe laid with plastic gasket joints may proceed as soon as the joint has been inspected and approved by Engineer. Take special precautions in placing and compacting backfill to avoid damage to joints.
 4. When the atmospheric temperature is below 60 F, store plastic joint seal gaskets either in an area warmed to above 70 F, or artificially warmed to this temperature in a manner satisfactory to Engineer. Apply gaskets to pipe joints immediately prior to placing pipe in trench, then make connections to previously laid pipe.

3.04 CURVES AND FITTINGS

- A. Curves:
1. Observe Drawings for details regarding changes in direction.
 - a. Where changes of direction by curvature is acceptable, perform curve by deflecting pipe at each joint within the permissible joint deflection allowance recommended by manufacturer.
 2. $R = L/2(\tan 1/2 D/N)$ where R = radius of curvature, feet; L=average laid length of pipe sections measured along centerline, feet; D = total deflection angle of curve, degrees; N = number of pipe with pulled joints; D/N = total deflection of each pipe, degrees.
 - a. Do not exceed D/N from manufacturer.
 3. Employ use of special radius (beveled or mitered) pipe where deflected straight pipe will not provide a short enough change in radius.
- B. Fittings:
1. In addition to straight pipe or radius pipe, furnish bends, tees, adapters, closure pieces, and other fittings or specials shown on Drawings or required to complete work.
 - a. Design fittings to provide same strength as adjacent piping.
 2. Fittings to be smooth or mitered providing mitered angles do not exceed 22-1/2 Degrees and fitting has an R/d greater or equal to 1, where R = radius of bend, IN; d = diameter of pipe, in inches.

3.05 CONNECTIONS WITH EXISTING WORK

- A. Observe procedures outlined in AWWA C651 for cutting into or repairing existing mains.
- B. Make connections to existing pipes, storm drains, or appurtenances as shown on Drawings. Mortar or concrete bottom of existing structures if necessary to eliminate drainage pockets created by connections. Repair any damage to existing structure resulting from making connections.
- C. Finish stub ends for connections to future work not shown on Drawings by installing watertight plugs into free end of pipe.

D. Fill lift holes with concrete, mortar, or precast concrete plugs after pipe is in place.

3.06 THRUST AND ANCHOR BLOCKING

A. Install cast in place concrete blocking at all bends or install restrained joints.

3.07 BACKFILL

A. After pipe has been placed, bedded, and jointed as specified and approved by Engineer, backfilling shall be done in accordance with Section 31 23 17 - Trenching.

END OF SECTION

SECTION 33 05 14

PRECAST CONCRETE MANHOLES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Precast concrete manhole structures and appurtenant items.
- B. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 00 - Proposal Requirements, Contract Forms, and Conditions of the Contract.
 - 2. Division 01 - General Requirements.
 - 3. Section 09 90 00 - Painting.

1.02 MEASUREMENT AND PAYMENT

- A. Stipulated Price (Lump Sum). If Contract is a Stipulated Price Contract, payment for Work in this Section is included in total Stipulated Price.

1.03 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. ASTM International (ASTM):
 - a. A 48 - Standard Specification for Gray Iron Castings.
 - b. A 307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
 - c. A 615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
 - d. C150, Standard Specification for Portland Cement.
 - e. C 270 – Standard Specification for Mortar for Unit Masonry
 - f. C 443 – Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
 - g. C478, Standard Specification for Precast Reinforced Concrete Manhole Sections.
 - h. C923, Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals.
 - i. C 1107 – Standard Specification for Packaged Dry, Hydraulic- Cement Grout (Non-shrink)
 - j. D2665 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
 - 2. American Association of State Highway and Transportation Officials (AASHTO)

1.04 SUBMITTALS

- A. Shop Drawings:
 - 1. Section 01 33 00 for requirements of the submittal process.
 - 2. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 - c. Fabrication and/or layout drawings.
 - 3. Shop drawings of manhole sections, base units and construction details, including reinforcement, jointing methods, materials and dimensions.
 - 4. Summary of criteria used in manhole design including, as minimum, material properties, loadings, load combinations, and dimensions assumed. Include certification from

manufacturer that precast manhole design is in full accordance with ASTM C 478 and design criteria as established in this Specification.

5. Seal submittal drawings by Professional Engineer registered in State of Texas.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with Contract Documents, following manufacturers are acceptable:
 1. Manhole rings, covers and frames:
 - a. Neenah Foundry.
 - b. Deeter Foundry.
 2. Black mastic joint compound:
 - a. Kalktite 340.
 - b. Tufflex.
 - c. Plastico.
 3. Premolded joint compound:
 - a. Ram Nec.
 - b. Kent Seal.

2.02 MANHOLE STRUCTURE COMPONENTS

- A. Construct barrels for precast manholes from standard reinforced concrete manhole sections of diameter indicated on Drawings. Use various lengths of manhole sections in combination to provide correct height with fewest joints. Design wall sections for depth and loading conditions in this Section, with minimum thickness of 5". Base section shall have minimum thickness of 12" under invert.
- B. Provide tops to support HS-20 vehicle loading, and receive cast iron frame covers.
- C. Where manholes larger than 48" diameter are indicated on Drawings, provide precast base sections with flat slab top precast sections used to transition to 48" diameter manhole access riser sections. Transition can be concentric or eccentric unless otherwise shown on Drawings. Locate transition to provide minimum of 7-foot head clearance from base to underside of transition unless otherwise approved by Engineer.
- D. Design Loading Criteria: Manhole walls, transition slabs, cone tops, and manhole base slab shall be designed, by manufacturer, to requirements of ASTM C 478 for depth as shown on Drawings and to resist following loads.
 1. AASHTO HS-20 vehicle loading applied to manhole cover and transmitted down to transition and base slabs.
 2. Unit soil weight of 130 pcf located above portions of manhole, including base slab projections.
 3. Lateral soil pressure based on saturated soil conditions producing an at-rest equivalent fluid pressure of 110 pcf.
 4. Internal liquid pressure based on unit weight of 63 pcf.
 5. Dead load of manhole sections fully supported by transition and base slabs.
- E. Design: Manhole walls, transition slabs, cone tops, and manhole base slab shall be designed according to requirements of ASTM C 478 and following:
 1. Design additional reinforcing steel to transfer stresses at openings. Area of steel to be no less than shown on Drawings.
 2. Wall Loading Conditions:
 - a. Saturated soil pressure acting on empty manhole.
 - b. Manhole filled with liquid to a halfway depth as measured from invert to cover, with no balancing external soil pressure.
 3. Minimum clear distance between two wall penetrations shall be 12" or half diameter of smaller penetration, whichever is greater.

- F. Provide joints between sections with O-ring gaskets conforming to ASTM C 443.
- G. When base is cast monolithic with portion of vertical section, extend reinforcing in vertical section into base.
- H. Precast Concrete Base: Suitable cutouts or holes to receive pipe and connections. Lowest edge of holes or cutouts: for water line manhole, no less than 6" above inside surface of floor of base.

2.03 CONCRETE

- A. Conform to requirements of Division 03.
- B. Channel Inverts: Use 5 sack premix (bag) concrete or Class A concrete for inverts not integrally formed with manhole base, with minimum compressive strength of 4000 psi.
- C. Foundation: Provide Coarse Aggregate Type A1 (Flexible Base, TxDOT Item 247, Type A, Grade 1 or 2) for foundation where shown on Drawings.
- D. Concrete Foundation: Provide Class A concrete with minimum compressive strength of 4,000 psi for concrete foundation slab under manhole base section where indicated on Drawings.

2.04 REINFORCING STEEL

- A. Conform to requirements of Division 03.

2.05 MISCELLANEOUS METALS

- A. Provide cast-iron frames, rings, and covers conforming to requirements of Section 33 01 30 - Frames, Grates, Rings and Covers.

2.06 DROP CONNECTIONS AND STUBS

- A. Provide drop connections and stubs conforming to same pipe material requirements used in main pipe, unless otherwise indicated on Drawings.

2.07 PIPE CONNECTIONS TO MANHOLE

- A. Sanitary Sewers:
 - 1. Provide resilient connectors conforming to requirements of ASTM C 923. Use the following materials for metallic mechanical devices as defined in ASTM C 923:
 - a. External Clamps: Type 304 stainless steel.
 - b. Internal, Expandable Clamps on Standard Manholes: Type 316 stainless steel, 11 gauge minimum.
 - c. Internal, Expandable Clamps on Corrosion-Resistant Manholes:
 - 1) Type 316 stainless steel, 11 gauge minimum.
 - 2) Type 304 stainless steel, 11 gauge minimum, coated with minimum 16-mil fusion-bonded epoxy conforming to AWWA C 213.
 - 2. Where rigid joints between pipe and cast-in-place manhole base are specified or shown on Drawings, provide polyethylene-isoprene waterstop meeting physical property requirements of ASTM C 923, such as Press-Seal WS Series, or approved equal.
- B. Storm Sewer Connections
 - 1. Provide watertight connections in accordance with ASTM 923 and ASTM F 2510 as applicable.
- C. Water Lines:

1. Where smooth exterior pipes (i.e., steel, ductile iron, or PVC pipes) are connected to manhole base or barrel, seal space between pipe and manhole wall with assembly consisting of rubber gasket or links mechanically compressed to form a watertight barrier. Assemblies: Press-Wedge, Res-Seal, Thunderline Link-Seal, or approved equal. See Drawings for placement of assembly in manhole sections.
2. When connecting concrete or cement mortar coated steel pipes, or as option for connecting smooth exterior pipes to manhole base or barrel, space between pipe and manhole wall may be sealed with an assembly consisting of a stainless steel power sleeve, stainless steel take-up clamp and a rubber gasket. Take-up clamp: minimum of 9/16-inch wide. Provide PSX positive seal gasket system by Press-Seal Gasket Corporation or approved equal.

2.08 NON-SHRINK GROUT

- A. Provide prepackaged, inorganic, flowable, non-gas-liberating, non-metallic, cement-based grout requiring only addition of water.
- B. Meet requirements of ASTM C 1107 and have minimum 28-day compressive strength of 7000 psi.

2.09 VENT PIPES

- A. Vent Outlet Assembly: Provide vent outlet assembly as shown on Drawings, constructed of following specified materials:
 1. Flanges: Meet bolt pattern and dimensions for ASME B16.1, 125-pound flanges. Flange bolts shall be Type 316 stainless steel, conforming to ASTM A 307, Class A or B.

2.10 PROHIBITED MATERIALS

- A. Do not use brick masonry for construction of manholes, including adjustment of manholes to grade. Use only specified materials listed above.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that lines and grades are correct.
- B. Determine if subgrade, when scarified and recompacted, can be compacted to 95% of maximum Standard Proctor Density according to ASTM D 698 prior to placement of foundation material and base section. When proper density is not reached, moisture condition subgrade until that density is reached or treat as unstable subgrade.
- C. Do not build manholes in ditches, swales, or drainage paths unless approved by Engineer.

3.02 PLACEMENT

- A. Install precast manholes to conform to locations and dimensions shown on Drawings.
- B. Place sanitary and storm manholes at points of change in alignment, grade, size, pipe intersections, and end of sewer unless otherwise shown on Drawings.

3.03 MANHOLE BASE SECTIONS AND FOUNDATIONS

- A. Place precast base on 12" thick (minimum) foundation of crushed stone wrapped in filter fabric, cement stabilized sand, or concrete foundation slab.
- B. Unstable Subgrade Treatment: When unstable subgrade is encountered, notify Engineer for examination of subgrade to determine if subgrade has heaved upwards after being excavated.

When heaving has not occurred, over-excavate subgrade to allow for 24" thick layer of crushed stone wrapped in filter fabric as foundation material under manhole base. When there is evidence of heaving, provide pile-supported concrete foundation, as detailed on Drawings, under manhole base.

3.04 PRECAST MANHOLE SECTIONS

- A. Install sections, joints, and gaskets in accordance with manufacturer's printed recommendations.
- B. Install precast adjustment rings above tops of cones or flat-top sections as required to adjust finished elevation and to support manhole frame.
- C. Seal any lifting holes with non-shrink grout.
- D. Place at least two precast concrete grade rings with thickness of 12" or less, under casting.

3.05 PIPE CONNECTIONS AT MANHOLES

- A. Install approved resilient connectors at each pipe entering and exiting manholes in accordance with manufacturer's instructions.
 - 1. Where smooth exterior pipes (i.e. steel, ductile iron or PVC pipes) are connected to manhole base or barrel, space between pipe and manhole wall shall be sealed with an assembly consisting of rubber gaskets or links mechanically compressed to form watertight barrier. Assemblies: "Press- Wedge," "Res-Seal," "Thunderline Link-Seals," or approved equal. See Drawings for placement of assembly in manhole sections.
 - 2. When connecting concrete or cement mortar coated steel pipes, or as an option for connecting smooth exterior pipes to manhole base or barrel, space between pipe and manhole wall may be sealed with an assembly consisting of stainless steel power sleeve, stainless steel take-up clamp and rubber gasket. Take-up clamp: minimum of 9/16" wide. Provide PSX positive seal gasket system by Press-Seal Gasket Corporation or approved equal.
- B. Grout storm sewer connections to manhole unless otherwise shown on Drawings. Grout pipe penetration in place on both inside and outside of manhole.
- C. Ensure no concrete, cement stabilized sand, fill, or other rigid material is allowed to enter space between pipe and edge of wall opening at and around resilient connector on either interior or exterior of manhole. If necessary, fill space with compressible material to ensure full flexibility provided by resilient connector.
- D. Where new manhole is constructed on existing sewer, rigid joint pipe may be used. Install waterstop gasket around existing pipe at center of cast-in-place wall. Join ends of split waterstop material at pipe springline using an adhesive recommended and supplied by waterstop manufacturer.
- E. Test connection for watertight seal before backfilling.

3.06 INVERTS FOR SANITARY SEWERS

- A. Construct invert channels to provide smooth flow transition waterway with no disruption of flow at pipe-manhole connections. Conform to following criteria:
 - 1. Slope of Invert Bench: 1" per foot minimum; 1-1/2" per foot maximum.
 - 2. Depth of Bench to Invert:
 - a. Pipes smaller than 15": one-half of largest pipe diameter.
 - b. Pipes 15" to 24": three-fourths of largest pipe diameter.
 - c. Pipes larger than 24": equal to largest pipe diameter.

3. Invert Slope through Manhole: 0.10 foot drop across manhole with smooth transition of invert through manhole, unless otherwise indicated on Drawings.
- B. Form invert channels with concrete if not integral with manhole base section. For direction changes of mains, construct channels tangent to mains with maximum possible radius of curvature. Provide curves for side inlets and smooth invert fillets for flow transition between pipe inverts.

3.07 DROP CONNECTIONS FOR SANITARY SEWERS

- A. Backfill drop assembly with crushed stone wrapped in filter fabric, cement stabilized sand, or Class A concrete to form solid mass. Extend cement stabilized sand or concrete encasement minimum of 4" outside bells.
- B. Install drop connection when sewer line enters manhole higher than 24" above invert of manhole.

3.08 MANHOLE FRAME AND ADJUSTMENT RINGS

- A. Combine precast concrete or HDPE adjustment rings so elevation of installed casting cover matches pavement surface. Seal between concrete adjustment ring and precast top section with non-shrink grout; do not use mortar between adjustment rings. Apply latex-based bonding agent to precast concrete surfaces joined with non-shrink grout. Set cast iron frame on adjustment ring in bed of approved sealant material. Install sealant bed consisting of two beads of sealant, each bead having minimum dimensions of 1/2" and 1/2" wide.
- B. Wrap manhole frame and adjustment rings with external sealing material, minimum 3" beyond joint between ring and frame and ring and precast section.
- C. For manholes in unpaved areas, set top of frame minimum of 6" above existing ground line unless otherwise indicated on Drawings. In unpaved areas, encase manhole frame in mortar or non-shrink grout placed flush with face of manhole ring and top edge of frame. Provide rounded corner around perimeter

3.09 BACKFILL

- A. Place and compact backfill materials in area of excavation surrounding manholes in accordance with the requirements of Section 31 23 17 – Trenching, Backfilling and Compacting for Utilities. Provide embedment zone backfill material, as specified for adjacent utilities, from manhole foundation up to an elevation 12" over each pipe connected to manhole. Provide trench zone backfill, specified for adjacent utilities, above embedment zone backfill.
- B. Where rigid joints are used for connecting existing sewers to manhole, backfill under existing sewer up to springline of pipe with Class B concrete or flowable fill.
- C. In unpaved areas, provide positive drainage away from manhole frame to natural grade. Seed in accordance with Section 32 92 15 - Native Grassland Vegetation Restoration.

END OF SECTION

SECTION 33 05 16

CONCRETE WATER VAULTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Concrete vaults to be used for air release valve enclosures.
- B. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 00 – Proposal Requirements, Contract Forms, and Conditions of Contract
 - 2. Division 01 – General Requirements
 - 3. Section 03 30 00 – Concrete
 - 4. Section 31 23 17 – Trenching

1.02 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Measurement
 - a. This Item is considered subsidiary to Water Meter and Vault.
 - 2. Payment
 - a. Work performed and materials furnished in accordance with this Item are subsidiary to unit price bid per each “Water Meter and Vault” complete in place and no other compensation will be allowed.

1.03 REFERENCES

- A. Reference Standards
 - 1. Reference standards cited in this Specification refer to current reference standard published at time of Bid.
 - 2. American Association of State Highway and Transportation Officials (AASHTO).
 - 3. American Concrete Institute (ACI):
 - a. 350, Code Requirements for Environmental Engineering Concrete Structures and Commentary.
 - 4. ASTM International (ASTM):
 - a. A615, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
 - b. C857, Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
 - c. C858, Standard Specification for Underground Precast Concrete Utility Structures
 - d. C891, Standard Practice for Installation of Underground Precast Concrete Utility Structures.
 - e. C923, Standard Specification for Resilient Connectors Between Reinforced Concrete Manholes Structures, Pipes, and Laterals.
 - 5. Occupational Safety and Health Administration (OSHA)
 - a. 1910.23, Guarding Floor and Wall Openings and Holes

1.04 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00.
- B. All submittals shall be approved by Engineer prior to delivery.

1.05 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS

- A. Product Data
 - 1. Precast Concrete Vault
 - 2. Connection materials
 - 3. Pipe connections at vault walls
 - 4. Stubs and stub plugs
 - 5. Grade ring
 - 6. Ladder
 - 7. External coating material

1.06 QUALITY ASSURANCE

- A. Qualifications
 - 1. Meet requirements of ACI 318.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver vault or panels (units) to project site in such quantity to assure continuity of installation.
- B. Store units at Site in a manner which prevents cracking, distortion, staining or other physical damage.
- C. Lift units by designed lifting points or supports.

1.08 WARRANTY

- A. Manufacturer Warranty
 - 1. Manufacturer's Warranty shall be in accordance with Division 01.

PART 2 - PRODUCTS

2.01 EQUIPMENT, PRODUCT TYPES, MATERIALS

- A. Performance / Design Criteria
 - 1. Vault
 - a. Vault dimensions per Drawings
 - b. Opening per Drawings
 - c. Incorporate a sump into base or floor of vault.
 - 1) Avoid conflicts with piping.
 - 2) Do not locate directly under access location if applicable.
 - d. Place floor on a minimum 2% slope towards sump.
 - 2. Water Pipe Penetrations
 - a. Use adjustable-linked rubber seal devices or grout, as shown in Drawings, to provide seals around pipe penetrations.
 - 3. Vault Access
 - a. Cover / Door
 - 1) For non-traffic areas-non H-20 loading 36" x 36" steel single leaf door, Bilco Type J model or approved equal
 - 2) For traffic areas – 32" hinged ductile iron frame and cover or as shown in manhole lid assembly in Drawings
 - 3) With steel door, provide an automatic hold-open arm with release handle and locking device.
 - 4) Provide Bilco type fall protection grating under aluminum door that meets OSHA 29 CFR 1910.23 requirements or approved equal.

- 5) Incorporate a drain gutter with an outlet routed to exterior of vault lid.
- b. Ladder
 - 1) Provide aluminum ladder by Heron Industries or approved equal.
 - 2) Provide ladder to dimensions shown on Drawings.
- B. Materials
 - 1. Concrete for utility construction – Conform to Section 03 30 00.
 - 2. Frame and Cover – Conform to Section 33 01 30.
 - 3. Grade Ring – Conform to Section 33 01 30 and ASTM C 478.
 - 4. Reinforcing Steel – Conform to Section 03 30 00.
 - 5. Adjustable-linked rubber seal devices
 - a. Manufactured by Link-Seal or approved equal
 - 6. Exterior Coating
 - a. Coal Tar Bitumastic for below grade damp proofing
 - b. Dry film thickness (DFT) no less than 12 mils and no greater than 30 mils
 - c. Solids content is 68% by volume \pm 2%.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Evaluation and Assessment
 - 1. Verify lines and grades are in accordance to Drawings.

3.02 INSTALLATION

- A. General
 - 1. Vault
 - a. Perform installation in accordance to ASTM C891.
 - b. Construct vault to dimensions shown on Drawings.
 - c. Precast Sections
 - 1) Clean bell spigot and gaskets
 - a) Lubricate and join
 - 2) Minimize number of segments.
 - d. Vault Base
 - 1) Place vault base on 9" minimum base of compacted, crushed washed rock over undisturbed soils and grade level to elevation shown on Drawings.
 - 2. Water Pipe Penetrations
 - a. Install adjustable-linked rubber seal devices around pipe penetrations in accordance with manufacturer's recommendation.
 - 3. Modifications and pipe penetrations into vaults shall be approved by Engineer.

END OF SECTION

SECTION 33 05 20

BORE AND CASING

PART 1 - GENERAL

1.01 SCOPE

- A. This Section shall govern for furnishing and installing pipe by methods of tunneling or boring to lines and grades shown on Drawings and in conformity with provisions and these requirements.

1.02 SUBMITTALS

- A. Contractor will submit the following for approval by Engineer 30 days prior to installation of work:
1. Complete layout drawings that clearly indicate the location of jacking pit and receiving pit. Tunneling, jacking, and boring equipment details need to be included as part of tunneling, jacking, and boring action plan. Plan shall include anticipated loads including hydrostatic calculations, diagrams, and structural program print outs. Submit tunneling, jacking, and boring safety plan.
 2. Traffic control plan developed in accordance with latest edition of the Manual of Uniform Traffic Control Devices adopted by the Texas Department of Transportation and Section 01 55 26 - Traffic Control Plan.
 3. Groundwater control plan that indicates how groundwater is to be managed during boring operations.
 4. Certifications issued by an independent laboratory regarding the ability of Contractor personnel to perform welding operations to standards presented in these Specifications.
 5. Settlement monitoring plan that shows all points that will be monitored for settlement during installation and frequency at which readings will be made.
 6. Certificates of compliance demonstrating compliance of steel casing pipe with ASTM A-36, ASTM A-570, ASTM A-135, ASTM A-139, or approved equal. Steel casing pipe shall have a minimum yield strength of 35,000 psi.
 7. Shop drawings for casing spacers including sketches of insulators with material components and dimensions and proposed locations of insulators.
 8. Certificate of insurance as required for railroad crossing per Section 00 70 04 - General Terms and Conditions Railroad Crossing.

1.03 QUALITY ASSURANCE

- A. Design Criteria
1. Casing Insulators
 - a. Casing insulators shall be designed by Manufacturer to adequately support and electrically isolate carrier pipe within the casing pipe under all conditions. Number and location of spacing insulators shall be determined by Manufacturer to protect carrier pipe from damages. One insulator shall be placed within 2 feet from of ends of casing.
- B. Lines and Grades
1. Contractor shall establish adequate survey control to ensure that variations in final horizontal and vertical placement of casing pipe is maintained within 6" of lines and grades shown on Drawings. Line and grade shall be checked at end of each working day and corrected before pressure grouting void space between the outside of the casing pipe and the excavation. A copy of line and grade record shall be provided to the inspector on a weekly basis.
- C. Testing
1. Contractor shall coordinate all testing required by this Section with Engineer prior to commencement.

- D. Installer's Qualifications
 - 1. Installation shall be by a competent, experienced sub-contractor with a satisfactory experience record of at least five (5) years engaged in similar work of equal scope.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products in accordance with manufacturer's requirements and Specifications.

1.05 STANDARDS

- A. AWWA C-200 "Steel Water Pipe 6 inches and Larger" AWWA C-206 "Field Welding of Steel Water Pipe"
- B. AWWA C-210 "Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines"
- C. ASTM A-36 "Structural Steel"
- D. ASTM A-123 "Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products"
- E. ASTM A-135 "Electric - Resistance - Welded Steel Pipe"
- F. ASTM A-139 "Electric - Fusion (Arc) - Welded Steel Pipe"
- G. ASTM A-153 "Zinc Coating (Hot Dip) on Iron and Steel Hardware"
- H. ASTM D-698 "Test Methods for Moisture-Density Relations of Soils and Soil Aggregate Mixtures, Using 5.5-lb Rammer and 12 Inch Drop"
- I. ASTM D-4254 "Test Methods for Minimum Index Density of Soils and Calculation of Relative Density"
- J. AASHTO Standard Specifications for Highway Bridges, 1989.

1.06 JOB CONDITIONS; PERMITS AND EASEMENT REQUIREMENTS

- A. Where work is in public right-of-way or railroad company right-of-way, Contractor will coordinate appropriate permits or easements. Owner will execute permits as necessary. Contractor shall observe regulations and instructions of right-of-way Owner as to methods of performing the work and take precautions for safety of the property and public. Negotiations and coordination with right-of-way owner shall be carried on by Contractor, not less than five (5) days prior to time of his intentions to begin work on right-of-way.
- B. Comply with the requirements of the permit and/or easement, a copy of which will be supplied by Owner. Work within Texas Department of Transportation (TxDOT) shall comply with TxDOT specifications.
- C. As required by railroad for crossing, obtain Protective Liability Insurance in amount required by particular company or other insurance as is specified in the permit at no cost to Owner (See Section 00 70 04 of Specifications). Acquire a permit, agreement, or work order from right-of-way owner if required.
- D. Construction along roads and railroads shall be performed in such manner that excavated material be kept off roads and railroads at all times, as well as, all operating equipment. Construction shall not interfere with operations of roads, highways, or railroads.

- E. Barricades, warning signs, and flagmen, when necessary and specified, shall be provided by Contractor.
- F. Existing pipelines are to be protected. Contractor shall verify location and elevation of any pipe lines and telephone cable before proceeding with construction and plan his construction so as to avoid damage to existing pipe lines or telephone cables. Verification of location of existing utilities before manufacturing steel casing pipe shall be the complete responsibility of Contractor.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Casing Pipe. Casing pipe shall be new steel pipe manufactured in accordance with AWWA Standard C200, latest edition, Casing shall meet ASTM A-36, ASTM A-570, ASTM A-135, ASTM A-139, or approved equal. Steel casing pipe shall have minimum yield strength of 35,000 psi. Pipe joints shall be welded in accordance with AWWA C-206. Pipe shall be coated in accordance with C210 or approved equal.
- B. Casing pipe size shall be compatible with carrier pipe size as shown in Table 1 below or as specified in Drawings. Minimum length shall not be less than 20 feet. Used pipe will not be acceptable. Minimum Wall Thickness also shall be as shown in Table 1 below.

TABLE 1				
CARRIER	TYPICAL CASING		UNION PACIFIC CROSSING	
Pipe Size (in)	Pipe Size (in)	Wall Thickness (in)	Pipe Size (in)	Wall Thickness (in)
36	54	0.50	54	0.75

- C. Casing Spacers.
 - 1. Steel Pipe. Casing spacers shall be selected to provide a maximum clearance of 4 “ between the end of the runner and inside diameter of casing pipe. Spacer shall hold carrier pipe in a centered position within casing pipe. Casing spacers shall provide electrical insulation and adequate support of carrier pipe and shall prevent damage to carrier pipe and protective coating/bag/wrap during installation and normal operation. Casing spacer length, width, and spacing shall be based on casing spacer manufacturer’s recommendation and shall be approved by Engineer. Casing spacers shall be 304 Stainless steel. Casing spacers shall be secured to carrier pipe using steel bands that are 304 Stainless steel (all components). A casing spacer must be placed within 2 feet of end of casing and at intervals no greater than 10 feet. Bands shall be no less than 12” wide. Bands shall be 14 gauge minimum and risers shall be 10 gauge minimum, with design and fabrication in accordance with manufacturers recommendations for each installation. Acceptable manufacturers include Pipeline Seal and Insulator, Inc. or approved equal.
 - 2. Acceptable Manufacturers:
 - a. CASCADE WATERWORKS MFG. - Style CCS-JR stainless steel - with 8" band for pipe to 12" diameter and 12" band for pipe larger than 12" (UHMW polymer runners for all sizes).
 - b. Approved Equal
- D. Casing End Seals. Casing end seals shall be sized by Contractor to accommodate diameter of casing pipe.
 - 1. End Seals shall be as follows:
 - a. Provide end seals at each end of casing to contain grout backfill or to close casing ends to prevent inflow of water or soil.

- 1) For water piping less than 24" diameter, use hard rubber seals, Model PL Link Seal as manufactured by Thunderline Corporation or approved equal.
 - 2) For water piping 24" diameter and greater, use pull-on, 1/8" thick, synthetic rubber end seals, Model C, as manufactured by Pipeline Seal and Insulator, Inc. or approved equal.
- b. Design end seals to withstand anticipated soil or grouting pressure and be watertight to prevent groundwater from entering casing.
2. Approved Manufacturers
 - a. GPT INDUSTRIES - Model W wrap-around w/mastic seal Model C seamless pull-on
 - b. CANUSA/DIVISION OF SHAW PIPE RESOURCES - Casing Seal Kit (CSK) seamless pull-on, cross-linked polyolefin heat-shrink
- E. Grout. Grout shall be sand cement slurry containing a minimum of seven (7) sacks of Portland Cement per cubic yard of slurry. All slurry shall be plant batched and transit mixed.
- F. All shipments of casing pipe shall be accompanied by a certificate of compliance to these specifications prepared by an independent testing laboratory and signed by a registered professional engineer.

2.02 MIXES

- A. Cement Mortar
 1. Consisting of one (1) part cement to two (2) parts clean sand with sufficient water to make a thick workable mix.
- B. Pressure Grout
 1. Comprised of one (1) cubic foot of cement and 3.5 cubic feet of clean fine sand with sufficient water added to provide a free flowing thick slurry. If desired to maintain solids in mixture in suspension, one cubic foot of commercial grade bentonite may be added to each 12 to 15 cubic feet of the slurry.
- C. Cellular Grout
 1. Cellular grout shall be a low-density, non-shrink grout composed of Type II Portland cement, water, and a performed foam. Cellular grout shall have the following characteristics:
 - a. Minimum 28-day Compressive Strength = 1000psi
 - b. Slurry (Wet) Density = 50 to 60 pcf
 - c. Cement = Type II, per ASTM C150
 - d. Water = Potable
 - e. Foam = Per ASTM C869
 - f. Water/Cement Ratio = 0.56b to .60
- D. Flowable Fill
 1. Flowable Fill shall be in accordance with Section 31 23 24 Flowable Fill.

PART 3 - EXECUTION

3.01 GENERAL

- A. If the grade of the pipe at the jacking or boring end is below ground surface, suitable pits or trenches shall be excavated for the purpose of conducting jacking or boring operations and for placing end joint of pipe. Location of pits shall comply with provisions contained within permit issued by right-of-way owner and Utility Accommodation Policy published by Texas Department of Transportation. Excavations greater than five (5) feet in depth shall be protected as specified in Section 31 23 15 - Trench Safety Systems.

- B. Where pipe is required to be installed under railroad embankments, highways, streets, or other facilities by jacking or boring methods, construction shall be made in such a manner that will not interfere with the operation of railroad, street, highway, or other facility, and shall not weaken or damage any embankment or structure.
- C. Pipe damaged in jacking or boring operations shall be repaired in place to satisfaction of Engineer. Pipe damaged beyond repair will be removed and replaced. Repair or removal and replacement of damaged pipe will be done at Contractor's expense.

3.02 CONSTRUCTION METHODS

- A. Jacking
 - 1. Suitable pits or trenches shall be excavated for purpose of jacking operations for placing end joints of pipe. When trenches are cut in side of embankments such work shall be securely sheeted and braced. Concrete seal slabs shall be used in the bottom of all jacking pits to prevent inflow of groundwater and to provide a working surface for jacking operations. Jacking operations shall in no way interfere with operation of railroads, streets, highways or other facilities. Barricades and lights shall be furnished as directed by Engineer to safeguard traffic and pedestrians.
 - 2. Pipe to be jacked shall be set on guides to support the section of pipe being jacked and to direct it in proper line and grade. Embankment material shall be excavated just ahead of pipe and material removed through pipe, and the pipe forced through opening thus provided. In areas where groundwater may seep into pit, Contractor shall use pre-manufactured casing seals at point where casing extends through sheeting.
 - 3. Excavation for the underside of pipe, for at least one-third (1/3) of circumference of pipe, shall conform to contour and grade of pipe. A clearance of not more than 2" may be provided for upper half of pipe.
 - 4. Distance that excavation shall extend beyond end of pipe shall depend on character of the material, but shall not exceed two feet (2') in any case.
 - 5. Generally, pipe shall be jacked from downstream end.
 - 6. When jacking of pipe has begun, operation shall be carried on without interruption, insofar as practicable, to prevent pipe from becoming firmly set in embankment.
 - 7. Contractor shall backfill pits upon completion.
- B. Boring
 - 1. Boring shall proceed from a pit provided for the boring equipment and workmen. Location of pit shall be approved by Engineer. Boring shall be done mechanically either using a pilot hole or by auger method.
 - 2. When pilot hole method is used an approximate 2" pilot hole shall be bored entire length of crossing and shall be checked for line and grade on the opposite end of bore from the work pit. This pilot hole shall serve as centerline of larger diameter hole to be bored.
 - 3. When auger method is used, a steel encasement pipe of appropriate diameter equipped with a cutter head to mechanically perform excavation shall be used. Augers shall be of sufficient diameter to convey excavated material to work pit. Annular space between casing pipe and excavation shall be pressure grouted.
 - 4. Excavated material shall be disposed of by Contractor, as approved by Owner. Use of water or other fluids in connection with boring operation will be permitted only to the extent necessary to lubricate cuttings; jetting will not be permitted.
 - 5. In unconsolidated soil formations, a gel-forming colloidal drilling fluid consisting of at least 10% of high grade carefully processed bentonite may be used to consolidate cuttings of bit, seal walls of hole, and furnish lubrication for subsequent removal of cuttings and immediate installation of pipe.
- C. Installation of Pressure Grout Mix
 - 1. Install pressure grout mix in void space between the outside of casing pipe and excavation. For bore or jacks with casing pipe, install pressure grout mix immediately upon completion of setting casing pipe.
 - 2. Install cellular grout or flowable fill to completely fill the annular space between carrier pipe and the casing pipe.

3. Unless specified otherwise, install pressure grouting through grout fittings for casing pipe 48" in diameter or larger. Grout fittings shall be fabricated into casing pipe at a maximum spacing of 6'. Remove and plug grout fittings after pressure grouting.
4. Install pressure grout from low end for all crossings where grout fittings are not used. Seal low end and pressure grout until grout is extruded from opposite end.

3.03 FREE AIR SYSTEM

- A. If required by OSHA standards, free air systems shall be installed and maintained.

3.04 INSTALLING CARRIER PIPE IN CASINGS

- A. Pipe to be installed within the casing shall meet the requirements for this type of pipe as specified. Place, align, and weld skid rails (reinforce weld) inside casing. Skid rails shall also be extended across entire length of bore pit and cement mortar shall be placed on both sides of rails.
- B. For Polyethylene Tape or Polyurethane coated steel pipe:
 1. Before installing pipe inside casing, Contractor shall perform a 360 degree external weld on each joint of carrier pipe. Carrier pipe exterior joint coating shall be coated with heat shrink sleeves.
 2. Pull, push, or skid pipe into place inside the casing using a constant force method such as hydraulic cylinders. Use of construction equipment such as excavators for pulling or pushing pipe inside casing will not be allowed. Lubricants such as flax soap or drilling mud may be used to ease pipe installation. Do not use petroleum products, oil or grease for this purpose.
 3. After carrier pipe installation is complete, apply mortar inside joints.
 4. Verify electrical discontinuity between carrier pipe and casing by performing Casing Electrical Isolation Testing as specified in Section 26 64 00, Cathodic Protection System. If continuity exists, remedy the short prior to applying cellular grout or flowable fill.
 5. Completely fill the annular space between carrier pipe and the casing with cellular grout or flowable fill. Contractor shall take precautions to prevent flotation of carrier pipe during grouting. Provide necessary bulkheads as recommended by cellular grout supplier. If pressure is used to apply grout, verify maximum allowable pressure with carrier pipe manufacturer, and do not exceed this pressure.
- C. Casing Pipe Joints
 1. All joints for casing pipe shall be butt welded with a minimum of 2 passes around circumference of joint. Procedures and techniques employed in welding joints shall conform to AWWA C206, latest edition.
- D. Carrier Pipe Joints
 1. Carrier pipe joints shall be fully restrained using jointing systems defined in individual carrier pipe Specifications.

3.05 MONITORING

- A. Prior to initiation of boring operations, Contractor shall establish elevation and condition of adjacent structures near crossing site. Such structures may include pavement, buildings, signs, etc.
- B. During boring operations, Contractor will monitor these elevations at least twice a day in order to determine if any movement has occurred. If movement is detected, Contractor shall cease operations and notify Engineer.
- C. Copies of results of Contractor's monitoring program will be submitted to Engineer daily.

3.06 CLEANING AND RESTORATION

- A. Upon completion of the work of this Section, dispose of, away from Site, all excess material, all debris, trash, containers, residue, remains, and scraps which result from the work of this Section. In addition, restore Site to a condition equal to or better than that found prior to initiation of work.

END OF SECTION

SECTION 33 05 23

CASING BY OPEN CUT

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work of this Section includes all labor, machinery, material, construction equipment and appurtenances required to perform in a good workman-like manner all jacking and boring of pipeline casings at designated locations and installation of carrier pipe within casing.

1.02 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to Engineer for review and acceptance prior to construction in accordance with General Conditions and Section 01 33 00 "Submittals."
- B. Submit certificates of inspection from pipe manufacturer certifying that steel casing pipe supplied meets requirements of these Specifications.
- C. Submit Shop Drawings of each steel casing and carrier pipe installation prior to fabrication of piping, casing, and appurtenances.
- D. Before starting excavation, Contractor shall submit Drawings of jack pit bracing, casing (or conduit), and jacking head proposed to be used. In addition to submitting details for jacking pit bracing and casing and jacking head, Contractor shall submit to for review and record purposes 2 copies of Drawings, design details, and calculations for support blocks, bracing to prevent pipe shifting or flotation, and pressure cement mortar mix design, placement method, and equipment.
- E. If welding of casing pipe is required, submit welder's certification in accordance with Division 05 requirements.

1.03 REQUIREMENTS

- A. Unless otherwise specified, methods and equipment used in jacking casing or conduit shall be optional with Contractor, provided that proposed method is approved by Engineer and meet all Texas Department of Transportation (FTxDOT) requirements. Such approval, however, shall in no way relieve Contractor of responsibility for making a satisfactory installation meeting criteria set forth herein. Only workmen experienced in jacking operations shall be used in performing Work.
- B. Only a certified welder shall perform welding operations on casing pipe. Welder's certification shall be submitted to Engineer.
- C. Prior to commencement of jack and bore operation, Contractor must notify Engineer.

PART 2 - PRODUCTS

2.01 PIPE CASING

- A. Steel casing shall be new and unused Grade B steel pipe, minimum yield strength 36,000-psi., with allowance for corrosion; and shall conform to ASTM A 139 or AWWA C 200, latest editions, for fabricated pipe. Thickness shall be as shown in the table below. Joints shall be electric-arc (arc) welded by operators qualified in accordance with American Welding Society Standard Procedure. Steel casing sizes shown are minimum required diameters. Casing sizes only pertain to installations involving a single carrier pipe.
 - 1. Steel Casing Pipe

Carrier Pipe Nominal Diameter	Casing Outside Diameter	Casing Wall Thickness
36"	54"	0.500"

2.02 JOINTS

- A. Joints of sections of casing pipe to be jacked shall be welded with a continuous circumferential weld by a certified welder. It shall be Contractor's responsibility to provide stress transfer across the joints which is capable of resisting jacking forces involved. Welds shall be ground smooth on side of casing to provide smooth bore and shall not extend more than 3/4" beyond pipe outside diameter. Field welds shall be complete penetration, single-level groove type joint. Welds shall be airtight and continuous.

2.03 BRACING

- A. Pipe shall be braced to prevent shifting or flotation. Details of bracing and blocking of pipe are subject to approval of Engineer.

2.04 STAINLESS STEEL CASING SPACERS

- A. Carrier pipes, inside of steel casing pipe, shall be supported by casing spacers at no more than 6-1/2-feet between spacers with double spacers on each end of casing and spacers at a maximum of 2-feet behind bell. Each spacer shall be a minimum 8" wide for pipe 12" diameter or less or minimum 12" wide for pipe 16" or greater and manufactured of minimum 14-gauge Type 304 stainless steel. All nuts, bolts and washers shall be 304 stainless steel and compatible with respective 304 stainless steel shell/band. Each spacer shall have a minimum of 4 runner supports manufactured of an ultra high molecular weight polyethylene or glass reinforced polymer. Runner supports shall be of adequate height to position carrier pipe in center of casing with a minimum top clearance of 1-1/2". All casing spacers larger than 36" diameter (carrier pipe) shall be factory designed, taking in consideration weight of carrier pipe filled with water. All calculations and Drawings produced by manufacturer shall be submitted to Engineer for review
- B. Acceptable Manufacturers:
1. CASCADE WATERWORKS MFG. - Style CCS-JR stainless steel - with 8" band for pipe to 12" diameter and 12" band for pipe larger than 12" (UHMW polymer runners for all sizes).

2.05 CASING END SEALS

- A. Casing ends shall be sealed with brick and cement in annular space and casing end seals shall be used to completely close both openings on either side of casing. These end seals shall be pull on (seamless) or wrap around with stainless steel straps for securing to carrier pipe and casing. End seals shall be constructed of specially compounded synthetic rubber a minimum thickness of 1/8".
- B. Acceptable Manufacturers:
1. GPT INDUSTRIES - Model W wrap-around w/mastic seal Model C seamless pull-on
 2. CANUSA/DIVISION OF SHAW PIPE RESOURCES - Casing Seal Kit (CSK) seamless pull-on, cross-linked polyolefin heat-shrink

PART 3 - EXECUTION

3.01 GENERAL

- A. Installation of pipeline casings under public right of way shall be in accordance with all requirements of encroachment permits issued by governing agency.

- B. Steel casing pipe sizes shown on Drawings are minimum sizes. Larger pipe may be provided to facilitate installation, at no additional cost to Owner. Thickness of steel casing pipe shall be of sufficient thickness and axial strength to withstand forces to be encountered. Steel casing pipe shall be of minimum length as shown on Drawings.

3.02 EXCAVATION

- A. Excavation shall conform to Section 31 23 17 Trenching
- B. Excavated material shall be removed from conduit as excavation progresses, and no accumulation of such material within conduit will be permitted

3.03 TOLERANCES

- A. Extreme care shall be exercised by Contractor to maintain line and grade during jacking operations, and Contractor may be required to modify manner in which he is conducting his operation to correct any deviation when deemed necessary by Engineer. A maximum tolerance of 0.12-foot per 100 linear feet of casing is permitted.

3.04 RESPONSIBILITY

- A. Contractor shall be fully responsible for structural sufficiency of casing and placement thereof. Details shown on Drawings are to be considered minimum requirements only.

3.05 INSTALLATION OF CARRIER PIPE

- A. Carrier pipes installed inside of steel casing pipe shall be supported at a minimum of every 10-foot by casing spacers or 2 spacers per pipe, whichever is less.
- B. Adjust pipe grade as required by changing thickness of supports to compensate for any grade variations of casing, and to maintain carrier pipelines, grades, and dimensions, as shown on Drawings.
- C. If alignment of casing is such that carrier pipe grade cannot be met, grade of casing shall, if required by Engineer, be adjusted.
- D. All carrier pipe installed in a casing must be restrained for entire length of casing. Piping shall, at a minimum, be restrained to 1 joint outside of casing. If a fitting is present at joint, restraint requirements shall be provided.

END OF SECTION

SECTION 33 11 00

PIPE AND PIPE FITTINGS, GENERAL

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Process piping systems.
 2. Utility piping systems.
 3. Plumbing piping systems.

1.02 QUALITY ASSURANCE

- A. Referenced Standards:
1. American Association of State Highway and Transportation Officials (AASHTO):
 - a. M36, Corrugated Steel Culverts and Underdrains.
 - b. M190, Standard Specification for Bituminous Coated Corrugated Metal Culvert Pipe and Pipe Arches.
 - c. M252, Standard Specification for Corrugated Polyethylene Drainage Tubing.
 - d. M294, Interim Specification for Corrugated Polyethylene Pipe 12" to 24" Diameter.
 2. American Iron and Steel Institute (AISI).
 3. American Society of Mechanical Engineers (ASME):
 - a. B16.3, Malleable Iron Threaded Fittings.
 - b. B16.5, Pipe Flanges and Flanged Fittings.
 - c. B16.9, Factory-Made Wrought Steel Butt-Welding Fittings.
 - d. B16.22, Wrought Copper and Bronze Solder - Joint Pressure Fittings.
 - e. B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes.
 - f. B36.19, Stainless Steel Pipe.
 - g. B40.100, Pressure Gauges and Gauge Attachments.
 4. ASTM International (ASTM):
 - a. A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - b. A74, Standard Specification for Cast Iron Soil Pipe and Fittings.
 - c. A106, Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service.
 - d. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - e. A182, Standard Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
 - f. A197, Standard Specification for Cupola Malleable Iron.
 - g. A234, Standard Specification for Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
 - h. A269, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - i. A312, Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
 - j. A518, Standard Specification for Corrosion-Resistant High-Silicon Iron Castings.
 - k. A536, Standard Specification for Ductile Iron Castings.
 - l. A587, Standard Specification for Electric-Resistance-Welded Low-Carbon Steel Pipe for the Chemical Industry.
 - m. A774, Standard Specification for As-Welded Wrought Austenitic Stainless Steel Fittings for General Corrosive Service at Low and Moderate Temperatures.

- n. A778, Standard Specification for Welded, Unannealed Austenitic Stainless Steel Tubular Products.
 - o. B88, Standard Specification for Seamless Copper Water Tube.
 - p. C14, Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.
 - q. C76, Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
 - r. C425, Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings.
 - s. C443, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
 - t. C564, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
 - u. C700, Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated.
 - v. D1785, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
 - w. D2466, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
 - x. D2467, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
 - y. F439, Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
 - z. F441, Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.
5. American Water Works Association (AWWA):
 - a. B300, Standard for Hypochlorites.
 - b. C200, Standard for Steel Water Pipe - 6" and Larger.
 - c. C207, Standard for Steel Pipe Flanges for Waterworks Service - Sizes 4" through 144 IN.
 - d. C208, Standard for Dimensions for Fabricated Steel Water Pipe Fittings.
 - e. C606, Standard for Grooved and Shouldered Joints.
 - f. C651, Standard for Disinfecting Water Mains.
 - g. C800, Standard for Underground Service Line Valves and Fittings.
 6. American Water Works Association/American National Standards Institute (AWWA/ANSI):
 - a. C110/A21.10, Standard for Ductile-Iron and Gray-Iron Fittings for Water.
 - b. C111/A21.11, Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - c. C115/A21.15, Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
 - d. C151/A21.51, Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
 - e. C153/A21.53, Standard for Ductile-Iron Compact Fittings for Water Service.
 7. Chlorine Institute, Inc. (CI):
 - a. Pamphlet 6, Piping Systems for Dry Chlorine.
 8. Cast Iron Soil Pipe Institute (CISPI):
 - a. 301, Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
 9. International Plumbing Code (IPC).
 10. National Fire Protection Association (NFPA):
 - a. 54, National Fuel Gas Code.
 - b. 69, Standard on Explosion Prevention Systems.
 11. Underwriters Laboratories, Inc. (UL).
- B. Coordinate flange dimensions and drillings between piping, valves, and equipment.

1.03 SYSTEM DESCRIPTION

- A. Piping Systems Organization and Definition:
 - 1. Piping services are grouped into designated systems according to chemical and physical properties of fluid conveyed, system pressure, piping size and system materials of construction.

1.04 SUBMITTALS

- A. Shop Drawings:
 - 1. See Section 01 33 00 - Submittals for requirements for mechanics and administration of submittal process.
 - 2. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Copies of manufacturer's written directions regarding material handling, delivery, storage and installation.
 - c. Separate schedule sheet for each piping system scheduled in this Section showing compliance of all system components.
 - 1) Attach technical product data on gaskets, pipe, fittings, and other components.
 - 3. Fabrication and/or layout drawings:
 - a. Exterior yard piping drawings (minimum scale 1" equals 10') with information including:
 - 1) Dimensions of piping lengths.
 - 2) Invert or centerline elevations of piping crossings.
 - 3) Acknowledgement of bury depth requirements.
 - 4) Details of fittings, tapping locations, thrust blocks, restrained joint segments, harnessed joint segments, hydrants, and related appurtenances.
 - 5) Acknowledge designated valve or gate tag numbers, manhole numbers, instrument tag numbers, pipe and line numbers.
 - 6) Line slopes and vents.
 - b. Interior piping drawings (minimum scale 1/8" equals 1') with information including:
 - 1) Dimensions of piping from column lines or wall surfaces.
 - 2) Centerline dimensions of piping.
 - 3) Centerline elevation and size of intersecting ductwork, conduit/conduit racks, or other potential interferences requiring coordination.
 - 4) Location and type of pipe supports and anchors.
 - 5) Locations of valves and valve actuator type.
 - 6) Details of fittings, tapping locations, equipment connections, flexible expansion joints, connections to equipment, and related appurtenances.
 - 7) Acknowledgement of valve, equipment and instrument tag numbers.
 - 8) Provisions for expansion and contraction.
 - 9) Line slopes and air release vents.
 - 10) Rough-in data for plumbing fixtures.
 - c. Schedule of interconnections to existing piping and method of connection.
- B. Operation and Maintenance Manuals:
 - 1. See Section 01 33 00 - Submittals for requirements for:
 - a. Mechanics and administration of submittal process.
 - b. Content of Operation and Maintenance Manuals.
- C. Miscellaneous Submittals:
 - 1. Qualifications of lab performing disinfection analysis on water systems.
 - 2. Test reports:
 - a. Copies of pressure test results on all piping systems.
 - b. Reports defining results of dielectric testing and corrective action taken.
 - c. Disinfection test report.

- d. Notification of time and date of piping pressure tests.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect pipe coating during handling using methods recommended by manufacturer.
 - 1. Use of bare cables, chains, hooks, metal bars or narrow skids in contact with coated pipe is not permitted.
- B. Prevent damage to pipe during transit.
 - 1. Repair abrasions, scars, and blemishes.
 - 2. If repair of satisfactory quality cannot be achieved, replace damaged material immediately.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with Contract Documents, the following manufacturers are acceptable:
 - 1. Insulating unions:
 - a. "Dielectric" by Epco.
 - 2. Dielectric flange kit:
 - a. PSI.
 - b. Maloney.
 - c. Central Plastics.
 - 3. Pipe saddles (for gage installation):
 - a. Dresser Style 91 (steel and ductile iron systems).
 - b. Dresser Style 194 (non-metallic systems).
- B. Submit request for substitution in accordance with Specification Section 01 25 13 – Product Substitutions.

2.02 COMPONENTS AND ACCESSORIES

- A. Insulating Components:
 - 1. Dielectric flange kits:
 - a. Flat faced.
 - b. 1/8" thick dielectric gasket, phenolic, non-asbestos.
 - c. Suitable for 175 psi, 210 DegF.
 - d. 1/32" wall thickness bolt sleeves.
 - e. 1/8" thick phenolic insulating washers.
 - 2. Dielectric unions:
 - a. Screwed end connections.
 - b. Rated at 175 psi, 210 DegF.
 - c. Provide dielectric gaskets suitable for continuous operation at union rated temperature and pressure.
- B. Reducers:
 - 1. Furnish appropriate size reducers and reducing fittings to mate pipe to equipment connections.
 - 2. Connection size requirements may change from those shown on Drawings depending on equipment furnished.
- C. Protective Coating and Lining:
 - 1. Refer to Division 09 for painting, coatings, linings, paint, tests and other items for pipe, fittings, and appurtenances.

PART 3 - EXECUTION

3.01 EXTERIOR BURIED PIPING INSTALLATION

- A. Unless otherwise shown on Drawings, provide a minimum of 3 feet earth cover over exterior buried piping systems and appurtenances conveying water, fluids, or solutions subject to freezing.
- B. Enter and exit through structure walls, floors, and ceilings by using penetrations and seals specified in Section 01 73 20 - Openings and Penetrations in Construction and as shown on Drawings.
- C. When entering or leaving structures with buried piping, install restrained flexible joint.
 - 1. Install second joint not more than 6 feet nor less than 4 feet from first joint.
- D. Install expansion devices as necessary to allow expansion and contraction movement.
- E. Laying Pipe In Trench:
 - 1. Excavate and backfill trench in accordance with Section 31 23 17 - Trenching.
 - 2. Clean each pipe length thoroughly and inspect for compliance to Specifications.
 - 3. Grade trench bottom and excavate for pipe bell and lay pipe on trench bottom.
 - 4. Install gasket or joint material according to manufacturer's directions after joints have been thoroughly cleaned and examined.
 - 5. Except for first two (2) joints, before making final connections of joints, install two (2) full sections of pipe with earth tamped along side of pipe or final with bedding material placed.
 - 6. Lay pipe in only suitable weather with good trench conditions.
 - a. Never lay pipe in water except where approved by Engineer.
 - 7. Seal open end of line with watertight plug if pipe laying stopped.
 - 8. Remove water in trench before removal of plug.
- F. Lining Up Push-On Joint Piping:
 - 1. Lay piping on route lines shown on Drawings.
 - 2. Deflect from straight alignments or grades by vertical or horizontal curves or offsets.
 - 3. Observe maximum deflection values stated in manufacturer's written literature.
 - 4. Provide special bends when specified or where required alignment exceeds allowable deflections stipulated.
 - 5. Install shorter lengths of pipe in such length and number that angular deflection of any joint, as represented by specified maximum deflection, is not exceeded.
- G. Anchorage and Blocking:
 - 1. Provide reaction blocking, anchors, joint harnesses, or other acceptable means for preventing movement of piping caused by forces in or on buried piping tees, wye branches, plugs, or bends.
 - 2. Place concrete blocking so that it extends from fitting into solid undisturbed earth wall.
 - a. Concrete blocks shall not cover pipe joints.
 - 3. Provide bearing area of concrete in accordance with Drawing detail.
- H. Install insulating components where dissimilar metals are joined together.

3.02 INTERIOR AND EXPOSED EXTERIOR PIPING INSTALLATION

- A. Install piping in vertical and horizontal alignment as shown on Drawings.
- B. Alignment of piping smaller than 4" may not be shown; however, install according to Drawing intent and with clearance and allowance for:
 - 1. Expansion and contraction.
 - 2. Operation and access to equipment, doors, windows, hoists, moving equipment.
 - 3. Headroom and walking space for working areas and aisles.
 - 4. System drainage and air removal.

- C. Enter and exit through structure walls, floor and ceilings using penetrations and seals specified in Specification Section 01 73 20 - Openings and Penetrations in Construction and as shown on Drawings.
- D. Install vertical piping runs plumb and horizontal piping runs parallel with structure walls.
- E. Pipe Support:
 - 1. Use methods of piping support as shown on Drawings and as required in Section 33 25 22 - Pipe Supports.
 - 2. Where pipes run parallel and at same elevation or grade, they may be grouped and supported from common trapeze-type hanger, provided hanger rods are increased in size as specified for total supported weight.
 - a. Pipe in group requiring least maximum distance between supports shall set distance between trapeze hangers.
 - 3. Size pipe supports with consideration to specific gravity of liquid being piped.
- F. Locate and size sleeves and castings required for piping system.
 - 1. Arrange for chases, recesses, inserts or anchors at proper elevation and location.
- G. Use reducing fittings throughout piping systems.
 - 1. Bushings will not be allowed unless specifically approved in writing.
- H. Equipment Drainage and Miscellaneous Piping:
 - 1. Provide drip pans and piping at equipment where condensation may occur.
 - 2. Hard pipe stuffing box leakage to nearest floor drain.
 - 3. Avoid piping over electrical components such as motor control centers, panelboards, etc.
 - a. If piping must be so routed, utilize 16 GA, 316 stainless steel drip pan under piping and over full length of electrical equipment.
 - b. Hard pipe drainage to nearest floor drain.
 - 4. Collect system condensate at drip pockets, traps and blowoff valves.
 - 5. Provide drainage for process piping at locations shown on Drawings in accordance with Drawing details.
 - 6. For applications defined above and for other miscellaneous piping which is not addressed by a specific piping service category in PART 1, provide 304 stainless steel piping and fittings.
 - a. Size to handle application with 3/4" being minimum size provided.
- I. Unions:
 - 1. Install in position which will permit valve or equipment to be removed without dismantling adjacent piping.
 - 2. Mechanical type couplings may serve as unions.
 - 3. Additional flange unions are not required at flanged connections.
- J. Install expansion devices as necessary to allow expansion/contraction movement.
- K. Provide full face gaskets on all systems.
- L. Anchorage and Blocking:
 - 1. Block, anchor, or harness exposed piping subjected to forces in which joints are installed to prevent separation of joints and transmission of stress into equipment or structural components not designed to resist those stresses.
- M. Equipment Pipe Connections:
 - 1. Equipment - General:
 - a. Exercise care in bolting flanged joints so that there is no restraint on opposite end of pipe or fitting which would prevent uniform gasket pressure at connection or would cause unnecessary stresses to be transmitted to equipment flanges.

- b. Where push-on joints are used in conjunction with flanged joints, final positioning of push-on joints shall not be made until flange joints have been tightened without strain.
 - c. Tighten flange bolts at uniform rate which will result in uniform gasket compression over entire area of joint.
 - 1) Provide tightening torque in accordance with manufacturer's recommendations.
 - d. Support and match flange faces to uniform contact over their entire face area prior to installation of any bolt between piping flange and equipment connecting flange.
 - e. Permit piping connected to equipment to freely move in directions parallel to longitudinal centerline when and while bolts in connection flange are tightened.
 - f. Align, level, and wedge equipment into place during fitting and alignment of connecting piping.
 - g. Grout equipment into place prior to final bolting of piping but not before initial fitting and alignment.
 - h. To provide maximum flexibility and ease of alignment, assemble connecting piping with gaskets in place and minimum of four (4) bolts per joint installed and tightened.
 - 1) Test alignment by loosening flange bolts to see if there is any change in relationship of piping flange with equipment connecting flange.
 - 2) Realign as necessary, install flange bolts and make equipment connection.
 - i. Provide utility connections to equipment shown on Drawings, scheduled or specified.
2. Plumbing and HVAC equipment:
- a. Make piping connections to plumbing and HVAC equipment, including but not limited to installation of fittings, strainers, pressure reducing valves, flow control valves and relief valves provided with or as integral part of equipment.
 - b. Furnish and install sinks, fittings, strainers, pressure reducing valves, flow control valves, pressure relief valves, and shock absorbers which are not specified to be provided with or as integral part of equipment.
 - c. For each water supply piping connection to equipment, furnish and install union and gate or angle valve.
 - 1) Provide wheel handle stop valve at each laboratory sink water supply.
 - 2) Minimum size: 1/2".
 - d. Furnish and install "P" trap for each waste piping connection to equipment if waste is connected directly to building sewer system.
 - 1) Size trap as required by IPC.
 - e. Stub piping for equipment, sinks, lavatories, supply and drain fittings, key stops, "P" traps, miscellaneous traps and miscellaneous brass through wall or floor and cap and protect until such time when later installation is performed.

N. Provide insulating components where dissimilar metals are joined together.

3.03 CONNECTIONS WITH EXISTING PIPING

- A. Where connection between new work and existing work is made, use suitable and proper fittings to suit conditions encountered.
- B. Perform connections with existing piping at time and under conditions which will least interfere with service to customers affected by such operation.
- C. Undertake connections in fashion which will disturb system as little as possible.
- D. Provide suitable equipment and facilities to dewater, drain, and dispose of liquid removed without damage to adjacent property.

- E. Where connections to existing systems necessitate employment of past installation methods not currently part of trade practice, utilize necessary special piping components.
- F. Where connection involves potable water systems, provide disinfection methods as prescribed in this Section.
- G. Once tie-in to each existing system is initiated, continue work continuously until tie-in is made and tested.

3.04 ACCESS PROVISIONS

- A. Provide access doors or panels in walls, floors, and ceilings to permit access to valves, piping and piping appurtenances requiring service.
- B. Size of access panels to allow inspection and removal of items served, minimum 10" x 14" size.
- C. Fabricate door and frame of minimum 14 GA, stretcher leveled stock, cadmium plated or galvanized after fabrication and fitted with screw driver lock of cam type.
- D. Provide with key locks, keyed alike, in public use areas.
- E. Furnish panels with prime coat of paint.
- F. Style and type as required for material in which door installed.
- G. Where door is installed in fire-rated construction, provide door bearing UL label required for condition.

3.07 FIELD QUALITY CONTROL

- A. Pipe Testing - General:
 - 1. Test piping systems as follows:
 - a. Test exposed, non-insulated piping systems upon completion of system.
 - b. Test exposed, insulated piping systems upon completion of system but prior to application of insulation.
 - c. Test concealed interior piping systems prior to concealment and, if system is insulated, prior to application of insulation.
 - d. Test buried piping (insulated and non-insulated) prior to backfilling and, if insulated, prior to application of insulation.
 - 2. Utilize pressures, media and pressure test durations as specified in 33 26 90 - Water Pipeline Testing and Disinfection.
 - 3. Isolate equipment which may be damaged by specified pressure test conditions.
 - 4. Perform pressure test using calibrated pressure gages and calibrated volumetric measuring equipment to determine
 - a. Select each gage so that specified test pressure falls within upper half of gage's range.
 - b. Notify Engineer 24 hours prior to each test.
 - 5. Completely assemble and test new piping systems prior to connection to existing pipe systems.
 - 6. Acknowledge satisfactory performance of tests and inspections in writing to Engineer prior to final acceptance.
 - 7. Bear the cost of all testing and inspecting, locating and remedying of leaks and any necessary retesting and re-examination.

END OF SECTION

SECTION 33 11 05

NUTS, BOLTS, AND GASKETS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
1. All nuts, bolts and gaskets associated with pressurized water utility lines including:
 - a. T-Bolts and Nuts
 - b. Flange Bolts and Nuts
 - c. Threaded Rods
 - d. Push-on Gaskets
 - e. Mechanical Joint Gaskets
 - f. Flange Gaskets
 - g. Flange Isolation Kits
- B. Related Specification Sections include, but are not necessarily limited to:
1. Division 00 – Proposal Requirements, Contract Forms, and Conditions of Contract
 2. Division 01 – General Requirements
 3. Section 33 11 10 – Ductile Iron Pipe

1.02 REFERENCES

- A. Reference Standards
1. Reference standards cited in this Specification refer to current reference standard published at time of latest revision at time of Bid, unless a date is specifically cited.
 2. American Iron and Steel Institute (AISI).
 3. American Society of Mechanical Engineers (ASME):
 - a. PCC-1-2012 Guidelines for Pressure Boundary Bolted Flange Joint Assembly.
 4. American Society of Testing and Materials (ASTM):
 - a. A193, Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
 - b. A194, Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
 - c. A242, Standard Specification for High-Strength Low-Alloy Carbon Structural Steel
 - d. B117, Salt Spray Testing
 - e. F436, Standard Specification for Hardened Steel Washers
 5. American Water Works Association (AWWA):
 - a. C111/A21.11, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - b. C207, Steel Pipe Flanges for Waterworks Service – Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm).
 - c. C600, Installation of Ductile-Iron Mains and Their Appurtenances.
 - d. M11, Steel Pipe.
 - e. M41, Ductile-Iron Pipe and Fittings.
 6. Fastener Quality Act (FQA)
 - a. Public Law 106-34 (P.L. 106-34)
 7. NSF International (NSF):
 - a. 61, Drinking Water System Components - Health Effects.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00.
- B. All submittals shall be approved by Engineer prior to delivery and/or fabrication for specials.

1.04 ACTION SUBMITTALS / INFORMATIONAL SUBMITTALS

- A. Product Data
 - 1. Bolts and nuts for mechanical and or flange joints
 - 2. Gaskets
- B. Certificates
 - 1. Furnish an affidavit certifying that all fasteners, excluding T-Bolts, shall conform to Fastener Quality Act (FQA) (P.L. 106-34).
 - 2. Furnish an affidavit certifying that Xylan Coating is manufactured by Whitford Corporation, or a Whitford Corporation certified Applicator.

1.05 QUALITY ASSURANCE

- A. Qualifications
 - 1. Manufacturers
 - a. Fastener manufacturing operations (bolts, nuts, gaskets and coatings) shall be performed under the control of the manufacturer.
 - b. All gaskets shall meet or exceed latest revisions NSF 61 and shall meet or exceed requirements of this Specification.
- B. Pre-construction Testing
 - 1. Owner may, at its own cost, subject random fittings for destructive testing by an independent laboratory for compliance with this Specification.
 - a. Compliance test shall be performed in United States.
 - b. Any visible defects or failure to meet quality standards herein will be grounds for rejecting entire order.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Storage and Handling Requirements
 - 1. Secure and maintain a location to store material in accordance with Division 01.

PART 2 - PRODUCTS

2.01 EQUIPMENT, PRODUCT TYPES AND MATERIALS

- A. Regulatory Requirements
 - 1. All fasteners, excluding T-Bolts, shall conform to Fastener Quality Act (FQA) (P.L. 106-34). All fasteners shall meet marking requirements set forth by this Act.
- B. T-Bolts and Nuts
 - 1. Stainless Steel T-bolt with Xylan Coated Stainless Steel Nut
 - a. Stainless Steel T-bolt and Nut in accordance with AISI 304.
 - b. Coat nut with Xylan in accordance with this Section.
- C. Flange Bolts and Nuts
 - 1. Stainless Steel Bolt and Xylan Coated Nut
 - a. Meet requirements of AWWA C207
 - b. Bolts: ASTM A193, Grade B8, Class 1(AISI 304 Stainless Steel, carbide solution treated)
 - c. Nuts and Washers: ASTM A194, Grade 8 Nuts with AISI 304 Stainless Steel Washers
 - 1) Coat nut with Xylan in accordance with this Section.
- D. Threaded Rods
 - 1. Meet requirements of AWWA C207

2. Rods: ASTM A193, Grade B8, Class 1(AISI 304 Stainless Steel, carbide solution treated)
 3. Nuts and Washers: ASTM A194, Grade 8 Nuts with AISI 304 Stainless Steel Washers
 - a. Coat nut with Xylan in accordance with this Section.
- E. Push-on Gaskets
1. Conforming to physical and marking requirements specified in ANSI/AWWA C111/A21.11.
 2. All gaskets shall meet or exceed latest revisions NSF 61.
 3. Rubber gaskets shall be made of vulcanized styrene butadiene rubber SBR, unless otherwise specified in Drawings.
 4. Gaskets shall be new and free from all porous areas, foreign material, or other defects that make them unfit for intended use.
 5. Gaskets shall be size and shape required to provide an adequate compressive force against plain end and socket after assembly to affect a positive seal under all combinations of joint and gasket tolerances.
- F. Mechanical Joint Gaskets
1. Conforming to physical and marking requirements specified in ANSI/AWWA C111/A21.11.
 2. All gaskets shall meet or exceed latest revisions NSF 61.
 3. Rubber gaskets shall be made of vulcanized styrene butadiene rubber SBR, unless otherwise specified in Drawings.
 4. Gaskets shall be new and free from porous areas, foreign material, or other defects that make them unfit for intended use.
- H. Flange Gaskets
1. Class E Flanges
 - a. Full face
 - b. Manufactured true to shape from minimum 80 durometer SBR rubber stock of a thickness not less than 1/8"
 - c. Virgin stock
 - d. Conforming to physical and test requirements specified in AWWA/ANSI C111/A21.11
 - e. All gaskets shall meet or exceed the latest revisions NSF 61.
 - f. Finished gaskets shall have holes punched by manufacturer and shall match the flange pattern in every respect.
 - g. Frayed cut edges are not acceptable.
 - h. Field cut sheet gaskets are not acceptable.
- G. Hydrocarbon Resistant Gaskets
1. Furnish Viton® (Fluorocarbon) Rubber, hydrocarbon resistant gaskets, when required.
- H. Flange Isolation Kits
1. Flanges which are required by Drawings to be Isolation Flanges shall conform to Section 26 64 00.
 2. For bolts used with isolation sleeves per Section 26 64 00, threading must extend to bolt head with no grip to ensure sleeves fit properly.
- I. Xylan Coating
- a. Coat nuts and bolts with a ceramic-filled, baked on fluorocarbon resin, when required.
 - b. Coated nuts and bolts shall be prepared "near white" or "white" when coated to coating manufacturer's recommended thickness by a certified applicator.
 - c. Coating shall be of Xylan as manufactured by Whitford Corporation and applied by Whitford Corporation or Whitford Corporation Recommended Coater.
 - d. Coating shall be free from holidays and defects.
 - e. Coating thickness shall between 0.0007" and 0.0012" and shall be such that nut turns freely on bolt.

- f. Coating shall conform to performance requirements of ASTM B117, "Salt Spray Test" and shall include a certificate of conformance.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Mechanical Joints
 1. Assemble mechanical joints in accordance with ANSI/AWWA C111/A21.11 Appendix A, AWWA C600 and AWWA Manual M41.
 2. Use only Stainless Steel T-bolts with Xylan Coated Stainless Steel Nuts on all joints.
- B. Flanged Joints
 1. Install in accordance with ASME PCC-1-2012.
 2. Use only Stainless Steel Bolts and Xylan Coated Nuts on all joints.
 3. Wrap all buried steel flanges for AWWA C200, C301 or C303 pipe with Petrolatum Tape System.
 - a. If only 1 flange in a joint is steel (AWWA C200, C301, or C303), petrolatum tape wrapping will be required.
 - b. If a joint is made between two ductile iron flanges, joint should be polyethylene encased in accordance with Section 33 11 10.
 4. Flange bolts are normally spaced evenly around flange.
 5. During assembly, tighten nuts gradually and equally using a three-pass method in accordance with ASME PCC-1-2012.
 - a. For first pass, tighten the nuts to 50% at diametrically opposite sides to prevent misalignment and to ensure that all bolts carry equal loads.
 - b. For second pass, tighten nuts to 100% again in a diametrically opposite pattern.
 - c. Allow a minimum of 1 hour to pass to provide time for settlement between bolts and nuts and gasket relaxation.
 - d. Complete third pass by checking each bolt in a clockwise pattern. Each nut should be tightened until it will no longer turn. This step compensates for elastic interaction and brings all bolts into parity.
 6. Threads of all bolts should protrude a minimum of 1/2" from nuts.
- C. Threaded Rod
 1. Install as part of joint harness assembly in accordance with AWWA Manual M11.
 2. Space rods evenly around pipe.
 3. During assembly, tighten nuts gradually and equally using a three-pass method in accordance with ASME PCC-1-2012.
 - a. For first pass, tighten nuts to 50% at diametrically opposite sides to prevent misalignment and to ensure that all bolts carry equal loads.
 - b. For second pass, tighten the nuts to 100% again in a diametrically opposite pattern.
 4. Threads of all bolts should protrude a minimum of 1/2" from nuts.

END OF SECTION

SECTION 33 11 10

DUCTILE IRON PIPE

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Ductile Iron Pipe 3” through 64” for potable water, wastewater and reuse applications
- B. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 00 – Proposal Requirements, Contract Forms, and Conditions of Contract
 - 2. Division 01 – General Requirements
 - 3. Section 31 23 17 - Trenching
 - 4. Section 33 11 05 - Bolts, Nuts, and Gaskets
 - 5. Section 33 11 11 - Ductile Iron Fittings

1.02 REFERENCES

- A. Definitions
 - 1. Gland or Follower Gland
 - a. Non-restrained, mechanical joint fitting
 - 2. Retainer Gland
 - a. Mechanically restrained mechanical joint fitting
- B. Reference Standards
 - 1. Reference standards cited in this Specification refer to current reference standard published at the time of Bid.
 - 2. American Association of State Highway and Transportation Officials (AASHTO).
 - 3. American Society of Mechanical Engineers (ASME):
 - a. B16.1, Gray Iron Pipe Flanges and Flanged Fittings (Classes 25, 125 and 250).
 - 4. ASTM International (ASTM):
 - a. A193, Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications
 - b. A194, Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
 - c. A242, Standard Specification for High-Strength Low-Alloy Structural Steel.
 - d. A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
 - e. A674, Standard Practice for Polyethylene Encasement for Ductile Iron Pipe for Water or Other Liquids.
 - f. B117, Standard Practice for Operating Salt Spray (Fog) Apparatus.
 - g. B633, Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
 - 5. American Water Works Association (AWWA):
 - a. C203, Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot Applied.
 - b. C600, Installation of Ductile-Iron Water Mains and their Appurtenances.
 - c. M41, Ductile-Iron Pipe and Fittings.
 - 6. American Water Works Association/American National Standards Institute (AWWA/ANSI):
 - a. C104/A21.4, Cement–Mortar Lining for Ductile-Iron Pipe and Fittings.
 - b. C105/A21.5, Polyethylene Encasement for Ductile-Iron Pipe Systems.
 - c. C111/A21.11, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - d. C115/A21.15, Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
 - e. C150/A21.50, Thickness Design of Ductile-Iron Pipe.
 - f. C151/A21.51, Ductile-Iron Pipe, Centrifugally Cast, for Water.

- g. C600, Installation of Ductile-Iron Water Mains and their Appurtenances
- 7. NSF International (NSF):
 - a. 61, Drinking Water System Components - Health Effects.
- 8. Society for Protective Coatings (SSPC):
 - a. PA 2, Measurement of Dry Coating Thickness with Magnetic Gages.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00.
- B. All submittals shall be approved by Owner prior to delivery and/or fabrication for specials.

1.04 ACTION SUBMITTALS / INFORMATIONAL SUBMITTALS

- A. Product Data
 - 1. Interior lining
 - a. If it is other than cement mortar lining in accordance with AWWA/ANSI C104/A21.4, including:
 - 1) Material
 - 2) Application recommendations
 - 3) Field touch-up procedures
 - 2. Thrust Restraint
 - a. Retainer glands, thrust harnesses or any other means
 - 3. Gaskets
 - a. If hydrocarbon or other special gaskets are required
- B. Shop Drawings – Furnish for Ductile Iron Pipe used in water distribution system or main for 24” and greater diameters, including:
 - 1. Wall thickness design calculations sealed by a Licensed Professional Engineer in Texas including:
 - a. Working pressure
 - b. Surge pressure
 - c. Deflection
 - 2. Provide thrust restraint calculations for all fittings and valves, sealed by a Licensed Professional Engineer in Texas, to verify restraint lengths shown in Drawings.
 - 3. Lay schedule/drawing for 24” and greater diameters, sealed by a Licensed Professional Engineer in Texas including:
 - a. Pipe class
 - b. Joints type
 - c. Fittings
 - d. Stationing
 - e. Transitions
 - f. Joint deflection
- C. Certificates
 - 1. Furnish an affidavit certifying that all Ductile Iron Pipe meets provisions of this Section, each run of pipe furnished has met Specifications, all inspections have been made, and that all tests have been performed in accordance with AWWA/ANSI C151/A21.51.

1.05 QUALITY ASSURANCE

- A. Qualifications
 - 1. Manufacturers
 - a. Finished pipe shall be the product of 1 manufacturer.
 - 1) Change orders, specials, and field changes may be provided by a different manufacturer upon Owner approval.
 - b. Pipe manufacturing operations (pipe, lining, and coatings) shall be performed under control of manufacturer.
 - c. Ductile Iron Pipe

- 1) Manufactured in accordance with AWWA/ANSI C151/A21.51
 - a) Perform quality control tests and maintain results as outlined within standard to assure compliance.
- 2) Subject each pipe to a hydrostatic test of not less than 500 psi for duration of at least 10 seconds.

B. Pre-construction Testing

1. Owner may, at its own cost, subject random lengths of pipe for testing by an independent laboratory for compliance with this Specification.
 - a. Compliance test shall be performed in United States.
 - b. Any visible defects or failure to meet quality standards herein will be grounds for rejecting entire order.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements

1. Ductile Iron Pipe shall be stored and handled in accordance with guidelines as stated in AWWA M41.
2. Secure and maintain a location to store material in accordance with Division 01.

PART 2 - PRODUCTS

2.01 EQUIPMENT, PRODUCT TYPES AND MATERIALS

A. Acceptable Manufacturers

1. McWayne
2. American
3. U.S. Pipe
4. Approved Equal

B. Pipe

1. Pipe shall be in accordance with AWWA/ANSI C111/A21.11, AWWA/ANSI C150/A21.15, and AWWA/ANSI C151/A21.51.
2. All pipe shall meet the requirements of NSF 61.
3. Pipe shall have a lay length of 18 feet or 20 feet except for special fittings or closure pieces and necessary to comply with Drawings.
4. As a minimum the following pressures classes apply. Drawings may specify a higher pressure class or the pressure and deflection design criteria may also require a higher pressure class, but in no case should they be less than the following:

Diameter (inches)	Minimum Pressure Class (psi)
3 through 12	350
14 through 20	250
24	200
30 through 64	150

5. Pipe markings shall meet the minimum requirements of AWWA/ANSI C151/A21.51. Minimum pipe markings shall be as follows:
 - a. "DI" or "Ductile" shall be clearly labeled on each pipe
 - b. Weight, pressure class and nominal thickness of each pipe
 - c. Year and country pipe was cast
 - d. Manufacturer's mark
6. Pressure and Deflection Design

- a. Pipe design shall be based on trench conditions and design pressure class specified in Drawings.
 - b. Pipe shall be designed according to methods indicated in AWWA/ANSI C150/A21.50, AWWA/ANSI C151/A21.51, and AWWA M41 for trench construction, using the following parameters:
 - 1) Unit Weight of Fill (w) = 130 pcf
 - 2) Live Load = AASHTO HS 20
 - 3) Trench Depth = 12 feet minimum, or as indicated in Drawings
 - 4) Bedding Conditions = Type 4
 - 5) Working Pressure (Pw) = 150 psi
 - 6) Surge Allowance (Ps) = 100 psi
 - 7) Design Internal Pressure (Pi) = Pw + Ps or 2:1 safety factor of actual working pressure plus actual surge pressure, whichever is greater.
 - a) Test Pressure =
 - (1) No less than minimum stated working pressure (150 psi minimum) of pipeline measured at highest elevation along test section.
 - (2) No less than 1.5 times stated working pressure (225 psi minimum) at lowest elevation of test section.
 - 8) Maximum Calculated Deflection (Dx) = 3%
 - 9) Restrained Joint Safety Factor (Sf) = 15%
 - c. Trench depths shall be verified after existing utilities are located.
 - 1) Vertical alignment changes required because of existing utility or other conflicts shall be accommodated by an appropriate change in pipe design depth.
 - 2) In no case shall pipe be installed deeper than its design allows.
7. Provisions for Thrust
- a. Thrust at bends, tees, plugs or other fittings shall be mechanically restrained joints when required by Drawings.
 - b. Thrust at bends adjacent to casing pipe shall be restrained by mechanical means through casing and for a sufficient distance each side of casing.
 - c. No thrust restraint contribution shall be allowed for restrained length of pipe within casing.
 - d. Restrained joints, when required, shall be used for a sufficient distance from each side of bend, tee, plug, valve or other fitting to resist thrust which will be developed at design pressure of pipe. For purpose of thrust, the following shall apply:
 - 1) Valves shall be calculated as dead ends.
 - 2) Design pressure shall be greater than working pressure of pipe or internal pressure (Pi) whichever is greater.
 - 3) Restrained joints shall consist of approved mechanical restrained or push-on restrained joints
 - e. Pipe Manufacturer shall verify length of pipe with restrained joints to resist thrust in accordance with Drawings, AWWA M41, and the following:
 - 1) Weight of earth (We) shall be calculated as weight of projected soil prism above pipe, for unsaturated soil conditions.
 - 2) Soil density = 130 pcf (maximum value to be used), for unsaturated soil conditions
 - 3) If ground water is expected, account for reduced soil density.
8. Joints
- a. General – Comply with AWWA/ANSI C111/A21.11.
 - b. Push-On Joints
 - c. Mechanical Joints
 - d. Push-On Restrained Joints
 - 1) Restraining Push-on joints by means of a special gasket
 - a) Working pressure rating of restrained gasket must exceed test pressure of pipe line to be installed.
 - b) Approved for use of restraining Ductile Iron Pipe in casing with a carrier pipe of 4" to 12".

- c) Otherwise only approved if specially listed on Drawings
 - 2) Push-on Restrained Joint bell and spigot
 - a) Pressure rating shall exceed working and test pressure of pipe line.
 - e. Flanged Joints – AWWA/ANSI C115/A21.15, ASME B16.1, Class 125
 - f. Flange bolt circles and bolt holes shall match those of ASME B16.1, Class 125.
 - g. Field fabricated flanges are prohibited.
- 9. Gaskets
 - a. Provide Gaskets in accordance with Section 33 11 05.
- 10. Bolts and Nuts
 - a. Mechanical Joints
 - 1) Provide bolts and nuts in accordance with Section 33 11 05.
 - b. Flanged Ends
 - 1) Meet requirements of AWWA C115.
 - a) Provide bolts and nuts in accordance with Section 33 11 05.
- 11. Flange Coatings
 - a. Connections to Steel Flanges
 - 1) Buried connections with Steel Flanges shall be coated with a Petrolatum Tape System in accordance with Section 33 11 05.
- 12. Ductile Iron Pipe Exterior Coatings
 - a. All ductile iron pipe for buried service shall have an asphaltic or coal tar epoxy coating on pipe exterior, unless otherwise specified in Contract Documents.
 - b. All ductile iron pipe for exposed service, to be painted in accordance with Division 09 requirements, shall have an exterior coating of sprayed zinc primer. Mass of zinc applied shall be 200 g/m² of pipe surface area. A finishing layer topcoat shall be applied to zinc.
- 13. Polyethylene Encasement
 - a. All buried Ductile Iron Pipe shall be polyethylene encased.
 - b. Use only virgin polyethylene material.
 - c. Encasement for buried pipe shall be 8 mil linear low density (LLD) polyethylene conforming to AWWA/ANSI C105/A21.5 or 4 mil high density cross-laminated (HDCL) polyethylene encasement conforming to AWWA/ANSI C105/A21.5 and ASTM A674.
 - d. Marking: At a minimum of every 2 feet along its length, the mark polyethylene film with the following information:
 - 1) Manufacturer's name or trademark
 - 2) Year of manufacturer
 - 3) AWWA/ANSI C105/A21.5
 - 4) Minimum film thickness and material type
 - 5) Applicable range of nominal diameter sizes
 - 6) Warning – Corrosion Protection – Repair Any Damage.
 - e. Minimum widths

Polyethylene Tube and Sheet Sizes Ductile Iron Pipe		
Nominal Fittings Diameter (inches)	Minimum Width Flat Tube (inches)	Minimum Width Sheet (inches)
3	14	28
4	14	28
6	16	32
8	20	40
10	24	48

Polyethylene Tube and Sheet Sizes Ductile Iron Pipe		
Nominal Fittings Diameter (inches)	Minimum Width Flat Tube (inches)	Minimum Width Sheet (inches)
12	27	54
14	30	60
16	34	68
18	37	74
20	41	82
24	54	108
30	67	134
36	81	162
42	81	162
48	95	190
54	108	216

14. Ductile Iron Pipe Interior Lining
- a. Cement Mortar Lining
 - 1) Ductile Iron Pipe for potable water shall have a cement mortar lining in accordance with AWWA/ANSI C104/A21.04 and be acceptable according to NSF 61.
 - b. Ceramic Epoxy or Epoxy Linings
 - 1) Ductile Iron Pipe for use in low pH applications (raw water on this project) shall be lined with a Ceramic Epoxy or Epoxy lining.
 - 2) Apply lining at a minimum of 40 mils DFT.
 - 3) Due to tolerances involved, gasket area and spigot end up to 6" back from end of spigot end must be coated with 6 mils nominal, 10 mils maximum using a Joint Compound as supplied by manufacturer.
 - a) Apply joint compound by brush to ensure coverage.
 - b) Care should be taken that joint compound is smooth without excess buildup in gasket seat or on spigot ends.
 - c) Coat gasket seat and spigot ends after application of lining.
 - 4) Surface preparation shall be in accordance with manufacturer's recommendations.
 - 5) Check thickness using a magnetic film thickness gauge in accordance with method outlined in SSPC PA 2.
 - 6) Test interior lining of all pipe barrels for pinholes with a non-destructive 2,500 volt test.
 - a) Repair any defects prior to shipment.
 - 7) Mark each fitting with date of application of lining system along with its numerical sequence of application on that date and records maintained by applicator of his work.
 - 8) For all Ductile Iron Pipe in low pH pipe has been cut, coat exposed surface with touch-up material as recommended by manufacturer.
 - a) Touch-up material and lining shall be of same manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General
 - 1. Install pipe, fittings, specials and appurtenances as specified herein, as specified in AWWA C600, AWWA M41 and in accordance with pipe manufacturer's recommendations.
 - 2. See Section 33 11 11 for installation requirements for Ductile Iron Fittings
 - 3. Lay pipe to the lines and grades as indicated in the Drawings.
 - 4. Excavate and backfill trenches in accordance with Section 31 23 17.
 - 5. Embed Ductile Iron Pipe in accordance with Section 31 23 17.

- B. Pipe Handling
 - 1. Haul and distribute pipe and fittings at Site.
 - 2. Handle piping with care to avoid damage.
 - a. Inspect each joint of pipe and reject or repair any damaged pipe prior to lowering into trench.
 - b. Do not handle pipe in such a way that will damage interior lining.
 - c. Use only nylon ropes, slings or other lifting devices that will not damage surface of pipe for handling pipe.
 - 3. At close of each operating day:
 - a. Keep pipe clean and free of debris, dirt, animals and trash – during and after laying operation.
 - b. Effectively seal open end of pipe using a gasketed night cap.

- C. Joint Making
 - 1. Mechanical Joints
 - a. Bolt the follower ring into compression against gasket with bolts tightened down evenly then cross torqued in accordance with AWWA C600.
 - b. Overstressing of bolts to compensate for poor installation practice will not be permitted.
 - 2. Push-on Joints
 - a. Install Push-on joints as defined in AWWA/ANSI C111/A21.11.
 - b. Wipe clean gasket seat inside bell of all extraneous matter.
 - c. Place gasket in the bell in position prescribed by manufacturer.
 - d. Apply a thin film of non-toxic vegetable soap lubricant to inside of gasket and outside of spigot prior to entering spigot into bell.
 - e. When using a field cut plain end piece of pipe, refinish field cut and scarf to conform to AWWA C600.
 - 3. Flanged Joints
 - a. Use erection bolts and drift pins to make flanged connections.
 - 1) Do not use undue force or restraint on ends of fittings.
 - 2) Apply even and uniform pressure to gasket.
 - b. Fitting must be free to move in any direction while bolting.
 - 1) Install flange bolts with all bolt heads faced in same direction.
 - 4. Joint Deflection
 - a. Deflect pipe only when necessary to avoid obstructions or to meet lines and grades and shown in Drawings.
 - b. Deflection of each joint must be in accordance with AWWA C600 Table 3.
 - c. Maximum deflection allowed is 50% of that indicated in AWWA C600.
 - d. Manufacturer's recommendation may be used with approval of Engineer.

- D. Polyethylene Encasement Installation
 - 1. Preparation
 - a. Remove all lumps of clay, mud, cinders, etc., on pipe surface prior to installation of polyethylene encasement.
 - 1) Prevent soil or embedment material from becoming trapped between pipe and polyethylene.

- b. Fit polyethylene film to contour of pipe to affect a snug, but not tight encase with minimum space between polyethylene and pipe.
 - 1) Provide sufficient slack in contouring to prevent stretching polyethylene where it bridges irregular surfaces such as bell-spigot interfaces, bolted joints or fittings and to prevent damage to polyethylene due to backfilling operations.
 - 2) Secure overlaps and ends with adhesive tape and hold.
- c. For installations below water table and/or in areas subject to tidal actions, seal both ends of polyethylene tube with adhesive tape at joint overlap.
- 2. Tubular Type (Method A)
 - a. Cut polyethylene tube to length approximately 2 feet longer than pipe section.
 - b. Slip tube around pipe, centering it to provide 1-foot overlap on each adjacent pipe section and bunching it accordion-fashion lengthwise until it clears pipe ends.
 - c. Lower pipe into trench and make up pipe joint with preceding section of pipe.
 - d. Make shallow bell hole at joints to facilitate installation of polyethylene tube.
 - e. After assembling pipe joint, make overlap of polyethylene tube, pull bunched polyethylene from preceding length of pipe, slip it over end of new length of pipe and wrap until it overlaps joint at end of preceding length of pipe.
 - f. Secure overlap in place.
 - g. Take up slack width at top of pipe to make a snug, but not tight, fit along barrel of pipe, securing fold at quarter points.
 - h. Repair cuts, tears, punctures or other damage to polyethylene.
 - i. Proceed with installation of next pipe in same manner.
- 3. Tubular Type (Method B)
 - a. Cut polyethylene tube to length approximately 1 foot shorter than pipe section.
 - b. Slip tube around pipe, centering it to provide 6" of bare pipe at each end.
 - c. Take up slack width at top of pipe to make a snug, but not tight, fit along barrel of pipe, securing fold at quarter points; secure ends.
 - d. Before making up joint, slip 3-foot length of polyethylene tube over end of preceding pipe section, bunching it accordion-fashion lengthwise.
 - e. After completing joint, pull 3-foot length of polyethylene over joint, overlapping polyethylene previously installed on each adjacent section of pipe by at least 1 foot; make each end snug and secure.
- 4. Sheet Type
 - a. Cut polyethylene sheet to a length approximately 2 feet longer than piece section.
 - b. Center length to provide 1-foot overlap on each adjacent pipe section, bunching it until it clears the pipe ends.
 - c. Wrap polyethylene around pipe so that it circumferentially overlaps top quadrant of pipe.
 - d. Secure cut edge of polyethylene sheet at intervals of approximately 3 feet.
 - e. Lower wrapped pipe into trench and make up pipe joint with preceding section of pipe.
 - f. Make shallow bell hole at joints to facilitate installation of polyethylene.
 - g. After completing joint, make overlap and secure ends.
 - h. Repair cuts, tears, punctures or other damage to polyethylene.
 - i. Proceed with installation of next section of pipe in same manner.
- 5. Pipe-Shaped Appurtenances
 - a. Cover bends, reducers, offsets and other pipe-shaped appurtenances with polyethylene in same manner as pipe and fittings.
- 6. Odd-Shaped Appurtenances
 - a. When it is not practical to wrap valves, tees, crosses, and other odd-shaped pieces in tube, wrap with flat sheet or split length polyethylene tube by passing sheet under appurtenances and bringing it up around body.
 - b. Make seams by bringing edges together, folding over twice and taping down.
 - c. Tape polyethylene securely in place at valve stem and at any other penetrations.
- 7. Repairs

- a. Repair any cuts, tears, punctures or damage to polyethylene with adhesive tape or with short length of polyethylene sheet or cut open tube, wrapped around fitting to cover damaged area and secured in place.
- 8. Openings in Encasement
 - a. Provide openings for branches, service taps, blow-offs, air valves and similar appurtenances by making an X-shaped cut in polyethylene and temporarily folding back film.
 - b. After appurtenance is installed, tape slack securely to appurtenance and repair cut, as well as other damaged area in polyethylene with tape.
 - c. Service taps may also be made directly through polyethylene, with any resulting damaged areas being repaired as described above.
- 9. Junctions between Wrapped and Unwrapped Pipe:
 - a. Where polyethylene-wrapped pipe joins an adjacent pipe that is not wrapped, extend polyethylene wrap to cover adjacent pipe for distance of at least 3 feet.
 - b. Secure end with circumferential turns of tape.
 - c. Wrap service lines of dissimilar metals with polyethylene or suitable dielectric tape for minimum clear distance of 3 feet away from Cast or Ductile Iron Pipe.

3.02 REPAIR/RESTORATION

A. Patching

- 1. Excessive field-patching is not permitted of lining or coating.
- 2. Patching of lining or coating will be allowed where area to be repaired does not exceed 100 square inches and has no dimensions greater than 12".
- 3. In general, there shall not be more than 1 patch on either the lining or coating of any 1 joint of pipe.
- 4. Wherever necessary to patch pipe:
 - a. Make patch with cement mortar as previously specified for interior joints.
 - b. Do not install patched pipe until patch has been properly and adequately cured and approved for laying by Engineer.
- 5. Promptly remove rejected pipe from Site.

3.03 FIELD QUALITY CONTROL

A. Potable Water Mains

- 1. Cleaning, disinfection, hydrostatic testing and bacteriological testing of water mains
 - a. Clean, flush, pig, disinfect, hydrostatic test and bacteriological test water main as specified in Section 33 26 90.

END OF SECTION

SECTION 33 11 11

DUCTILE IRON FITTINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Ductile Iron Fittings 3” through 64” for potable water for use with Ductile Iron Pipe and Polyvinyl Chloride (PVC) Pipe
 - 2. All mechanical joint fittings shall be mechanically restrained using restrained wedge type retainer glands.

- B. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 00 – Proposal Requirements, Contract Forms, and Conditions of the Contract
 - 2. Division 01 – General Requirements
 - 3. Section 03 30 00 – Cast-in-Place Concrete
 - 6. Section 31 23 17 – Trenching
 - 7. Section 33 11 05 – Nuts, Bolts, and Gaskets

1.02 REFERENCES

- A. Definitions
 - 1. Gland or Follower Gland
 - a. Non-restrained, mechanical joint fitting
 - 2. Retainer Gland
 - a. Mechanically restrained mechanical joint fitting, consisting of multiple gripping wedges incorporated into a follower gland meeting applicable requirements of ANSI/AWWA C110/A21.10.

- B. Reference Standards
 - 1. Reference standards cited in this Specification refer to current reference standard published at time of Bid.
 - 2. American Society of Mechanical Engineers (ASME):
 - a. B16.1, Gray Iron Pipe Flanges and Flanged Fittings (Classes 25, 125 and 250).
 - 3. ASTM International (ASTM):
 - a. A193, Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications
 - b. A194, Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
 - c. A242, Standard Specification for High-Strength Low-Alloy Structural Steel.
 - d. A674, Standard Practice for Polyethylene Encasement for Ductile Iron Pipe for Water or Other Liquids.
 - e. B117, Standard Practice for Operating Salt Spray (Fog) Apparatus.
 - 4. American Water Works Association (AWWA):
 - a. C203, Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot Applied.
 - b. C600, Installation of Ductile-Iron Water Mains and their Appurtenances.
 - c. M41, Ductile-Iron Pipe and Fittings.
 - 5. American Water Works Association/American National Standards Institute (AWWA/ANSI):
 - a. C104/A21.4, Cement–Mortar Lining for Ductile-Iron Pipe and Fittings.
 - b. C105/A21.5, Polyethylene Encasement for Ductile-Iron Pipe Systems.
 - c. C110/A21.10, Ductile-Iron and Gray-Iron Fittings.
 - d. C111/A21.11, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

- e. C115/A21.15, Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
- f. C151/A21.51, Ductile-Iron Pipe, Centrifugally Cast, for Water.
- g. C153/A21.53, Ductile-Iron Compact Fittings for Water Service.
- 6. NSF International (NSF):
 - a. 61, Drinking Water System Components - Health Effects.
- 7. Society for Protective Coatings (SSPC):
 - a. PA 2, Measurement of Dry Coating Thickness with Magnetic Gages.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00.
- B. All submittals shall be approved by Owner prior to delivery and/or fabrication for specials.

1.04 ACTION SUBMITTALS / INFORMATIONAL SUBMITTALS

- A. Product Data
 - 1. Ductile Iron Fittings
 - a. Pressure class
 - b. Interior lining
 - c. Joint types
 - 2. Polyethylene encasement and tape
 - a. Planned method of installation
 - b. Whether film is linear low density or high density cross linked polyethylene
 - c. Thickness of film provided
 - 3. Interior lining, if it is other than cement mortar lining in accordance with AWWA/ANSI C104/A21.4
 - a. Material
 - b. Application recommendations
 - c. Field touch-up procedures
 - 4. Thrust Restraint
 - a. Retainer glands
 - b. Thrust harnesses
 - c. Any other means
 - 5. Gaskets
 - a. Provide Gaskets in accordance with Section 33 11 05.
 - 6. Isolation Flanges
 - a. Flanges required by the drawings to be Isolation Flanges shall conform to Section 26 64 00.
 - 7. Bolts and Nuts
 - a. Mechanical Joints
 - 1) Provide bolts and nuts in accordance with Section 33 11 05.
 - b. Flanged Ends
 - 1) Meet requirements of AWWA C115.
 - a) Provide bolts and nuts in accordance with Section 33 11 05.
 - 8. Flange Coatings
 - a. Connections to Steel Flanges
 - 1) Buried connections with Steel Flanges shall be coated with a Petrolatum Tape System in accordance with Section 33 11 05.
- B. Certificates
 - 1. Manufacturer shall furnish an affidavit certifying that all Ductile Iron Fittings meet the provisions of this Section and meet requirements of AWWA/ANSI C110/A21.10 or AWWA/ANSI C153/A21.53.
 - 2. Furnish a certificate stating that buried bolts and nuts conform to ASTM B117.

1.05 QUALITY ASSURANCE

- A. Qualifications
 - 1. Manufacturers
 - a. Fittings manufacturing operations (fittings, lining, and coatings) shall be performed under control of the manufacturer.
 - b. Ductile Iron Fittings shall be manufactured in accordance with AWWA/ANSI C110/A21.10 or AWWA/ANSI C153/A21.53.
 - 1) Perform quality control tests and maintain the results as outlined in these standards to assure compliance.
- B. Pre-construction Testing
 - 1. Owner may, at its own cost, subject random fittings for destructive testing by an independent laboratory for compliance with this Specification.
 - a. Compliance test shall be performed in United States.
 - b. Any visible defects or failure to meet quality standards herein will be grounds for rejecting entire order.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Storage and Handling Requirements
 - 1. Store and handle in accordance with guidelines as stated in AWWA M41.
 - 2. Secure and maintain a location to store material in accordance with Division 01.

PART 2 - PRODUCTS

2.01 EQUIPMENT, PRODUCT TYPES AND MATERIALS

- A. Manufacturers
 - 1. All fittings shall be domestic. Foreign made fittings are not acceptable.
 - 2. Approved manufacturers are as follows:
 - a. McWayne
 - b. American
 - c. U.S. Pipe
 - d. Tyler Pipe
 - e. Approved Equal
- B. Ductile Iron Fittings
 - 1. Ductile Iron Fittings shall be in accordance with AWWA/ANSI C110/A21.10, AWWA/ANSI C153/A21.53.
 - 2. All fittings for potable water service shall meet requirements of NSF 61.
 - 3. Ductile Iron Fittings, at a minimum, shall meet or exceed pressures classes of pipe which fitting is connected, unless specifically indicated in Drawings.
 - 4. Fittings Markings
 - a. Meet minimum requirements of AWWA/ANSI C151/A21.51.
 - b. Minimum markings shall include:
 - 1) "DI" or "Ductile" cast or metal stamped on each fitting
 - 2) Applicable AWWA/ANSI standard for that fitting
 - 3) Pressure rating
 - 4) Number of degrees for all bends
 - 5) Nominal diameter of openings
 - 6) Year and country fitting was cast
 - 7) Manufacturer's mark
 - 5. Joints
 - a. Mechanical Joints with mechanical restraint
 - 1) Comply with AWWA/ANSI C111/A21.11 and applicable parts of ANSI/AWWA C110/A21.10.
 - 2) Retainer gland shall have the following working pressure ratings based on size and type of pipe:

- a) Ductile Iron Pipe
 - (1) 3" – 16", 350 psi
 - (2) 18" – 48", 250 psi
 - b) PVC C900 and C905
 - (1) 3" – 12", 305psi
 - (2) 14" – 16", 235psi
 - (3) 18" – 20", 200psi
 - (4) 24" – 30" 165psi
 - c) Ratings are for water pressure and must include a minimum safety factor of 2 to 1 in all sizes
 - 3) Retainer glands shall have specific designs for Ductile Iron and PVC and it should be easy to differentiate in field.
 - 4) Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536.
 - 5) Mechanical joint restraint shall require conventional tools and installation procedures per AWWA C600, while retaining full mechanical joint deflection during assembly as well as allowing joint deflection after assembly.
 - 6) Proper actuation of gripping wedges shall be ensured with torque limiting twist off nuts.
 - 7) A minimum of 6 wedges shall be required for 8" diameter PVC pipe.
 - b. Push-On, Restrained Joints
 - 1) Restraining Push-on joints by means of a special gasket
 - a) Working pressure rating of restrained gasket must exceed test pressure of pipe line to be installed.
 - b) Approved for use of restraining Ductile Iron Pipe in casing with a carrier pipe of 4" to 12"
 - c) Otherwise only approved if specially listed on Drawings
 - 2) Push-on Restrained Joint bell and spigot
 - a) Pressure rating shall exceed working and test pressure of pipe line
 - c. Flanged Joints
 - 1) AWWA/ANSI C115/A21.15, ASME B16.1, Class 125
 - 2) Flange bolt circles and bolt holes shall match those of ASME B16.1, Class 125.
 - 3) Field fabricated flanges are prohibited.
- 6. Gaskets
 - a. Provide Gaskets in accordance with Section 33 11 05.
- 7. Isolation Flanges
 - a. Flanges required by Drawings to be Isolation Flanges shall conform to Section 33 04 10.
- 8. Bolts and Nuts
 - a. Mechanical Joints
 - 1) Provide bolts and nuts in accordance with Section 33 11 05.
 - b. Flanged Ends
 - 1) Meet requirements of AWWA C115.
 - a) Provide bolts and nuts in accordance with Section 33 11 05.
- 9. Flange Coatings
 - a. Connections to Steel Flanges
 - 1) Buried connections with Steel Flanges shall be coated with a Petrolatum Tape System in accordance with Section 33 11 05.
- 10. Ductile Iron Fitting Exterior Coatings
 - a. All Ductile Iron Fittings for exposed service, to be painted in accordance with Division 09 requirements, shall have an exterior coating of sprayed zinc primer. Mass of zinc applied shall be 200 g/m² of pipe surface area. A finishing layer topcoat shall be applied to zinc.

- b. All Ductile Iron Fittings for buried service shall have a standard coal tar epoxy, or equivalent, coating.
- 11. Polyethylene Encasement
 - a. All buried Ductile Iron Fittings shall be polyethylene encased.
 - b. Use only virgin polyethylene material.
 - c. Encasement for buried fittings shall be 8 mil linear low density (LLD) polyethylene conforming to AWWA/ANSI C105/A21.5 or 4 mil high density cross-laminated (HDCL) polyethylene encasement conforming to conforming to AWWA/ANSI C105/A21.5 and ASTM A674.
 - d. Marking: At a minimum of every 2 feet along its length, mark polyethylene film with the following information:
 - 1) Manufacturer’s name or trademark
 - 2) Year of manufacturer
 - 3) AWWA/ANSI C105/A21.5
 - 4) Minimum film thickness and material type
 - 5) Applicable range of nominal diameter sizes
 - 6) Warning – Corrosion Protection – Repair Any Damage
 - e. Special Markings/Colors
 - 1) Reclaimed Water, perform one of the following:
 - a) Label polyethylene encasement with “RECLAIMED WATER”,
 - b) Provide purple polyethylene in accordance with American Public Works Association Uniform Color Code; or
 - c) Attach purple reclaimed water marker tape to polyethylene wrap.
 - f. Minimum widths

Polyethylene Tube and Sheet Sizes Push-On Joint Fittings		
Nominal Fittings Diameter (inches)	Minimum Width Flat Tube (inches)	Minimum Width Sheet (inches)
3	14	28
4	14	28
6	16	32
8	20	40
10	24	48
12	27	54
14	30	60
16	34	68
18	37	74
20	41	82
24	54	108
30	67	134

Polyethylene Tube and Sheet Sizes Push-On Joint Fittings		
Nominal Fittings Diameter (inches)	Minimum Width Flat Tube (inches)	Minimum Width Sheet (inches)
36	81	162
42	81	162
48	95	190
54	108	216

12. Ductile Iron Fittings Interior Lining
- a. Cement Mortar Lining
 - 1) Ductile Iron Fittings for potable water shall have a cement mortar lining in accordance with AWWA/ANSI C104/A21.4 and be acceptable according to NSF 61.
 - b. Ceramic Epoxy or Epoxy Linings
 - 1) Ductile Iron Fittings for use in low pH water (raw water on this project).
 - 2) Apply lining at a minimum of 40 mils DFT
 - 3) Due to tolerances involved, gasket area and spigot end up to 6" back from end of spigot end must be coated with 6 mils nominal, 10 mils maximum using a Joint Compound as supplied by manufacturer.
 - a) Apply joint compound by brush to ensure coverage.
 - b) Care should be taken that joint compound is smooth without excess buildup in gasket seat or on spigot ends.
 - c) Coat gasket seat and spigot ends after application of lining.
 - 4) Surface preparation shall be in accordance with manufacturer's recommendations.
 - 5) Check thickness using a magnetic film thickness gauge in accordance with method outlined in SSPC PA 2.
 - 6) Test interior lining of all fittings for pinholes with a non-destructive 2,500 volt test.
 - a) Repair any defects prior to shipment.
 - 7) Mark each fitting with date of application of lining system along with its numerical sequence of application on that date and records maintained by applicator of his work.
 - 8) For all Ductile Iron Fittings in low pH service where fitting has been cut, coat exposed surface with touch-up material as recommended by manufacturer.
 - a) Touch-up material and lining shall be of same manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General
 1. Install fittings, specials and appurtenances as specified herein, as specified in AWWA C600, AWWA M41, and in accordance with fittings manufacturer's recommendations.
 2. Lay fittings to lines and grades as indicated in Drawings.
 3. Excavate and backfill trenches in accordance with 31 23 17.
 4. Embed Ductile Iron Fittings in accordance with 31 23 17.
- B. Joint Making

1. Mechanical Joints with required mechanical restraint
 - a. All mechanical joints require mechanical restraint.
 - b. Bolt retainer gland into compression against the gasket, with bolts tightened down evenly then cross torqued in accordance with AWWA C600.
 - c. Overstressing of bolts to compensate for poor installation practice will not be permitted.
 2. Push-on Joints (restrained)
 - a. All push-on joints shall be restrained push-on type.
 - b. Install Push-on joints as defined in AWWA/ANSI C111/A21.11.
 - c. Wipe clean gasket seat inside bell of all extraneous matter.
 - d. Place the gasket in bell in the position prescribed by manufacturer.
 - e. Apply a thin film of non-toxic vegetable soap lubricant to inside of gasket and the outside of spigot prior to entering spigot into bell.
 - f. When using a field cut plain end piece of pipe, refinished field cut and scarf to conform to AWWA M-41.
 3. Flanged Joints
 - a. Use erection bolts and drift pins to make flanged connections.
 - 1) Do not use undue force or restraint on ends of fittings.
 - 2) Apply even and uniform pressure to gasket.
 - b. Fitting must be free to move in any direction while bolting.
 - 1) Install flange bolts with all bolt heads faced in same direction.
 4. Joint Deflection
 - a. Deflect pipe only when necessary to avoid obstructions or to meet lines and grades and shown in Drawings.
 - b. Deflection of each joint must be in accordance with AWWA C600 Table 3.
 - c. Maximum deflection allowed is 50% of that indicated in AWWA C600.
 - d. Manufacturer's recommendation may be used with approval of Engineer.
- C. Polyethylene Encasement Installation
1. Preparation
 - a. Remove all lumps of clay, mud, cinders, etc., on fittings surface prior to installation of polyethylene encasement.
 - 1) Prevent soil or embedment material from becoming trapped between fittings and polyethylene.
 - b. Fit polyethylene film to contour of fittings to affect a snug, but not tight encase with minimum space between polyethylene and fittings.
 - 1) Provide sufficient slack in contouring to prevent stretching polyethylene where it bridges irregular surfaces such as bell-spigot interfaces, bolted joints or fittings, and to prevent damage to polyethylene due to backfilling operations.
 - 2) Secure overlaps and ends with adhesive tape and hold.
 - c. For installations below water table and/or in areas subject to tidal actions, seal both ends of polyethylene tube with adhesive tape at joint overlap.
 2. Tubular Type (Method A)
 - a. Cut polyethylene tube to length approximately 2 feet longer than fittings section.
 - b. Slip tube around fittings, centering it to provide 1 foot overlap on each adjacent pipe section and bunching it accordion-fashion lengthwise until it clears fittings ends.
 - c. Lower fittings into trench with preceding section of pipe.
 - d. Make shallow bell hole at joints to facilitate installation of polyethylene tube.
 - e. After assembling fittings make overlap of polyethylene tube, pull bunched polyethylene from preceding length of pipe, slip it over end of fitting and wrap until it overlaps joint at end of preceding length of pipe.
 - f. Secure overlap in place.
 - g. Take up slack width at top of fitting to make a snug, but not tight, fit along barrel of fitting, securing fold at quarter points.
 - h. Repair cuts, tears, punctures or other damage to polyethylene.
 - i. Proceed with installation of next fitting in same manner.

3. Tubular Type (Method B)
 - a. Cut polyethylene tube to length approximately 1 foot shorter than fitting section.
 - b. Slip tube around fitting, centering it to provide 6" of bare fitting at each end.
 - c. Take up slack width at top of fitting to make a snug, but not tight, fit along barrel of fitting, securing fold at quarter points; secure ends.
 - d. Before making up joint, slip 3-foot length of polyethylene tube over end of preceding pipe section, bunching it accordion-fashion lengthwise.
 - e. After completing joint, pull 3-foot length of polyethylene over joint, overlapping polyethylene previously installed on each adjacent section of pipe by at least 1 foot; make each end snug and secure.
 4. Sheet Type
 - a. Cut polyethylene sheet to a length approximately 2 feet longer than piece section.
 - b. Center length to provide 1-foot overlap on each fitting, bunching it until it clears the fitting ends.
 - c. Wrap polyethylene around fitting so that it circumferentially overlaps top quadrant of fitting.
 - d. Secure cut edge of polyethylene sheet at intervals of approximately 3 feet.
 - e. Lower wrapped fitting into trench with preceding section of pipe.
 - f. Make shallow bell hole at joints to facilitate installation of polyethylene.
 - g. After completing joint, make overlap and secure ends.
 - h. Repair cuts, tears, punctures or other damage to polyethylene.
 - i. Proceed with installation of fittings in same manner.
 5. Pipe-Shaped Appurtenances
 - a. Cover bends, reducers, offsets, and other pipe-shaped appurtenances with polyethylene in same manner as pipe and fittings.
 6. Odd-Shaped Appurtenances
 - a. When it is not practical to wrap valves, tees, crosses and other odd-shaped pieces in tube, wrap with flat sheet or split length polyethylene tube by passing sheet under appurtenances and bringing it up around body.
 - b. Make seams by bringing edges together, folding over twice and taping down.
 - c. Tape polyethylene securely in place at valve stem and at any other penetrations.
 7. Repairs
 - a. Repair any cuts, tears, punctures or damage to polyethylene with adhesive tape or with short length of polyethylene sheet or cut open tube, wrapped around fitting to cover damaged area, and secure in place.
 8. Openings in Encasement
 - a. Provide openings for branches, service taps, blow-offs, air valves and similar appurtenances by making an X-shaped cut in polyethylene and temporarily folding back film.
 - b. After appurtenance is installed, tape slack securely to appurtenance and repair cut, as well as other damaged area in polyethylene with tape.
 - c. Service taps may also be made directly through polyethylene, with any resulting damaged areas being repaired as described above.
 9. Junctions between Wrapped and Unwrapped Fittings
 - a. Where polyethylene-wrapped fitting joins an adjacent pipe that is not wrapped, extend polyethylene wrap to cover adjacent pipe for distance of at least 3 feet.
 - b. Secure end with circumferential turns of tape.
 - c. Wrap service lines of dissimilar metals with polyethylene or suitable dielectric tape for minimum clear distance of 3 feet away from cast or Ductile Iron Fittings.
- D. Blocking
1. Install concrete blocking in accordance with Section 03 30 00 for all bends, tees, crosses and plugs in pipe lines as indicated in Drawings.
 2. Place concrete blocking so as to rest against firm undisturbed trench walls, normal to thrust.

3. Supporting area for each block shall be at least as great as that indicated on Drawings and shall be sufficient to withstand thrust, including water hammer, which may develop.
4. Each block shall rest on a firm, undisturbed foundation or trench bottom.
5. If Contractor encounters soil that appears to be different than that which was used to calculate blocking according to Drawings, Contractor shall notify Engineer prior to installation of blocking.

3.02 REPAIR/RESTORATION

A. Patching

1. Excessive field-patching is not permitted of lining or coating.
2. Patching of lining or coating will be allowed where area to be repaired does not exceed 100 square inches and has no dimensions greater than 12”.
3. In general, there shall not be more than 1 patch on either the lining or the coating of any fitting.
4. Wherever necessary to patch the fitting:
 - a. Make patch with cement mortar as previously specified for interior joints.
 - b. Do not install patched fitting until patch has been properly and adequately cured and approved for laying by Owner.
 - c. Promptly remove rejected fittings from Site.

3.03 FIELD [OR] SITE QUALITY CONTROL

A. Potable Water Mains

1. Cleaning, disinfection, hydrostatic testing and bacteriological testing of water mains
 - a. Clean, flush, disinfect, hydrostatic test and bacteriological test water main as specified in Section 33 26 90.

END OF SECTION

SECTION 33 11 13

BAR-WRAPPED STEEL CYLINDER PIPE

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Concrete Pressure Pipe, Bar-Wrapped, Steel Cylinder Type (Concrete Pressure Pipe) 18” through 72” for potable water applications in conformance with AWWA C303.
- B. Deviations from this Specification shall be approved by Engineer for Owner.
- C. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 00 – Bidding Requirements, Contract Forms, and Conditions of the Contract
 - 2. Division 01 – General Requirements
 - 3. Section 26 64 00 - Cathodic Protection Systems
 - 4. Section 31 23 17 - Trenching
 - 5. Section 33 11 05 – Nuts, Bolts, and Gaskets

1.02 REFERENCES

- A. Reference standards cited in this Specification refer to current reference standard published at time of Bid, unless a date is specifically cited.
- B. American Society of Mechanical Engineers (ASME):
 - 1. B16.1, Gray Iron Pipe Flanges and Flanged Fittings (Classes 25, 125 and 250).
- C. American Society of Testing and Materials (ASTM):
 - 1. A242, Standard Specification for High-Strength Low-Alloy Structural Steel.
 - 2. A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - 3. B117, Standard Practice for Operating Salt Spray (Fog) Apparatus.
 - 4. B633, Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
 - 5. C33, Standard Specification for Concrete Aggregates.
 - 6. C144, Standard Specification for Aggregate for Masonry Mortar.
 - 7. C150, Specification for Portland Cement.
 - 8. C293, Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Center-Point Loading).
 - 9. C497, Methods of Testing Concrete Pipe.
 - 10. C882, Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear.
 - 11. C1090, Standard Test Method for Measuring Changes in Height of Cylindrical Specimens of Hydraulic-Cement Grout.
 - 12. E165, Standard Practice for Liquid Penetrant Examination for General Industry.
- D. American Welding Society (AWS):
 - 1. D1.1, Structural Welding Code - Steel.
- E. American Water Works Association (AWWA):
 - 1. C206, Field Welding of Steel Water Pipe.
 - 2. C207, Steel Pipe Flanges for Waterworks Service - Sizes 4” through 144”.
 - 3. C303, Concrete Pressure Pipe, Bar-Wrapped, Steel-Cylinder Type.
 - 4. M9, Concrete Pressure Pipe.
- F. American Water Works Association/American National Standards Institute (AWWA/ANSI):
 - 1. C111/A21.11, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

- G. National Sanitation Foundation (NSF):
 - 1. NSF 61, Drinking Water System Components - Health Effects

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00.
- B. All submittals shall be approved by Engineer for Owner prior to delivery and/or fabrication for specials.
- C. Action submittals/informational submittals
- D. Product Data
 - 1. Exterior Coating
 - a. Material data
 - b. Application recommendations
 - c. Field touch-up procedures
 - 2. Joint Wrappers
 - a. Material data
 - b. Installation recommendations
 - 3. Flexible Joint Couplings
 - a. Manufacturer
 - b. Model
 - 4. Mixes
 - a. Mortar for interior joints and patches
 - b. Bonding agents for patches
 - 5. Gaskets (if applicable)
- E. Shop Drawings – Furnish for Concrete Pressure Pipe used in the potable water systems including:
 - 1. Wall thickness design calculations sealed by a Licensed Professional Engineer in Texas including:
 - a. Internal pressure
 - 1) Working Pressure
 - 2) Test Pressure
 - 3) Surge pressure
 - b. External pressure
 - 1) Deflection
 - 2) Buckling
 - c. Special physical loading such as supports or joint design
 - d. Thermal expansion and/or contraction, if applicable for proposed installation
 - e. Thrust restraint calculations for all fittings and valves including restraint length sealed by a Licensed Professional Engineer in Texas.
 - 2. Fabrication and lay drawings showing a schematic location with profile and a tabulated layout schedule that is sealed by a Licensed Professional Engineer in Texas and includes:
 - a. Pipe class
 - b. Joint types
 - c. Fittings
 - d. Thrust Restraint
 - e. Stationing (in accordance with the Drawings)
 - f. Transitions
 - g. Joint deflection
 - h. Outlet locations for welding, ventilation, and access
 - i. Welding requirements
 - 3. Pipe within Casing
 - a. Provide drawings detailing how pipe is restrained to prevent floating within casing.
 - 4. Certificates and Test Reports

- a. Submittals for certificates and testing reports shall be as outlined in this Section.

1.04 QUALITY ASSURANCE

A. Qualifications

1. Manufacturers

- a. Shall be American Concrete Pressure Pipe Association (ACPPA) Quality Program certified, I.S.O. Quality Certification Program certified, or equal, for Concrete Pressure Pipe and accessory manufacturing.
- b. Pipe manufacturing operations (pipe, lining, and coatings) shall be performed under the control of the manufacturer.
- c. Pipe shall be product of 1 manufacturer which has had not less than 10 years successful experience manufacturing AWWA C303 pipe of particular type and size indicated.
 - 1) Experience record will be thoroughly investigated by Engineer, and acceptance will be at sole discretion of Engineer and Owner.

B. Certifications

1. Prior to shipment of pipe, Pipe Manufacturer shall submit the following:

- a. Certificate of Adequacy of Design stating that pipe to be furnished complies with AWWA C303 and these Specifications
- b. Copies of results of factory hydrostatic tests shall be provided to Engineer
- c. Mill certificates, including chemical and physical test results for each heat of steel
 - 1) Manufacturer shall perform the tests described in AWWA C303, for all pipe, fittings, and specials, except that absorption test detailed in this Specification shall supersede the requirements of applicable portion of AWWA C303.
- d. Certified test reports for welder certification for factory and field welds in accordance with AWWA C303, Section 5
- e. Certified test reports for cement mortar tests
- f. Certified test reports for steel cylinder tests

C. Hydrostatic Pressure Testing

- 1. Hydrostatic pressure testing shall meet or exceed requirements of AWWA C303 Section 4.6 – Fabrication and Section 33 26 90 Water Pipeline Testing and Disinfection.
 - a. Each pipe cylinder, with rings welded to its ends, shall be hydrostatically tested prior to application of lining or coating.
 - b. Internal test pressure shall be that which results in a fiber stress equal to 75% of minimum yield strength of steel used.
 - c. Each pipe cylinder tested shall be completely watertight under maximum test pressure.
 - d. Test pressure shall be held for sufficient time to observe weld seams.
 - e. Pipe manufacturer shall maintain a recording of pressure gauge report and provide to Engineer.
- 2. Fittings shall be fabricated from hydrostatically tested pipe or fabricated of welded steel sheets or plates.
 - a. Fittings shall be tested in accordance with AWWA C303.
- 3. Factory Testing
 - a. Cement Mortar Coating - Absorption Test
 - 1) A water absorption test shall be performed on samples of cured mortar coating taken from each working shift.
 - a) Mortar coating samples shall have been cured in same manner as pipe.
 - b) A test value shall consist of average of a minimum of 3 samples taken from same working shift.
 - c) Test method shall be in accordance with ASTM C497, Method A.

- d) Average absorption value for any test shall not exceed 9% and no individual sample shall have an absorption exceeding 1%.
- e) Tests for each working shift shall be performed on a daily basis until conformance to absorption requirements has been established by 10 consecutive passing test results, at which time testing may be performed on a weekly basis for each working shift.
- f) Daily testing shall be resumed for each working shift with failing absorption test results and shall be maintained until conformance to the absorption requirements is re-established by 10 consecutive passing test results.

D. Cement Mortar Lining

- 1. Shop-applied cement mortar linings shall be tested in accordance with AWWA C303.

E. Owner Testing and Inspection

- 1. Owner reserves the option to have an independent testing laboratory, at Owner's expense, inspect pipe and fittings at pipe manufacturer's plant.
 - a. Owner's testing laboratory and Engineer shall have free access to manufacturer's plant.
 - b. Pipe manufacturer shall notify Owner, in writing, at least 2 weeks prior to pipe fabrication as to start of fabrication and fabricating schedule. Owner will then advise manufacturer as to Owner's decision regarding tests to be performed by an independent testing laboratory.
 - c. In the event Owner elects to retain an independent testing laboratory to make material tests and weld tests, it is intent that tests be limited to 1 spot testing of each category unless tests do not show compliance with standard.
 - 1) If these tests do not show compliance, Owner reserves its right to have laboratory make additional tests and observations.
- 2. Inspection and testing by independent testing laboratory anticipates that production of pipe shall be done over a normal period of time and without "slow downs" or other abnormal delays.
 - a. In event that an abnormal production time is required, and Owner is required to pay excessive costs for inspection, then Contractor shall be required to reimburse Owner for such costs over and above those which would have been incurred under a normal schedule of production as determined by Engineer.

F. Manufacturer's Technician for Pipe Installation

- 1. Pipe Manufacturer's Representative
 - a. During construction period, pipe manufacturer shall furnish services of a factory trained, qualified, job experienced technician to advise and instruct, as necessary, in pipe laying and pipe jointing.
 - 1) Technician shall assist and advise Contractor in his pipe laying operations and shall instruct construction personnel in proper joint assembly and joint inspection procedures.
 - 2) Technician is not required to be on-site full time; however, technician shall be regularly on-site during first 2 weeks of pipe laying and thereafter as requested by Engineer, Owner or Contractor.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packing

- 1. Prepare pipe for shipment to:
 - a. Afford maximum protection from normal hazards of transportation
 - b. Allow pipe to reach project site in an undamaged condition
- 2. Pipe damaged in shipment shall not be delivered to Site unless such damaged pipe is properly repaired.

3. After completed pipe and fittings have been removed from final cure at manufacturing plant:
 - a. Protect pipe lining from drying by means of plastic end covers banded to pipe ends.
 - b. Maintain covers over pipe ends at all times until ready to be installed.
 - c. Moisture shall be maintained inside pipe by periodic addition of water as necessary.
 4. Pipes shall be carefully supported during shipment and storage.
 - a. Pipe, fittings and specials shall be separated so that they do not bear against each other and whole load shall be securely fastened to prevent movement in transit.
 - b. Ship pipe on padded bunks with tie-down straps approximately over stulling.
 - c. Store pipe on padded skids, sand or dirt berms, tires or other suitable means to protect pipe from damage.
 - d. Each end and each length of pipe, fitting or special (42" and larger) and middle of each pipe joint shall be internally supported and braced with stulls to maintain a true circular shape.
 - 1) Internal stulls shall consist of timber or steel firmly wedged and secured so that stulls remain in place during storage, shipment and installation.
 - 2) Pipe shall be rotated so that one stull remains vertical during storage, shipment and installation.
- B. Delivery, Handling, and Storage
1. Once first shipment of pipe has been delivered to Site, Engineer and Contractor shall inspect pipe's interior coating for excessive cracking.
 - a. If excessive cracking is found, exceeding allowance in AWWA C303, modify shipping procedures to reduce or eliminate cracking.
 2. Deliver, handle and store pipe in accordance with manufacturer's recommendations to protect coating systems.
- C. Marking for Identification
1. For each joint of pipe and each fitting, plainly mark on 1 end:
 - a. Class for which it is designated
 - b. Date of manufacturer
 - c. Identification number
 - d. Top centerlines shall be marked on all specials.
- D. Point of Delivery
1. Contractor is responsible for securing and maintaining a location to store material.

PART 2 - PRODUCTS

2.01 EQUIPMENT, PRODUCT TYPES, AND MATERIALS

- A. Manufacturers
1. Approved Manufacturers
 - a. Thompson Pipe Group
 - b. Northwest Pipe Company
 - c. Ameron Water Transmission Group
 2. Manufacturer must comply with this Specification and related Sections.
- B. Materials
1. General
 - a. Pipe shall be manufactured in accordance with latest revisions of AWWA C303, AWWA M9, as well as special requirements of this Specification.
 - b. All pipe shall meet requirements of NSF 61.
 2. Cement
 - a. Cement for use in concrete and mortar shall be Type I or II Portland Cement.

3. Aggregates
 - a. Aggregates for concrete lining and coating shall conform to ASTM C33.
4. Sand
 - a. Sand used for inside and outside joints shall be of silica base, conforming to ASTM C144
5. Special Coating (Mortar Rings)
 - a. Pipe to be installed in casing shall have 2 built-up mortar rings, each approximately 2 feet long and slightly higher than pipe bell, to prevent pipe from being supported by pipe bell.
 - b. Built-up mortar rings are to be applied at quarter points of pipe section.
6. Bushings, Couplings and Plugs
 - a. Where outlets or taps are threaded, furnish and install brass reducing bushings in larger steel half couplings for outlet size indicated.
 - b. Threaded plugs shall be brass only.
7. Mixes
 - a. Cement Mortar
 - 1) Cement mortar used for pouring joints shall consist of:
 - a) 1 part Portland Cement
 - b) 2 parts clean, fine, sharp silica sand
 - c) Mixed with water
 - d) No manufactured sand shall be permitted.
 - e) Exterior joint mortar shall be mixed to consistency of thick cream.
 - f) Interior joint mortar shall be mixed with as little water as possible so that mortar is very stiff, but workable.
 - g) Cement shall be ASTM C150, Type I or Type II.
 - h) Sand shall conform to ASTM C144.
 - 2) Cement mortar used for patching shall be mixed as per cement mortar for inside joints.
 - b. Provide WELD-CRETE Probond Epoxy Bonding Agent ET-150, parts A and B; Sikadur 32 Hi-Mod or approved equal bonding agent for pipe patching.
8. Joint Wrappers
 - a. Joint wrappers shall be manufactured by Mar-Mac Manufacturing Company, or approved equal.
 - b. For pipe within casing, Flex Protex joint filler, or approved equal, may be used for pipes that can be welded from the interior.
9. Flexible Joint Couplings
 - a. Flexible Joint Couplings shall be Dresser Style 38, Smith-Blair Style 411 or approved equal.
10. Pipe Ends
 - a. Standard pipe end shall include steel joint ring and a continuous solid rubber ring gasket as per AWWA M9.
11. Gaskets
 - a. Flange in accordance with AWWA C207.
 - b. Provide Gaskets in accordance with Section 33 11 05.
12. Bolts and Nuts
 - a. Flanged Ends
 - 1) Flange in accordance with AWWA C207.
 - 2) Provide stainless bolts and nuts in accordance with Section 33 11 05.
13. Threaded Outlets
 - a. Where outlets or taps are threaded, Threaded with CC Threads and furnish and install brass bushings for outlet size indicated.
14. Weld Lead Outlets (if applicable)
 - a. Use of threaded outlets for access for weld leads is permitted.
 - b. Additional outlet configurations shall be approved by Engineer.
 - c. Outlets shall be welded after use.
15. Snap Rings
 - a. Snap rings shall be manufactured by Hanson, or approved equal.

16. Butt Straps for Closure Piece
- a. Provide at locations indicated on Drawings or for connections to existing pipe. Minimum of 24" wide split butt strap; minimum plate thickness equal or greater than thinnest member being joined (but no less than 1/4" thickness); fabricated from material equal in chemical and physical properties to thinnest member being joined. Permit no angular deflection at butt-strap joints.

B. Performance / Design Criteria

1. Pipe Design

- a. Pipe shall be designed, manufactured and tested in accordance with latest revisions of AWWA C303, AWWA M9, as well as special requirements of this Specification.
- b. Sizes and pressure classes (working pressure) shall be as specified in Drawings.
- c. For purposes of pipe design, working pressure plus transient pressure shall be as indicated below.
- d. Pipe design shall be based on trench conditions and design pressure class specified in Drawings.
- e. Pipe shall be designed according to methods indicated in AWWA C303 and AWWA M9 for trench construction, using the following parameters:
 - 1) Unit Weight of Fill (w) = 130 pounds per cubic foot
 - 2) Live Load = AASHTO H-20 truck for unpaved conditions
 - 3) Live Load = Cooper E-80 loading for railroad crossings
 - 4) Trench Depth = As indicated on Drawings
 - 5) Coefficient $K_u' = 0.150$
 - 6) Trench Width (B_d) as indicated on Drawings
 - 7) Bedding Conditions = as indicated on Drawings
 - 8) Pressure Class = 150 psi min. working pressure, or as shown on Drawings, whichever is greatest.
 - 9) Surge Allowance = 100 psi minimum
 - a) where: Total Pressure (including surge) = work pressure (psi) + 100 psi.
 - 10) Deflection Lag Factor = 1.0
 - 11) Soil Reaction Modulus (E') < 1,000
- f. Trench depths indicated on Drawings shall be verified after existing utilities are located.
 - 1) Vertical alignment changes required because of existing utility or other conflicts shall be accommodated by an appropriate change in pipe design depth.
 - 2) In no case shall pipe be installed deeper than its design allows.

2. Provisions for Thrust

- a. Thrust at bends, tees or other fittings shall be resisted by restrained joints or snap rings.
 - 1) Thrust at bends adjacent to casing shall be restrained by welding joints through the casing and a sufficient distance each side of casing.
 - 2) No thrust restraint contribution shall be allowed for pipe in casing unless annular space in casing is filled with grout.
 - 3) Distance for thrust restraint shown on Drawings is minimum restraint and does not relieve manufacturer from calculating restraint needs as specified herein.
 - a) In no case shall restrained distance be less than indicated on Drawings.
- b. Restrained joints shall be used a sufficient distance from each side of bend, tee, plug or other fitting to resist thrust which develops at design pressure of pipe.
 - 1) Distance for thrust restraint shown on Drawings is minimum restraint and does not relieve manufacturer from calculating restraint needs as specified herein.
 - a) In no case shall restrained distance be less than indicated on Drawings.
 - 2) Restrained joints shall consist of welded joints or snap rings.

- 3) In areas where restrained joints are used for thrust restraint, pipe shall have adequate cylinder thickness to transmit thrust forces.
- c. Thrust restraint design
 - 1) Length of pipe with restrained joints to resist thrust forces shall be verified by pipe manufacturer in accordance with AWWA M9 and the following:
 - a) Weight of Earth (W_e) shall be calculated as weight of projected soil prism above pipe.
 - 2) Soil Density = 130 pounds per cubic foot (maximum value to be used for unsaturated soil).
4. Inside Diameter
 - a. Inside diameter, of the cement mortar lining shall be nominal diameter specified, unless otherwise indicated on Drawings.
5. Joint Bonds, Insulated Connections and Flange Gaskets
 - a. Joint Bonds, Insulated Connection and Flange Gaskets shall be in accordance with Section 26 64 00.
6. Bend Fittings
 - a. All bend fittings shall be long radius to permit passage of pipeline pigs.
7. Fittings with Flanges
 - a. Flanged joints shall be provided at connections to valves and where indicated on Drawings.
 - b. Ends to be fitted with slipon flanges shall have longitudinal or spiral welds ground flush to accommodate type of flanges provided.
 - c. Pipe flanges and welding of flanges to Concrete Pressure Pipe shall conform to requirements of AWWA C207 and AWWA C206.
 - d. Pipe flanges shall be of rated pressure equal to or greater than adjacent pipe class.
 - e. Flanges shall match fittings or appurtenances which are to be attached.
 - f. Flanges shall be Class E with a minimum of 275 psi working pressure in accordance with AWWA C207 and in accordance with ASME B16.1 Class 125.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General
 1. Install Concrete Pressure Pipe, fittings, specials and appurtenances as required for proper functioning of completed pipe line.
 2. Install pipe, fittings, specials and appurtenances as specified herein, as specified in AWWA M9, and in accordance with pipe manufacturer's recommendations.
 3. Lay pipe to lines and grades show on Drawings.
 4. Excavate, embed and backfill trenches in accordance with Section 31 23 17.
 5. At the close of each operating day:
 - a. Keep pipe clean and free of debris, dirt, animals and trash – during and after laying operation.
 - b. Effectively seal open end of pipe using a gasketed night cap.
 6. If pipe is placed in casing, restrain pipe from floating.
- B. Pipe Handling
 1. Haul and distribute pipe fittings at Site and handle piping with care to avoid damage.
 2. Before lowering into trench and inspect each joint of pipe and reject or repair any damaged pipe.
 3. Pipe shall be handled at all times with a minimum of 1" wide non-abrasive sling, belts or other equipment designed to prevent damage to coating or lining.
 4. Equipment shall be kept in such repair that its continued use is not injurious to coating.
 5. Spacing of pipe supports required to handle pipe shall be adequate to prevent cracking or damage to lining or coating.

- C. Pipe Jointing
1. General
 - a. Thoroughly clean bell and spigot rings before laying each joint of pipe by brushing and wiping.
 - b. If any damage to protective coating on metal has occurred, repair damage before laying pipe.
 - c. Lubricate gasket and inside surface of bell with an approved lubricant (flax soap) which will facilitate telescoping of joint.
 - d. Tightly fit together sections of pipe and exercise care to secure true alignment and grade.
 - e. When a joint of pipe is being laid, place gasket on the spigot ring and enter spigot end of pipe into bell of adjoining pipe and force into position.
 - 1) Inside joint space between ends of pipe sections shall have an opening within tolerances as recommended by pipe manufacturer.
 - f. No "blocking up" of pipe or joints will be permitted, and if pipe is not uniformly supported or joint not made up properly, remove joint and properly prepare trench.
 - g. After joining, check the position of gasket with a feeler gauge.
 - 1) If gasket is out of position, disassemble joint and repeat joint laying procedure.
 - h. For interior welded joints, complete backfilling before welding.
 - i. For exterior field-welded joints, provide adequate working room under and beside pipe.
 2. Exterior Joints
 - a. Make exterior joint by placing a joint wrapper around pipe and secure in place with 2 metal straps.
 - 1) Wrapper shall be 9" wide for pipe 36" and larger, and 7" wide for smaller pipe, hemmed on each side.
 - 2) Wrapper shall be fiberglass reinforced or burlap cloth, with lengths encircling pipe, leaving enough opening between ends to allow mortar to be poured inside wrapper into joint.
 - 3) Fill joint with mortar from 1 side in 1 continuous operation until it has flowed entirely around pipe.
 - 4) During filling of joint, pat or manipulate sides of wrapper to settle mortar and expel any entrapped air.
 - 5) Leave wrappers in place undisturbed until mortar has set-up.
 3. Interior Joints
 - a. Upon completion of backfilling of pipe trench, fill inside joint recess with a stiff cement mortar/high-strength grout.
 - b. Prior to placing of mortar/grout, clean out dirt or trash which has collected in joint and moisten concrete surfaces of joint space by spraying or brushing with a wet brush.
 - c. Ram or pack stiff mortar/grout into joint space and take extreme care to insure that no voids remain in joint space.
 - d. After joint has been filled, level surfaces of joint mortar/grout with interior surfaces of pipe with a steel trowel so that surface is smooth.
 - e. Interior joints of pipe smaller than 21" shall have bottom of bell buttered with grout, prior to inserting spigot, such that when spigot is pushed into position it will extrude surplus grout from joint.
 - 1) Surplus grout shall be struck off flush with inside of pipe by pulling a filled burlap bag or an inflated ball through pipe with a rope.
 4. Welded Joints
 - a. Weld joints in accordance with AWWA M9.
 - 1) Contractor shall provide adequate ventilation for welders and for inspector(s) to observe welds.
 - 2) Unless otherwise specified on Drawings, welds shall be full circle fillet welds.

- b. Adequate provisions for reducing temperature stresses shall be responsibility of Contractor.
 - c. Before welding:
 - 1) Thoroughly clean pipe ends.
 - 2) Weld pipe by machine or by manual shielded electric arc process.
 - d. Welding shall be performed so as not to damage lining or coating.
 - e. Furnish labor, equipment, tools and supplies, including shielded type welding rod.
 - 1) Protect welding rod from any deterioration prior to its use.
 - 2) If any portion of a box or carton is damaged, reject entire box or carton.
 - f. In all hand welding:
 - 1) The metal shall be deposited in successive layers.
 - 2) Not more than 1/8" of metal shall be deposited in each pass.
 - 3) Each pass except final 1, whether in butt or fillet welds, shall be thoroughly bobbed or peened to relieve shrinkage stresses and to remove dirt, slag or flux before succeeding bead is applied.
 - 4) Each pass shall be thoroughly fused into plates at each side of welding groove or fillet and shall not be permitted to pile up in center of weld.
 - 5) Undercutting along side shall not be permitted.
 - g. Welds shall be free from pin holes, nonmetallic inclusions, air pockets, undercutting and/or any other defects.
 - h. If ends of pipe are laminated, split or damaged to extent that satisfactory welding contact cannot be obtained, remove pipe from line.
 - i. Furnish each welder employed with a steel stencil for marking welds so that work of each welder may be identified.
 - 1) Have each welder stencil pipe adjacent to weld with stencil assigned to him.
 - a) In event any welder leaves job, his stencil shall be voided and not duplicated if another welder is employed.
 - j. Welders
 - 1) Each welder employed by Contractor shall be required to satisfactorily pass a welding test in accordance with AWWA C206 before being allowed to weld on line.
 - 2) After each welder has qualified in preliminary tests referred to above, inspections shall be made of joints in line.
 - k. Inspection will be done by a Certified Welding Inspector retained by Owner.
 - 1) Any welder making defective welds shall not be allowed to continue to weld.
 - l. Weld Testing
 - 1) Dye penetrant test all welds in accordance with ASTM E165, or magnetic particle test in accordance with AWWA C206 and set forth in AWS D.1.1. shall be performed by Contractor under supervision and inspection of Owner's Representative or an independent testing laboratory, on all full welded joints.
 - a) Welds that are defective will be replaced or repaired, whichever is deemed necessary by Engineer, at Contractor's expense.
 - b) If Contractor disagrees with Engineer's interpretation of welding tests, test sections may be cut from joint for physical testing. Contractor shall bear expense of repairing joint, regardless of results of physical testing.
 - 2) Procedure for repairing joint shall be approved by Engineer before proceeding.
5. Protection of Exposed Metal
- a. Protect exposed ferrous metal by a minimum of 1" coating of cement mortar as previously specified for inside joints, unless otherwise specified in Drawings.
 - b. Exposed large flat surfaces such as flanges, bolts, caulked joints, threaded outlets, closures, etc., shall have coating reinforced with galvanized wire mesh.

- c. Thoroughly clean and wet surface receiving a cement mortar coating with water just prior to placing cement mortar coating.
 - d. After placing, take care to prevent cement mortar from drying out too rapidly by covering with damp earth or burlap.
 - e. Cement mortar coating shall not be applied during freezing weather.
 - f. All exposed metal shall be coated with 20 mils of Raven Aquatapoxy A-6.
6. Patching
- a. Excessive field-patching of lining or coating shall not be permitted.
 - b. Patching of lining or coating will be allowed where area to be repaired does not exceed 100 square inches and has no dimensions greater than 12”.
 - c. In general, there shall not be more than 1 patch on either lining or coating of any 1 joint of pipe.
 - d. Wherever necessary to patch pipe, make patch with cement mortar as previously specified for interior joints.
 - e. Do not install patched pipe until patch has been properly and adequately cured and approved for laying by Owner.
 - f. Promptly remove rejected pipe from Site.

D. Blocking

- 1. Install concrete blocking in accordance with Section 03 30 00 for all bends, tees, crosses and plugs in pipe lines as indicated in Drawings.
- 2. Place concrete blocking so as to rest against firm undisturbed trench walls, normal to thrust.
- 3. Supporting area for each block shall be at least as great as that indicated on Drawings and shall be sufficient to withstand thrust, including water hammer, which may develop.
- 4. Each block shall rest on a firm, undisturbed foundation or trench bottom.
- 5. Wrap each fitting with polyethylene before placing concrete.
- 6. If Contractor encounters soil that appears to be different than that which was used to calculate blocking according to Drawings, Contractor shall notify Engineer prior to installation of blocking.

3.02 CLOSURES AND APPROVED PIPE MODIFICATIONS.

- A. No modifications of standard pipe for closures shall be permitted in field. No field cutting of pipe or exposure of bar wire shall be permitted without written approval from Owner.
- B. Pipe manufacturer's representative and Owner shall witness closures and approved pipe modification efforts.
- C. Provide minimum lap of 4” between member being joined and edge of butt strap. Weld on both interior and exterior, unless otherwise approved by Owner.
- D. Provide full circumferential welds on joints required to be welded. Employ independent certified testing laboratory, approved by Owner, to perform weld tests on field welds. Use magnetic particle test method and dye-penetrant test on lap welds for butt welds, for 100% of joint welds. If defective weld is revealed, repair defective weld and retest. Use wire and flux from same manufacturer throughout entire project.
- E. Fill wrapper in field and allowing excess grout water to seep out. Refill wrapper as necessary. When joint mortar level has stabilized and begun to mechanically stiffen, lap Ethafoam wrapper over top of joint and secure in place.
- F. Stretch test each gasket splice to twice its unstretched length and inspect for defects.

3.03 FIELD QUALITY CONTROL

- A. Field Tests and Inspections
 - 1. Cleaning and Testing

- a. Cleaning, disinfection, hydrostatic testing and bacteriological testing of water mains
 - 1) Clean, flush, disinfect, hydrostatic test, and bacteriological test water main as specified in AWWA C651-05 and Section 33 26 90.

END OF SECTION

SECTION 33 11 14

BURIED STEEL PIPE AND FITTINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Buried Steel Pipe 24" and larger for potable water applications
- B. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 00 – Proposal Requirements, Contract Forms, and Conditions of the Contract
 - 2. Division 01 – General Requirements
 - 3. Section 26 64 00 - Cathodic Protection Systems
 - 4. Section 33 26 90 – Waterline Testing and Disinfection
 - 5. Section 31 23 17 - Trenching
 - 6. Section 33 11 05 – Nuts, Bolts, and Gaskets

1.02 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Buried Steel Pipe
 - a. Measurement
 - 1) Measured horizontally along the surface from center line to center line of the fitting or appurtenance
 - b. Payment
 - 1) Work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at unit price bid per linear foot of "Steel AWWA C200 Pipe" installed for:
 - a) Various sizes
 - b) Various type of backfill
 - c. Bid shall include:
 - 1) Furnishing and installing Buried Steel Pipe with joints as specified by Drawings
 - 2) Mobilization
 - 3) Coating
 - 4) Lining
 - 5) Pavement removal
 - 6) Excavation
 - 7) Hauling
 - 8) Disposal of excess material
 - 9) Furnishing, placement and compaction of embedment
 - 10) Thrust restraint
 - 11) Bolts and nuts
 - 12) Welding
 - 13) Gaskets
 - 14) Furnishing, placement and compaction of backfill
 - 15) Trench water stops
 - 16) Clean-up
 - 17) Cleaning
 - 18) Disinfection
 - 19) Testing
 - 2. Buried Steel Pipe Fittings
 - a. Measurement
 - 1) Measurement for this Item shall be by lump sum.
 - b. Payment

- 1) Work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at lump sum price bid for "Steel Fittings".
- c. Bid shall include:
 - 1) Furnishing and installing Buried Steel Pipe with joints as specified by the Drawings
 - 2) Mobilization
 - 3) Coating
 - 4) Lining
 - 5) Pavement removal
 - 6) Excavation
 - 7) Hauling
 - 8) Disposal of excess material
 - 9) Furnishing, placement and compaction of embedment
 - 10) Thrust restraint
 - 11) Bolts and nuts
 - 12) Welding
 - 13) Gaskets
 - 14) Furnishing, placement and compaction of backfill
 - 15) Trench water stops
 - 16) Clean-up
 - 17) Cleaning
 - 18) Disinfection
 - 19) Testing

1.03 REFERENCES

A. Reference Standards

1. Reference standards cited in this Specification refer to the current reference standard published at the time of Bid.
2. American Architectural Manufacturers Association (AASHTO).
3. American Society of Mechanical Engineers (ASME):
 - a. B16.1, Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125 and 250).
4. ANSI International (ASTM):
 - a. A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PDI Tensile Strength.
 - b. B117, Standard Practice for Operating Salt Spray (Fog) Apparatus.
 - c. B633, Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
 - d. C33, Standard Specifications for Concrete Aggregates.
 - e. C144, Standard Specification for Aggregate for Masonry Mortar.
 - f. C150, Standard Specification for Portland Cement.
 - g. C216, Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale).
 - h. D16, Standard Terminology for Paint, Related Coatings, Materials, and Applications.
 - i. D242, Standard Specification for Mineral Filler for Bituminous Paving Mixtures.
 - j. DD522, Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings.
 - k. D2240, Standard Test Method for Rubber Property-Durometer Hardness.
 - l. D4541, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
 - m. E165, Standard Practice for Liquid Penetrant Examination for General Industry.
5. American Welding Society (AWS)
6. D1.1, Structure Welding Code - Steel.
7. American Water Works Association (AWWA):
 - a. C200, Steel Water Pipe - 6 Inches and Larger.

- b. C205, Cement Mortar Protective Lining and Coating for Steel Water Pipe 4 Ins and Larger Shop-Applied.
- c. C206, Field Welding of Steel Water Pipe.
- d. C207, Steel Pipe Flanges for Waterworks Service - Sizes 4 IN through 144 IN
- e. C208, Dimensions for Fabricated Steel Water Pipe Fittings.
- f. C210, Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines.
- g. C216, Heat Shrinkable Cross-Linked Polyolefin Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines
- h. C222, Polyurethane Coatings for the Interior and Exterior of Steel Water Pipe and Fittings
- i. M11, Steel Pipe - A Guide for Design and Installation.
- 8. American Water Works Association/American National Standards Institute (AWWA/ANSI):
 - a. C111/A21.11, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- 9. International Organization for Standardization (ISO).
- 10. NACE International (NACE):
 - a. SP0188, Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.
- 11. NSF International (NSF):
 - a. 61, Drinking Water System Components - Health Effects.
- 12. Spray Polyurethane Foam Alliance (SPFA).
- 13. Society for Protective Coatings (SSPC)/National Associate of Corrosion Engineers (NACE)
 - a. PA 2, Measurement of Dry Coating Thickness with Magnetic Gages.
 - b. SP 1, Solvent Cleaning.
 - c. SP 2, Hand Tool Cleaning.
 - d. SP 3, Power Tool Cleaning.
- 14. Society for Protective Coatings/National Associate of Corrosion Engineers (SSPC/NACE)
 - a. SP 10/NACE No. 2, Near-White Blast Cleaning.

1.04 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00.
- B. All submittals shall be approved by Engineer prior to delivery and/or fabrication for specials.

1.05 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS

- A. Product Data
 - 1. Exterior Coating
 - a. Material data
 - b. Application recommendations
 - c. Field touch-up procedures
 - 2. Heat Shrink Sleeves, if applicable
 - a. Material data
 - b. Installation recommendations
 - 3. Joint Wrappers, if applicable
 - a. Material data
 - b. Installation recommendations
 - 4. Mixes
 - a. Mortar for interior joints and patches
 - b. Bonding agents for patches
 - 5. Gaskets
- B. Shop Drawings

1. Wall thickness design calculations sealed by a Licensed Professional Engineer in Texas including:
 - a. Internal pressure
 - 1) Maximum design pressure
 - 2) Surge pressure
 - b. External pressure
 - 1) Deflection
 - 2) Buckling
 - 3) Extreme loading conditions
 - c. Special physical loading such as supports or joint design
 - d. Thermal expansion and/or contraction
2. Thrust restraint calculations for all fittings and valves including restraint length sealed by a Licensed Professional Engineer in Texas to verify restraint lengths shown in Drawings.
3. Fabrication and lay drawings showing a schematic location with profile and a tabulated layout schedule that is sealed by a Licensed Professional Engineer in Texas and includes:
 - a. Pipe class
 - b. Joint types
 - c. Fittings
 - d. Outlets
 - e. Thrust Restraint
 - f. Stationing (in accordance with the Drawings)
 - g. Transitions
 - h. Joint deflection
 - i. Interior lining
 - j. Outlet locations for welding, ventilation, and access
 - k. Welding requirements and provisions for thermal stress control

C. Certificates and Test Reports

1. Prior to shipment of pipe, the pipe manufacturer shall submit the following:
 - a. A Certificate of Adequacy of Design stating that pipe to be furnished complies with AWWA C200, AWWA C205, AWWA C210, AWWA C222 and these Specifications.
 - b. Copies of results of factory hydrostatic tests shall be provided to Engineer.
 - c. Mill certificates, including chemical and physical test results for each heat of steel.
 - d. A Certified Test Report from polyurethane coating manufacturer indicating that coatings were applied in accordance with manufacturer's requirements and in accordance with this Specification.
 - e. Certified test reports for welder certification for factory and field welds in accordance with AWWA C200, Section 4.11.
 - f. Certified test reports for cement mortar tests.
 - g. Certified test reports for steel cylinder tests.

1.06 QUALITY ASSURANCE

A. Qualifications

1. Manufacturers
 - a. Shall be certified under S.P.F.A. or I.S.O. quality certification program for steel pipe and accessory manufacturing
 - b. Finished pipe shall be product of a single manufacturer.
 - c. Pipe manufacturing operations (pipe, lining and coatings) shall be performed under control of manufacturer.
 - d. Pipe manufacturer shall not have less than 5 years successful experience manufacturing pipe of particular type and size indicated or demonstrate an experience record that is satisfactory to Engineer.
 - 1) This experience record will be thoroughly investigated by Engineer, and acceptance will be at sole discretion of the Engineer.

- 2) Pipe manufacturing operations (pipe, fittings, lining, coating) shall be performed at 1 location, unless otherwise approved by Engineer.
- e. Manufacture pipe in accordance with latest revisions of AWWA C200, AWWA C205, AWWA C210 and AWWA C222.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Packing

1. Prepare pipe for shipment to:
 - a. Afford maximum protection from normal hazard of transportation
 - b. Allow pipe to reach project site in an undamaged condition
2. Pipe damaged in shipment shall not be delivered to Site unless such damaged pipe is properly repaired.
3. After the completed pipe and fittings have been removed from final cure at manufacturing plant:
 - a. Protect pipe lining from drying by means of plastic end covers banded to pipe ends.
 - b. Maintain covers over pipe ends at all times until ready to be installed.
 - c. Moisture shall be maintained inside the pipe by periodic addition of water, as necessary.
4. Pipes shall be carefully supported during shipment and storage.
 - a. Pipe, fittings and specials shall be separated so that they do not bear against each other and whole load shall be securely fastened to prevent movement in transit.
 - b. Ship pipe on padded bunks with tie-down straps approximately over stulling.
 - c. Store pipe on padded skids, sand or dirt berms, tires or other suitable means to protect pipe from damage.
 - d. Each end of each length of pipe, fitting or special and middle of each pipe joint shall be internally supported and braced with stulls to maintain a true circular shape.
 - 1) Internal stulls shall consist of timber or steel firmly wedged and secured so that stulls remain in place during storage, shipment and installation.
 - 2) Pipe shall be rotated so that one stull remains vertical during storage, shipment and installation.
 - 3) At a minimum, stulls shall be placed at each end and center.
 - a) Additional stulls may be required depending upon length of joints and pipe design.
 - 4) Stulls shall not be removed until backfill operations are complete (excluding final clean up), unless it can be demonstrated to Engineer's satisfaction that removal of stulls will not adversely affect pipe installation.

B. Delivery, Handling, and Storage

1. Once first shipment of pipe has been delivered to Site, Engineer and Contractor shall inspect pipe's interior coating for excessive cracking.
2. If excessive cracking is found, Contractor shall modify shipping procedures to reduce or eliminate cracking.
3. Deliver, handle and store pipe in accordance with manufacturer's recommendations to protect coating systems.
4. Secure and maintain a location to store material in accordance with Division 01.

PART 2 - PRODUCTS

2.01 EQUIPMENT, PRODUCT TYPES, AND MATERIALS

A. Manufacturers

1. Approved Manufacturers
 - a. Thompson Pipe Group

- b. Northwest Pipe Company
- c. Ameron Water Transmission Group
- 2. Manufacturer must comply with this Specification and related Sections.

B. Materials

- 1. General
 - a. Pipe shall be manufactured in accordance with latest revisions of AWWA C200, AWWA C205, AWWA C210 and AWWA C222.
 - b. All pipe lining material in contact with potable water shall meet requirements of NSF 61.
- 2. Exterior Polyurethane Coating
 - a. For Pipe:
 - 1) Polyurethane Coating shall be factory applied and meet requirements of AWWA C222. Use a Coating Standard ASTM D16, Type V system which is a 100% solids, 2-component polyurethane (or 2-package polyisocyanate, polyol-cured urethane) coating.
 - a) Components shall have balanced viscosities in their liquid state and shall not require agitation during use.
 - b) Conversion to Solids by Volume: 97% ± 3%
 - c) Temperature Resistance: Minus 40 degrees F and plus 150 degrees F
 - d) Minimum Adhesion: 1,500 psi, when applied to steel pipe which has been blasted to comply with SSPC SP 10/NACE No. 2
 - (1) Cure Time: For handling in 2-3 minutes at 120 degrees F and full cure within 7 days at 70 degrees F
 - e) Maximum Specific Gravities
 - (1) Polyisocyanate resin, 1.20
 - (2) Polyol resin, 1.15
 - f) Minimum Impact Resistance: 80 inch-pounds using 1" diameter steel ball
 - g) Minimum Tensile Strength: 2000 psi
 - h) Hardness: Minimum Durometer hardness of 65 on Shore D scale in accordance with ASTM D2240
 - i) Flexibility Resistance
 - (1) ASTM D522 using 1" mandrel
 - (2) Allow coating to cure for 7 days.
 - (3) Perform testing on test coupons held for 15 minutes at temperature extremes specified above.
 - j) Dry Film Thickness: 35 mils
 - k) Coating shall be a self priming, plural component, 100% solids, non-extended polyurethane, suitable for burial or immersion and shall be:
 - (1) Corropipe II Omni as manufactured by Madison Chemical Industries Inc.
 - (2) Durashield 210 as manufactured by LifeLast, Inc., or
 - (3) Protec II, as manufactured by ITW – Futura Coatings, Inc.
 - 2) Coating manufacturer shall have a minimum of 5 years experience in production of this type coating.
 - b. For Specials, Fittings, Repair and Connections
 - 1) Provide shop-applied and field-applied coating as follows:
 - a) Corropipe II Omni, and GP II (E) Touch-Up, respectively, as manufactured by Madison Chemical Industries, or
 - b) Durashield 210, Durashield 310, or Durashield 310 JARS as manufactured by LifeLast, Inc., or
 - c) Protec II, or as recommended by the coating manufacturer.
 - d) Properties specified above.

- e) Mix and apply polyurethane coatings in accordance with the coating manufacturer's recommendations.
- 3. Cement Mortar Linings
 - a. Cement mortar linings shall be shop-applied.
 - b. Shop-applied cement mortar linings shall conform to requirements of AWWA C205 with the following modifications:
 - 1) Sand used for cement mortar shall be silica sand ASTM C33.
 - 2) Curing of linings shall conform to requirements of AWWA C205.
- 4. Gaskets
 - a. Flange in accordance with AWWA C207.
 - b. Provide Gaskets in accordance with Section 33 11 05.
- 5. Bolts and Nuts
 - a. Flanged Ends
 - 1) Flange in accordance with AWWA C207.
 - 2) Provide bolts and nuts in accordance with Section 33 11 05.
- 6. Flange Coatings
 - a. Flange Coatings in accordance with Section 33 11 05.
- 7. Steel shall:
 - a. Meet requirements of AWWA C200
 - b. Be of continuous casting
 - c. Be homogeneous
 - d. Be suitable for field welding
 - e. Be fully kilned
 - f. Be fine austenitic grain size
- 8. Bend Fittings
 - a. Fabricate all fittings from hydrostatically tested pipe.
 - b. All bend fittings shall be long radius to permit easy passage of pipeline pigs.
- 9. Threaded Outlets
 - a. Where outlets or taps are threaded, Threaded with CC Threads and furnish and install brass bushings for outlet size indicated.
- 10. Weld Lead Outlets
 - a. Use of NPT threaded outlets for access for weld leads is permitted.
 - b. Additional outlet configurations shall be approved by the Engineer.
 - c. Outlets shall be welded after use.
- 11. Mixes
 - a. Mortar for Joints
 - 1) Mortar shall be 1 part cement to 2 parts sand.
 - 2) Cement shall be ASTM C150, Type I or II.
 - 3) Sand shall be of sharp silica base.
 - a) Sand shall conform to ASTM C144.
 - 4) Interior joint mortar shall be mixed with as little water as possible so that mortar is very stiff, but workable.
 - 5) Water for cement mortar shall be from a potable water source.
 - 6) Mortar for patching shall be as per interior joints.
 - b. Bonding Agent
 - 1) Bonding Agent for Cement Mortar Lining must meet NSF 61, if cement lining is in contact with potable water.
 - 2) Bonding agent for cement mortar lining patching shall be:
 - a) Probond Epoxy Bonding Agent ET-150, parts A and B
 - b) Sikadur 32 Hi-Mod, or
 - c) Approved equal
- 12. Heat Shrink Sleeves for Polyurethane Coated Steel Pipe
 - a. Primer: Provide as recommended by sleeve manufacturer.
 - b. Filler Mastic: Provide mastic filler as recommended by heat shrink sleeve manufacturer.
 - 1) Size and type shall be as recommended by sleeve manufacturer for type of pipe and joint.

- c. Joint Coating: Cross-linked polyolefin wrap or sleeve with a mastic sealant, 85 mils total thickness, suitable for pipeline operating temperature, sleeve material recovery as recommended by manufacturer.
 - 1) High recovery sleeves shall be provided for bell and spigot and coupling style joints with a minimum of 50% recovery.
 - 2) Sleeve length shall provide a minimum of 3" overlap onto intact pipe coating on each side of joint.
 - 3) Width to take into consideration shrinkage of sleeve due to installation and joint profile
- d. Heat shrink sleeves shall meet AWWA C216, as manufactured by:
 - 1) Canusa
 - 2) Raychem, or
 - 3) Approved equal
- e. Provide heat shrink sleeve suitable to interior joint welding without damage to heat shrink sleeve.

C. Performance / Design Criteria

1. Pipe Design

- a. Steel pipe shall be designed, manufactured and tested in conformance with AWWA C200, AWWA M11 and these Specifications.
- b. Sizes and pressure classes (working pressure) shall be as shown below.
- c. For purpose of pipe design, transient pressure plus working pressure shall be as indicated below.
- d. Fittings, specials and connections shall be designed for same pressures as adjacent pipe.
- e. Pipe design shall be based on trench conditions and design pressure in accordance with AWWA M11; using the following parameters:
 - 1) Unit Weight of Fill (W) = 130 pounds per cubic foot
 - 2) Live Load
 - a) = AASHTO HS 20, at all locations except at railroads
 - b) = Cooper E80, at Railroads
 - 3) Trench Depth = As indicated in Drawings
 - 4) Deflection Lag Factor (Dl) = 1.0
 - 5) Coefficient (K) = 0.10
 - 6) Maximum Calculated Deflection:
 - a) $D_x = 2\%$
 - 7) Soil Reaction Modulus (E') < 1,000
 - 8) Working Pressure = 150 psi, or as shown on Drawings, whichever is greater.
 - a) Test Pressure =
 - (1) No less than minimum stated working pressure (in psi) of pipeline measured at highest elevation along test section.
 - (2) No less than 1.5 times stated working pressure at lowest elevation of test section.
 - 9) Surge Allowance = 100 psi, minimum
 - a) Where Total Pressure (including surge) = working pressure (psi) + 100 psi
- f. Fittings and specials shall be:
 - 1) Designed in accordance with AWWA C208 and AWWA M11 except that crotch plates shall be used for outlet reinforcement for all Pressure Diameter Values, PDV, greater than 6,000.
- g. Where pipe requires additional external support to achieve specified maximum deflection, Contractor and pipe supplier will be required to furnish alternate methods for pipe embedment.
 - 1) No additional compensation will be made to Contractor by Owner where this method is required.
- h. Trench depths indicated shall be verified after existing utilities are located.

- 1) Vertical alignment changes required because of existing utility or other conflicts shall be accommodated by an appropriate change in pipe design depth.
 - 2) In no case shall pipe be installed deeper than its design allows.
 - i. Field fabrication or cutting is not allowed, unless otherwise approved by Engineer.
2. Provisions for Thrust
- a. Thrust at bends, tees or other fittings shall be resisted by restrained joints.
 - 1) Thrust at bends adjacent to casing shall be restrained by welding joints through casing and a sufficient distance each side of casing.
 - 2) Distance for thrust restraint shown on Drawings is minimum restraint and does not relieve manufacturer from calculating restraint needs as specified herein.
 - a) In no case shall the restrained distance be less than indicated on Drawings.
 - b. Restrained joints shall be used a sufficient distance from each side of bend, tee, plug or other fitting to resist thrust which develops at design pressure of pipe.
 - c. Restrained joints shall consist of welded joints.
 - d. Length of pipe designed with restrained joints to resist thrust shall be verified by pipe manufacturer in accordance with AWWA M11 and the following:
 - 1) Weight of earth (W_e) shall be calculated as weight of projected soil prism above pipe, for unsaturated soil conditions
 - 2) Soil Density = 110 pounds per cubic foot (maximum value to be used), for unsaturated soil conditions
 - 3) Coefficient of Friction = 0.25 (maximum value to be used for polyurethane coated steel pipe).
 - 4) If indicated on Drawings and Geotechnical Borings that ground water is expected, account for reduced soil density.
 - 5) For horizontal bends, length of pipe to be restrained shall be calculated as follows:

$$L = P A (1 - \cos \Delta) / f (2W_e + W_p + W_w)$$
 Where:
 - Δ = Deflection angle
 - L = Length of pipe to be restrained on each side
 - P = Internal pressure
 - A = Cross sectional area of pipe steel cylinder I.D.
 - W_e = Weight of prism of soil over pipe
 - W_p = Weight of pipe
 - W_w = Weight of water
 - f = Coefficient of friction between pipe and soil
3. Inside Diameter
- a. Inside diameter, including cement-mortar lining, shall be a minimum of nominal diameter of pipe specified, unless otherwise indicated on Drawings.
4. Wall Thickness
- a. Minimum pipe wall steel thickness shall be as designed, but not less than 0.25" or pipe D/240, whichever is greater for pipe and fittings, with no minus tolerance, where D is nominal inside pipe diameter.
 - b. Where indicated on Drawings, pipe and fittings shall have thicker steel pipe wall.
 - c. Minimum steel wall thickness shall also be such that fiber stress shall not exceed:
 - 1) 50% of minimum yield strength of steel for working pressure and
 - 2) 75% of minimum yield strength of steel at maximum pressure (including transient pressure), nor the following, at specified working pressure:
 - a) Maximum Stress at Working Pressure - 23,000 psi.

- d. Pipe which is placed in casing or tunnel shall have a minimum pipe wall steel thickness of 0.375" or pipe D/144, whichever is greater, where D is nominal pipe diameter.
 - e. Pipe, fittings and specials shall be designed such that maximum stresses in pipe due to thrust loading will not exceed 18,000 psi.
5. Seams
- a. Except for mill-type pipe, piping shall be made from steel plates rolled into cylinders or sections thereof with longitudinal and girth seams butt welded or shall be spirally formed and butt welded.
 - 1) There shall be not more than 2 longitudinal seams.
 - 2) Girth seams shall be butt welded and shall not be spaced closer than 6 feet except in specials and fittings.
6. Joint Length
- a. Maximum joint length shall not exceed 50 feet.
 - b. Maximum joint length of steel pipe installed in casing shall meet project requirements.
 - c. Manufactured random segments of pipe will not be permitted for straight runs of pipe.
 - 1) Closing piece segments, however, shall be acceptable.
7. Joint Bonds, Insulated Connections and Flange Gaskets
- a. Joint Bonds, Insulated Connection, and Flange Gaskets shall be in accordance with Section 26 64 00.
8. Bend Fittings
- a. All bend fittings shall be long radius to permit passage of pipeline pigs.
9. Pipe Ends
- a. Pipe ends shall be:
 - 1) Lap welded slip joints
 - 2) Butt strap joint
 - 3) Flanged joint
 - 4) Flexible coupled joint
 - 5) Roll groove gasket joint
 - b. Pipe ends shall be welded or harnessed where indicated and as necessary to resist thrust forces.
 - 1) Thrust at bends adjacent to casing shall be restrained by welding joints through casing and a sufficient distance each side of casing.
 - c. Rubber Gasket Joint
 - 1) Rubber gasketed joints (O-ring or Carnegie Joints) will only be allowed for pipe sizes 54" diameter and smaller.
 - 2) Joints shall conform to AWWA C200 standard.
 - 3) The joints shall consist of:
 - a) Bell
 - (1) Flared bell end formed and sized by forcing pipe or a plug die or by expanding on segmental dies.
 - b) Spigot
 - (1) Rolled spigot or carnegie shaped steel joint ring in accordance with AWWA C200 and as shown as Item F or H in Figure 8-1 of AWWA M11.
 - 4) Welded area of bell and spigot pipe ends shall be checked after forming by dye penetrant or magnetic particle method.
 - 5) Difference in diameter between interior diameter (I.D.) of bell and outer diameter (O.D.) of spigot shoulder at point of full engagement with an allowable deflection shall be no more than 0.04" as measured on circumference with a diameter tape.

- 6) Gasket shall have sufficient volume to approximately fill area of groove and shall conform to AWWA C200.
 - 7) Joint shall be suitable for specified test and/or surge pressure and deflection.
 - 8) Joints shall be of clearances such that water tightness shall be provided under all operating and test conditions with a pipe diameter deflection based upon supplied pipe coating.
 - 9) Joints shall be electrically continuous.
 - d. Lap Welded Slip Joint
 - 1) Lap welded slip joint shall be provided in all locations for pipe larger than 24" and where joints are welded for thrust restraint.
 - 2) Lap welded slip joints may be welded from inside or outside.
 - 3) Ends of pipe, fittings and specials for field welded joints shall be prepared with one end expanded in order to receive a plain end making a bell and plain end type of joint.
 - a) Clearance between surfaces of lap joints shall not exceed 1/8" at any point around periphery.
 - 4) In addition to provisions for a minimum lap of 1 1/2" as specified in AWWA C200, depth of bell shall be such as to provide for a minimum distance of 1" between weld and nearest tangent of bell radius when welds are to be located on inside of pipe.
 - e. Fittings with Flanges
 - 1) Flanged joints shall be provided at connections to valves and where indicated on Drawings.
 - 2) Ends to be fitted with slip-on flanges shall have longitudinal or spiral welds ground flush to accommodate type of flanges provided.
 - 3) Pipe flanges and welding of flanges to steel pipe shall conform to requirements of AWWA C207 and AWWA C206.
 - 4) Pipe flanges shall be of rated pressure equal to or greater than adjacent pipe class.
 - 5) Flanges shall match fittings or appurtenances which are to be attached.
 - 6) Flanges shall be Class E with 275 psi working pressure in accordance with AWWA C207 and drilled in accordance with ASME B16.1 Class 125.
 - 7) When Isolation Flanges are required by Drawings, Drillings shall accommodate required spacing for mylar sleeves according to Section 33 04 10.
 - f. Flexible Couplings
 - 1) Flexible couplings shall be provided where specified on Drawings.
 - 2) Ends to be joined by flexible couplings shall be:
 - a) Plain end type, prepared as stipulated in AWWA C200.
 - b) Welds on ends to be joined by couplings shall be ground flush to permit slipping coupling in at least one direction to clear pipe joint.
 - c) Harness bolts and lugs shall comply with AWWA M11.
 - g. Butt Strap Closure Joints
 - 1) Where necessary to make closure to pipe previously laid, closure joints shall be installed using butt strap joints in accordance with AWWA C206 and applicable provisions of this Specification.
10. Polyurethane Coating
- a. Applicator Qualifications
 - 1) Equipment shall be certified by coating manufacturer to meet requirements for:
 - a) Material mixing
 - b) Temperature control
 - c) Application rate
 - d) Ratio control for multi-part coatings

- 2) Equipment not meeting written requirements of coating manufacturer shall be rejected for coating application until repairs or replacement of equipment is made to satisfaction of Engineer.
- 3) Personnel responsible for application of coating system shall:
 - a) Provide certification of attendance at coating manufacturer's training class within last 3 years
 - b) Be present during all coating application work and shall have responsibility for controlling all aspects of coating application
- b. Surface Preparation
 - 1) Remove visible oil, grease, dirt and contamination in accordance with SSPC SP 1.
 - 2) Remove surface imperfections such as metal slivers, burrs, weld splatter, gouges or delaminations in metal by filing or grinding prior to abrasive surface preparation.
 - 3) In cold weather or when moisture collects on pipe and temperature of pipe is less than 45 degrees F, preheat pipe to a temperature between 45 and 90 degrees F and 5 degrees F above dew point.
 - 4) Clean pipe by abrasive blasting with a mixture of steel grit and shot to produce surface preparation cleanliness as required by coating manufacturer and as specified.
 - a) Recycled abrasive shall be cleaned of debris and spent abrasive in an air wash separator.
 - 5) Blast media mixture and gradation shall be adequate to achieve a sharp angular surface profile as required by coating manufacturer and to minimum depth specified.
 - 6) Protect prepared pipe from humidity, moisture and rain.
 - 7) Keep pipe clean, dry and free of flash rust.
 - a) Remove all flash rust, imperfections or contamination on cleaned pipe surface by reblasting prior to primer application.
 - 8) Complete priming and coating of pipe in a continuous operation the same day as surface preparation.
 - 9) Abrasive blast exterior surfaces in accordance with SSPC SP 10/NACE No. 2; to a near-white blast cleaning with a minimum 3.0 mil angular profile in bare steel.
- c. Equipment
 - 1) 2-component, heated airless spray unit in accordance with coating manufacturer's recommendation
- d. Temperature
 - 1) Minimum 5 degrees F above dew point temperature
 - a) Temperature of the surface shall not be less than 60 degrees F during application.
- e. Humidity
 - 1) Heating of pipe surfaces may be required to meet requirements of this Section if relative humidity exceeds 80%.
- f. Resin
 - 1) Do not thin or mix resins; use as received.
 - 2) Store resins at a temperature recommended by coating manufacturer.
- g. Application
 - 1) Applicator shall be certified by coating manufacturer and conform to coating manufacturer's recommendations.
 - a) Thinning is not permitted.
 - 2) Apply directly to pipe to achieve a total dry film thickness (DFT) of 35 mils.
 - 3) Multiple-pass, single coat application process is permitted provided maximum allowable re-coat time specified by coating manufacturer is not exceeded.

- 4) Provide cutbacks in accordance with coating manufacturer's recommendations as appropriate for type of joint and heat shrink sleeve to be used.
- h. Re-coating
 - 1) Re-coat only when coating has cured less than maximum time specified by coating manufacturer.
 - 2) When coating has cured for more than re-coat time, brush-blast or thoroughly sand surface.
 - 3) Blow-off cleaning using clean, dry, high pressure compressed air.
- i. Curing
 - 1) Do not handle pipe until coating has been allowed to cure, per manufacturer's recommendations.

2.02 SOURCE QUALITY CONTROL

A. Marking for Identification

1. For each joint of pipe and each fitting, plainly mark on 1 end:
 - a. Pressure class for which it is designated
 - b. Date of manufacturer
 - c. Identification number
 - d. Top centerlines shall be marked on all specials

B. Factory Testing

1. Cement Mortar Lining - Shop-applied cement mortar linings shall be tested in accordance with AWWA C205.
2. Polyurethane Coating - Polyurethane coating shall be tested in accordance with AWWA C222.
 - a. Thickness: Test thickness of coating in accordance with SSPC PA 2.
 - 1) Test coating system applied to the pipe for holidays according to the procedures outlined in NACE SP0188 using a high voltage spark tester (operating at 100 volts per mil), for the dry film thickness (DFT) specified of 35 mil.
 - b. Adhesion Testing
 - 1) Polyurethane coatings or linings shall have an adhesion to steel of 1,500 pounds per square inch, minimum.
 - 2) Test polyurethane coating adhesion to steel substrates using pneumatic pull off equipment, such as HATE Model 108 or Delfesko Positest, in accordance with ASTM D4541 and AWWA C222, except as modified in this Section.
 - 3) Adhesion testing records shall include:
 - a) Pipe identification
 - b) Surface tested (interior or exterior)
 - c) Surface temperature
 - d) Coating thickness
 - e) Tensile force applied
 - f) Mode of failure
 - g) Percentage of substrate failure relative of dolly surface
 - 4) Glue dollies for adhesion testing to coating surface and allowed to cure for a minimum of 12 hours.
 - a) Because of high cohesive strength, score polyurethane coatings around dolly prior to conducting adhesion test.
 - 5) Failure shall be by adhesive and cohesive failure only.
 - a) Adhesive failure is defined as separation of coating from steel substrate.
 - b) Cohesive failure is defined as failure within coating, resulting in coating remaining both on steel substrate and dolly.
 - 6) Retest partial adhesion and glue failure if substrate failure is less than 50% relative of dolly surface area and applied tension is less than specified adhesion.
 - 7) Glue failures in excess of minimum required tensile adhesion are accepted as meeting specified adhesion requirements.

- 8) Conduct, accept and reject adhesion tests on polyurethane pipe coating and lining independently (where applicable).
- 9) Frequency of adhesion testing in accordance with AWWA C222.
- 10) Randomly select repair patches on polyurethane coating for adhesion testing in a manner as described herein and at discretion of coating inspector conducting adhesion tests.
 - a) Adhesion of repairs shall be as specified by coating manufacturer for type of repair.

C. Manufacturer's Technician for Pipe Installation

1. Pipe Manufacturer's Representative
 - a. If required by Engineer or requested by Contractor during construction, pipe manufacturer shall furnish services of a factory trained, qualified, job experienced technician to advise and instruct as necessary in pipe laying and pipe jointing.
 - 1) Technician shall assist and advise Contractor in his pipe laying operations and shall instruct construction personnel in proper joint assembly and joint inspection procedures.
 - 2) Technician is not required to be on-site full time; however, technician shall be regularly on-site during first 3 weeks of pipe laying.
2. Polyurethane Coating Manufacturer's Representative
 - a. Pipe manufacturer shall provide services of polyurethane coating manufacturer's representative and a representative from heat shrink joint manufacturer for a period of not less than 3 days at beginning of actual pipe laying operations to advise Contractor regarding installation, including but not limited to:
 - 1) Handling and storage
 - 2) Cleaning and inspecting
 - 3) Coating repairs
 - 4) Field applied coating
 - 5) Heat shrink installation procedures
 - 6) General construction methods and how they may affect pipe coating
 - b. Representative shall be required to return if, in opinion of Engineer, polyurethane coating or Contractor's construction methods do not comply with Specifications.
 - 1) Cost for manufacturer's representatives to return to Site shall be at no additional cost to Owner.

D. Hydrostatic Pressure Testing

1. Perform hydrostatic pressure testing in accordance with AWWA C200.
2. Hydrostatically test each joint of pipe prior to application of lining or coating.
 - a. Internal test pressure shall be that which results in a fiber stress equal to 75% of the minimum yield strength of steel used.
 - b. Each joint of pipe tested shall be completely watertight under maximum test pressure.
 - c. Test pressure shall be held for sufficient time to observe weld seams.
 - d. Maintain a recording pressure gauge, reference number of pipe tested, etc.
 - 1) Pipe shall be numbered in order that this information can be recorded.
3. Test fittings by:
 - a. Hydrostatic test
 - b. Magnetic particle test
 - c. Ultrasonic
 - d. Radiography
 - e. Dye penetrant test

E. Owner Testing and Inspection

1. Pipe may be subject to inspection at manufacturer's facility by an independent testing laboratory, which laboratory shall be selected and retained by Owner.

- a. Representatives of Owner, laboratory, or Engineer shall have access to all work whenever it is in preparation or progress.
 - b. Pipe manufacturer shall provide proper facilities for access and for inspection.
 - c. Pipe manufacturer shall notify Owner in writing, a minimum of 2 weeks prior to pipe fabrication so that Owner may advise manufacturer regarding tests to be performed by an independent testing laboratory.
 - d. Material, fabricated parts and pipe, which are discovered to be defective, or which do not conform to the requirements of this Specification shall be subject to rejection at any time prior to final acceptance of product.
2. Inspection and testing by independent testing laboratory anticipates that production of pipe shall be done over a normal period of time and without "slow downs" or other abnormal delays.
- a. Pipe manufacturer shall coordinate their manufacturing schedule with Contractor and advise Contractor of any changes in schedule.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General

- 1. Install steel pipe, fittings, specials and appurtenances as specified herein, as specified in AWWA M11, in accordance with pipe manufacturer's recommendations and as required for proper functioning of completed pipe line.
- 2. Lay pipe to lines and grades as indicated in Drawings.
- 3. Excavate, embed and backfill trenches in accordance with Section 33 05 10.
- 4. For installation of carrier pipe within casing, as specified.
- 5. Inspect and test each joint for holidays just prior to pipe being lowered into ditch.
 - a. All damaged areas and holidays are to be repaired before pipe is lowered into trench.
- 6. Place and consolidate embedment and backfill prior to removing pipe stulls.
- 7. Maximum allowable pipe deflection is limited to 2%.
- 8. Install bonds at all pipe joints, except for welded joints or insulated joints.

B. Pipe Handling

- 1. Haul and distribute pipe and fittings at Site.
- 2. Handle pipe with care to avoid damage.
 - a. Pipe shall be handled at all times with sufficient non-abrasive slings, belts or other equipment designed to prevent damage to coating or lining.
 - b. Spacing of pipe supports required to handle pipe shall be adequate to prevent cracking or damage to lining or coating.
 - c. Inspect each joint of pipe and reject or repair any damaged pipe prior to lowering into trench.
 - d. Equipment shall be kept in such repair that its continued use is not injurious to coating.
 - e. Do not lay pipe in wet conditions.
- 3. At the close of each operating day:
 - a. Keep pipe clean and free of debris, dirt, animals and trash – during and after laying operation.
 - b. Effectively seal open end of pipe using a gasketed night cap at end of each day.

C. Line Up at Bends

- 1. Line up pipe for joining so as to prevent damage thereto.
 - a. Thoroughly clean bells and spigot ends of each joint of pipe of foreign matter, rust and scale before placing spigot into bell.
- 2. Where abrupt changes in grade and direction occur, employ special shop fabricated fittings for installation.

- a. Field cutting the ends of steel pipe to accomplish angular changes in grade or direction of line shall not be permitted.

D. Pipe Laying

1. Rubber Gasket Joints

- a. Join rubber gasket joints in accordance with manufacturer's recommendations.
- b. Clean bell and spigot of foreign material.
- c. Lubricate gaskets and bell and relieve gasket tension around perimeter of pipe.
- d. Engage spigot as far as possible in bell.
- e. Joint deflection or pull shall not exceed manufacturer's recommendation.
- f. Check gasket with feeler gauge all around pipe.
- g. In areas of petroleum hydrocarbon soil contamination, install special Neoprene gaskets or approved equal.

2. Welded Joints

- a. Weld joints in accordance with AWWA C206.
 - 1) Contractor shall provide adequate ventilation for welders and for Engineer and Inspector to observe welds.
 - 2) Welds shall be full circle fillet welds, unless otherwise specified.
 - 3) Welding shall be completed after application of field applied joint coating.
- b. Adequate provisions for reducing temperature stresses shall be the responsibility of Contractor.
- c. After pipe has been joined and properly aligned and prior to start of welding procedure:
 - 1) Spigot and bell shall be made essentially concentric by shimming or tacking to obtain clearance tolerance around periphery of joint.
 - 2) In no case shall clearance tolerance be permitted to accumulate.
- d. Before welding:
 - 1) Thoroughly clean pipe ends.
 - 2) Weld pipe by machine or by manual shielded electric arc process.
 - 3) Welding shall be performed so as not to damage lining or coating.
 - 4) Cover polyurethane coating as necessary to protect from weld splatter.
- e. Furnish labor, equipment, tools and supplies, including shielded type welding rod.
 - 1) Protect welding rod from any deterioration prior to its use.
 - 2) If any portion of a box or carton is damaged, reject entire box or carton.
- f. Hand Welding
 - 1) Metal shall be deposited in successive layers.
 - 2) Not more than 1/8" of metal shall be deposited in each pass.
 - 3) Each pass except final pass, whether in butt or fillet welds, shall be thoroughly bobbed or peened to relieve shrinkage stresses and to remove dirt, slag or flux before succeeding bead is applied.
 - 4) Each pass shall be thoroughly fused into plates at each side of welding groove or fillet and shall not be permitted to pile up in center of weld.
 - 5) Undercutting along side shall not be permitted.
- g. Welds shall be free from pin holes, non-metallic inclusions, air pockets, undercutting and/or any other defects.
- h. If ends of pipe are laminated, split or damaged to extent that satisfactory welding contact cannot be obtained, remove defective pipe.
- i. Furnish each welder employed with a steel stencil for marking welds, so that the work of each welder may be identified.
- j. Have each welder stencil pipe adjacent to the weld with stencil assigned to him.
 - 1) In event any welder leaves job, his stencil shall be voided and not duplicated if another welder is employed.
- k. Welders
 - 1) Use only competent, skilled and qualified workmen.

- a) Each welder employed by the Contractor shall be required to satisfactorily pass a welding test in accordance with AWWA C206 before being allowed to weld on this project.
- b) After each welder has qualified in preliminary tests referred to above, inspections shall be made of all joints.
- c) Any welder producing defective welds shall not be allowed to continue to weld.

E. Interior Joint Grouting

- 1. Upon completion of backfilling of pipe trench, clean out dirt or trash which has collected in joint and moisten the concrete surfaces of joint space by spraying or brushing with a wet brush.
- 2. Fill inside of joint recess with a stiff cement mortar.
- 3. Where mortar joint opening is 1" or wider, such as where trimmed spigots are required, apply a bonding agent to mortar and steel surface prior to placing joint mortar.
- 4. Ram or pack stiff mortar into joint space and take extreme care to ensure that no voids remain in joint space.
- 5. After joint has been filled, level surfaces of joint mortar with interior surfaces of pipe with a steel trowel so that surface is smooth.
- 6. Interior joints of pipe 24" and smaller shall have bell buttered with mortar, prior to inserting spigot, such that where spigot is pushed into position it will extrude surplus mortar from the joint.
 - a. Surplus mortar shall be struck off flush with inside of pipe by pulling a filled burlap bag or inflated ball through pipe with a rope.

F. Exterior Joint Protection

- 1. Heat Shrink Sleeves
 - a. General
 - 1) Buried pipe joints shall be field coated after pipe assembly in accordance with AWWA C216, using Heat Shrink Sleeves.
 - 2) Width of heat shrink sleeve shall be sufficient to overlap polyurethane coating by a minimum of 3".
 - 3) Overlapping of 2 or more heat shrink sleeves to achieve necessary width will not be permitted.
 - b. Installation
 - 1) Clean pipe surface and adjacent coating of all mud, oil, grease, rust and other foreign contaminants with a wire brush in accordance with SSPC SP 2, or SSPC SP 3. Remove oil or grease contamination by solvent wiping the pipe and adjacent coating in accordance with SSPC SP 1.
 - a) Clean full circumference of pipe and a minimum of 6" onto existing coating.
 - 2) Remove all loose or damaged pipe coating at joint and either repair coating as specified herein or increase length of joint coating, where reasonable and practical.
 - 3) Complete joint bonding of non-welded pipe joints before application of joint coating.
 - 4) Joint bonds shall be low profile bonds and all gaps and crevices around bonds shall be filled with mastic sealant.
 - 5) Store sleeves in shipping box until use is required.
 - a) Keep dry and sheltered from exposure to direct sunlight.
 - b) Store off ground or concrete floors and maintain at a temperature between 60 degrees F and 100 degrees F as recommended by sleeve manufacturer.
 - 6) Metal surface shall be free of all dirt, dust and flash rusting prior to sleeve application.
 - 7) Preheat pipe uniformly to 140 degrees F to 160 degrees F or as recommended by sleeve manufacturer.

- a) Monitor pipe temperature using a surface temperature gauge, infrared thermometer or color changing crayons.
- b) Protect preheated pipe from rain, snow, frost or moisture with tenting or shields and do not permit joint to cool.
- 8) Prime joint with specified primer and fill all cracks, crevices and gaps with mastic filler in accordance with manufacturer's recommendations for full circumference of pipe.
- 9) Apply heat shrink sleeve when it is at a minimum temperature of 60 degrees F and while maintaining pipe temperature above preheat temperature specified.
- 10) Apply sleeve in accordance with manufacturer's instructions and center sleeve over joint to provide a minimum of 3" overlay onto existing pipe coating.
- 11) Apply heat to sleeve using either propane fire infrared heaters or wrap around heaters.
 - a) Hold flame a minimum of 6" from sleeve surface.
 - b) Periodically roll coating on pipe surface.
 - c) Heat from center of the sleeve to outer edge until properly seated, then begin in opposite direction.
 - d) Monitor sleeve for color change, where appropriate, or with appropriate temperature gauges.
 - e) Take care not to excessively heat parent coating.
- 12) Completed joint sleeve shall be fully bonded to pipe and existing coating surface, without voids, mastic beading shall be visible along full circumference of sleeve, and there shall be no wrinkling or excessive burns on sleeves.
 - a) Sleeves which do not meet these requirements shall be removed and joint recoated as directed by Engineer.
 - b) Minor repairs may be repaired using heat shrink sleeve repair kits.
- 13) Allow sleeve to cool before moving, handling or backfilling. In hot climates, provide shading from direct sunlight.
 - a) Water quenching will be allowed only when permitted by sleeve manufacturer.

G. Protective Welded Joints Coating System – Weld After Backfill

1. General

- a. Application of protective coating at the pipe joints will be as follows:
 - 1) Apply a 3 layer joint coating system consisting of a factory applied 35 mil polyurethane coating
 - 2) A field applied 60 mil by 6" wide strip of CANUSA HCO Wrapid Tape heat resistant tape at location of welding
 - 3) A field applied 110 mil (full recovered thickness) by 18" wide CANUSA AquaWrap high shrink heat shrinkable joint sleeve
 - 4) After heat shrinkable joint sleeve is installed, backfill trench and then weld joint.
- b. Contractor is responsible for his operations so that they do not damage factory applied coating system.
- c. When applying the 3 layer joint coating system for post welding joints, Contractor must show that his operation will not damage joint coating system to Engineer's satisfaction.
- d. Contractor will be required to fully uncover a maximum of 10 joints, selected at random by Engineer to visually inspect and test joint after welding. Any damage must be repaired.
 - 1) If Contractor's welding procedure damages 3 layer joint coating system, Contractor, at direction of Engineer, shall modify his welding procedure.

2. Joint Coating (3 Layer)

- a. Apply 3 Layer Joint Coating System before Welding the Joint

- b. Pipe Manufacturing and Heat Tape
 - 1) A 35 mil thickness polyurethane coating shall be applied over entire length of pipe.
 - 2) Contractor shall field apply 60 mil thick by 6" wide strip of CANUSA HCO Wrapid Tape heat resistant tape to exterior bell end of pipe, centered on location of welding, over a 35 mil factory applied polyurethane coating.
- c. Surface Preparation and Installation for Heat Shrinkable Joint Sleeve
 - 1) Clean pipe surface and adjacent coating of all mud, oil, grease, rust and other foreign contaminates with a wire brush in accordance with SSPC SP 2, or SSPC SP 3. Remove oil or grease contamination by solvent wiping the pipe and adjacent coating in accordance with SSPC SP 1.
 - a) Clean the full circumference of pipe and a minimum of 6" onto existing coating.
 - 2) Remove all loose or damaged pipe coating at joint and either repair coating as specified herein or increase the length of joint coating, where reasonable and practical.
 - 3) Complete joint bonding of pipe joints before application of joint coating.
 - a) Joint bonds shall be low profile bonds and all gaps and crevices around bonds shall be filled with mastic sealant.
 - 4) Store sleeves in shipping box until use is required.
 - a) Keep dry and sheltered from exposure to direct sunlight.
 - b) Store off ground or concrete floors and maintain at a temperature between 60 degrees F and 100 degrees F as recommended by sleeve manufacturer.
 - 5) Metal surface shall be free of all dirt, dust and flash rusting prior to sleeve application.
 - 6) Preheat pipe uniformly to 140 degrees F to 160 degrees F or as recommended by sleeve manufacturer.
 - a) Monitor pipe temperature using a surface temperature gauge, infrared thermometer or color changing crayons.
 - b) Protect preheated pipe from rain, snow, frost or moisture with tenting or shields and do not permit joint to cool.
 - 7) Prime joint with specified primer and fill all cracks, crevices, and gaps with mastic filler in accordance with manufacturer's recommendations for full circumference of pipe.
 - 8) Apply heat shrink sleeve when it is at a minimum temperature of 60 degrees F and while maintaining pipe temperature above preheat temperature specified.
 - a) Apply sleeve in accordance with manufacturer's instructions and center sleeve over joint to provide a minimum of 3" overlay onto existing pipe coating.
 - 9) Apply heat to sleeve using either propane fire infrared heaters or wrap around heaters.
 - a) Hold flame a minimum of 6" from sleeve surface.
 - b) Periodically roll coating on pipe surface.
 - c) Heat from center of sleeve to outer edge until properly seated, then begin in opposite direction.
 - d) Take care not to excessively heat parent coating.
 - e) Monitor sleeve for color change, where appropriate, or with appropriate temperature gauges.
 - 10) Completed joint sleeve shall be fully bonded to pipe and existing coating surface, without voids, mastic beading shall be visible along full circumference of sleeve, and there shall be no wrinkling or excessive burns on sleeves.
 - a) Sleeves which do not meet these requirements shall be removed and joint recoated as directed by Engineer.

- b) Minor repairs may be repaired using heat shrink sleeve repair kits.
 - 11) Allow sleeves to cool before moving, handling or backfilling.
 - a) In hot climates, provide shading from direct sunlight.
 - b) Water quenching will be allowed only when permitted by sleeve manufacturer.
 - 12) Holiday testing shall be performed using a high voltage holiday tester (operating at 100 volts per mil) at each joint after field application of heat shrinkable joint sleeve per SP0188.
 - a) If any holidays or cuts are detected, sleeve shall be repaired using heat shrink sleeve manufacturer's recommendation.
 - b) Damaged area shall be covered with a minimum of 50-mm overlap around damaged area.
- H. Protection of Buried Metal
 - 1. Coat buried ferrous metal such as bolts and flanges, which cannot be protected with factory or field-applied polyurethane coatings or heat shrink sleeves, with 2 wraps of wax tape and encase in flowable fill.
- I. Blocking
 - 1. Install concrete blocking in accordance with Section 03 30 00 for all bends, tees, crosses and plugs in pipe lines as indicated in Drawings.
 - 2. Place concrete blocking so as to rest against firm undisturbed trench walls, normal to thrust.
 - 3. Supporting area for each block shall be at least as great as that indicated on Drawings and shall be sufficient to withstand thrust, including water hammer, which may develop.
 - 4. Each block shall rest on a firm, undisturbed foundation or trench bottom.
 - 5. Wrap each fitting with polyethylene before placing concrete.
 - 6. If Contractor encounters soil that appears to be different than that which was used to calculate blocking according to Drawings, Contractor shall notify Engineer prior to installation of blocking.

3.02 REPAIR

- A. Repair and Field Touchup of Polyurethane Coating
 - 1. For repair and field touch-up of polyurethane coating, apply:
 - a. Madison GP II (E) Touchup Polyurethane Coating
 - b. Lifelast Durasheild 210, 310 or 310 JARS
 - c. ITW – Futura Coatings Protec II, or
 - d. Coating manufacturer's recommendation
 - 2. Holidays
 - a. Remove all traces of oil, grease, dust, dirt and other debris.
 - b. Roughen area to be patched by sanding with rough grade sandpaper (40 grit).
 - c. Apply a 35 mil coat of repair material described above.
 - d. Work repair material into scratched surface by brushing or rolling in accordance with manufacturer's recommendations.
 - e. Retest for Holiday.
 - 3. Field Cuts or Large Damage
 - a. If in opinion of Engineer polyurethane coating is excessively damaged, pipe segment will be rejected until coating system is removed and replaced so that system is in a "like-new" condition.
 - b. Remove burrs from field cut ends or handling damage and smooth out edge of polyurethane coating.
 - c. Remove all traces of oil, grease, dust, dirt and other debris.
 - d. Roughen area to be patched with rough grade sandpaper (40 grit).
 - e. Feather edges and include overlap of roughened polyurethane in area to be patched.

- f. Apply a 35 mil coat of repair material described above, in accordance with manufacturer's recommendations.
- g. Work repair material into scratched surface by brushing.
- h. Feather edges of repair material into prepared surface.
- i. Cover at least 1" of roughed area surrounding damage or adjacent to field cut.
- j. Test repairs for holidays.

B. Patch of Cement Mortar Lining

- 1. Repair cracks larger than 1/16".
- 2. Pipes with disbonded linings will be rejected.
- 3. Excessive patching of lining shall not be permitted.
- 4. Repair in accordance with AWWA C205 and as follows:
 - a. Apply bonding agent to patch area.
 - b. Patching of lining shall be allowed where area to be repaired does not exceed 100 square inches and has no dimension greater than 12".
 - c. In general, there shall be not more than one patch in lining of any joint of pipe.
- 5. Wherever necessary to patch pipe, make patch with mortar indicated.
- 6. Do not install patched pipe until the patch has been properly and adequately cured, unless approved by Engineer.

3.03 FIELD QUALITY CONTROL

A. Field Tests and Inspections

- 1. Quality Control of Field Applied Polyurethane Coating
 - a. Surface Preparation
 - 1) Visually inspect surface preparation to ensure cleanliness and dryness requirements have been met.
 - 2) Use Testex tape on at least 1 joint per day to ensure that adequate profile is being achieved.
 - b. Visual
 - 1) Visually inspect cured coating to ensure that coating is completely cured with no blisters, cracks, pinholes, missed areas, excessive roughness, "sticky" or "goeey" areas.
 - 2) Check to ensure that coating completely covers steel and existing coating.
 - c. Thickness
 - 1) Use a magnetic dry film thickness (DFT) gauge on cured coating to ensure adequate thickness has been achieved according to SSPC PA 2.
 - a) If thickness of coating is below minimum specified millage anywhere along length of pipe, then adjustments must be made to spray system to correct problem.
 - 2) At a minimum, thickness shall be measured for every 50 square feet of sprayed area.
 - d. Adhesion
 - 1) Perform the following procedure on a minimum of 1 joint per day:
 - a) Select area to test that has cured for at least 1 hour for fast setting coatings.
 - b) Test and repair in accordance with AWWA C222 Dolly Pull-off Test.
 - e. Holiday Testing
 - 1) Holiday testing shall be performed using a high voltage holiday tester at each joint no sooner than 1 hour after field application of polyurethane coating.
 - f. Inspection at Welding Joints
 - 1) When applying 3 layer joint coating system for post welding joints, Contractor must show that his operation will not damage joint coating system to Engineer's satisfaction.

- 2) Contractor will be required to fully uncover a maximum of 10 joints, selected at random by Engineer or City to visually inspect and test joint after welding.
 - 3) Any damage must be repaired.
 - 4) If Contractor's welding procedure damages 3 layer joint coating system, Contractor, at direction of Engineer, will be required to modify his welding procedure.
2. Weld Testing
- a. Dye penetrant tests in accordance with ASTM E165, or magnetic particle test in accordance with AWWA C206 and set forth in AWS D.1.1. shall be performed by Contractor under supervision and inspection of Engineer or an independent testing laboratory, on all full welded joints.
 - 1) Welds that are defective will be replaced or repaired, whichever is deemed necessary by Engineer, at Contractor's expense.
 - 2) If Contractor disagrees with Engineer's interpretation of welding tests, test sections may be cut from joint for physical testing. Contractor shall bear expense of repairing joint, regardless of results of physical testing.
 - 3) Procedure for repairing joint shall be approved by Engineer before proceeding.
3. Deflection Testing
- a. Prior to hydrostatic testing, Contractor shall perform deflection testing at a minimum rate of 1 measurement for every 2,500 linear feet of water line in presence of Engineer.
 - b. Engineer may reject any areas not meeting deflection requirements of this Specification.
4. Cleaning and Testing
- a. Cleaning, disinfection, hydrostatic testing, and bacteriological testing of water mains:
 - 1) Clean, flush, disinfect, hydrostatic test, and bacteriological test water main as specified in Section 33 26 90.

END OF SECTION

SECTION 33 11 20

STAINLESS STEEL PIPE

PART 1 – GENERAL

1.01 SCOPE

- A. Contractor shall furnish all materials, tools, equipment, transportation, labor, supervision and incidentals required to supply, store, install, clean, and test shop fabricated stainless steel pipe and fittings as shown on Drawings and as specified herein.

1.02 SYSTEM

- A. Shop fabricated stainless steel piping shall be used for the following applications:
 1. Well head above grade discharge piping
 2. Where shown on Drawings

1.03 QUALIFICATIONS

- A. All shop fabricated stainless steel pipe and fittings shall be furnished by a single fabricator who is reputable and qualified and can demonstrate 10 years experience in the fabrication of stainless steel piping. Pipe and fittings shall be shop fabricated and field installed in accordance with common industry wide practices and methods and shall comply with these specifications.

1.04 SUBMITTALS

- A. Contractor shall submit for review and approval piping layouts, schedules, shop fabrication drawings, specifications, catalog cuts and other data necessary to show conformance of complete piping systems to these specifications. Contractor's submittal shall include dimensions, fittings, locations of equipment, valves, and appurtenances, joint locations and details, types and locations of supports, coordination with all other work and existing conditions, and all other pertinent Specifications for piping systems to be furnished in accordance with Section 01 33 00 – Submittals.
- B. Shop fabrication spool drawings shall show alloys, diameters, pipe wall thickness, fittings, branches, flanges and other joint preparation details, dimensions, and other appurtenances to be supplied.

PART 2 – MATERIALS

2.01 PIPE AND FITTINGS

- A. Pipes shall be manufactured from ASTM-A240 annealed and pickled sheets and plates in accordance with ASTM A778 in Grade TP 316L stainless steel. Pipe shall be manufactured to nominal pipe sizes as listed in ANSI B36.19, Table 2, and shall be Schedule 40, unless otherwise noted on Drawings.
- B. Fittings shall be butt weld type manufactured in accordance with ASTM-A-774 of same grade (alloy) and in same thickness as pipe. Long radius elbows (i.e. centerline to end of elbow equals 1.5 times nominal pipe size) up to 24" diameter shall be smooth flow type. All short radius, special radius, and reducing elbows; and long radius elbows greater than 24" diameter shall be of mitered construction with at least (5) miter sections for 90 degree bends, (3) mitered sections for 45 and 60 degree bends, and (2) mitered sections for 30 degree and smaller bends. Reducers may be straight tapered, cone type. Tees, crosses, laterals and wyes may be shop fabricated from specified pipe.
- C. Finish on raw material, manufactured to ASTM A-240 will be No. 1, HRAP (*hot rolled annealed and pickled and passivated*). Finish on completed pipe and fittings shall be as specified in ASTM A778 and A774, respectively.
- D. Grade TP316L products may be substituted for TP 304L products. Heavier wall pipes or fittings may be substituted for a lighter wall thickness specified. ASTM A312 pipe and A403 fittings may be substituted for A778 and A774 products, respectively.

2.02 COUPLINGS

- A. Piping will be shop prepared for pipe couplings where shown on Drawings.
1. Pipe shall be plain end with external weld beads ground smooth to insure proper seating. For pressure pipe lines, sleeve coupling joints will be restrained where indicated on Drawings. Restraint shall be by use of harness rods connecting across joint to plate lugs on adjacent flange joints. Where no adjacent flange joints exist, stainless steel harness lugs, as detailed on Drawings, shall be welded to pipe to receive harness rods. All sleeve couplings, plate lugs, harness rods and hardware will be provided by Contractor.
 2. Couplings will be Fixed - FxF, Expansion - ExE, or Fixed by Expansion - FxE. Pipe shall be plain end with external weld beads ground smooth and with stainless steel restraining rings shop welded to piping ends for fixed type couplings.
 3. Expansion couplings shall be flanged rubber arch type. Pipe flanges shall be provided for these couplings where shown on Drawings.

2.03 THREADED CONNECTIONS

- A. Threaded pipe, gauge or instrument connections shall be made using stainless steel 3,000-pound threaded half couplings conforming to ASTM A182 or ASTM A-276, shop welded to pipe at the locations shown on Drawings.

2.04 JOINTS

- A. ANSI 150 pound flanges shall be provided as a minimum at all flanged valves, meters, couplings, and other equipment. Couplings will be provided where shown on Drawings. Use EPDM gaskets and high strength stainless steel nuts, bolts, and washers to match grade of stainless steel specified.
- B. Pipe and fitting spools shall be shop fabricated to fullest extent possible in 20'0" maximum lengths. Smaller pipe spools shall be provided with joints as shown on Drawings for special handling, installation, and/or disassembly requirements.
- C. All other joints required for shipping, handling and installation of piping spools shall be (field welds, flange joints, sleeve couplings, band couplings, or split couplings).

PART 3 – EXECUTION

3.01 INSTALLATION

- A. After manufacture of individual stainless steel fittings and pipe lengths, they shall be pickled by immersion in a tank containing an ambient nitric hydrofluoric acid solution made up from Oakite Deoxidizer SS, or equal, and monitored to generally maintain a 25% or higher solution by volume of water. Duration of immersion shall be 15 to 20 minutes and may be supplemented by manually scrubbing or brushing with non metallic pads or stainless steel wire brushes. Acid treatment shall be followed by immersion in a rinse water tank, followed if necessary by a spray rinse. Stainless steel products shall then be allowed to air dry to achieve full passivation. Provide Engineer with certifications showing that all stainless piping has been pickled and passivated prior to shipment.
- B. Welding of pipe spools shall be performed using welders and procedures qualified in accordance with ASME Section IX. Walls shall be beveled according to procedure, root pass welded with TIG (GTAW), and have subsequent weld passes performed using TIG (GTAW), MIG (GMAW), or Metallic Arc (SMAW) process. Filler metal of equal or superior ELC grades only shall be added to all welds to provide a cross section at weld equal to or greater than parent metal. Concavity, undercut, cracks or crevices shall not be allowed. Butt welds shall have full penetration to interior surface, and inert argon gas shielding shall be provided to interior and exterior of the joint. Angle face rings shall be continuously welded on both sides to pipe or fitting. Exterior welds, such as back side of face rings or flanges and structural attachments, may be welded by MIG (GMAW) or Metallic Arc (SMAW) process; however care must be taken to avoid melting through to interior surface on very light walls. Excessive weld deposits, slag, spatter and projections shall be removed by grinding. Welds on gasket surfaces shall be ground smooth. Weld deposit shall be smooth and evenly distributed; weld reinforcement shall be as follows.

Wall Thickness

Weld Reinforcement (Max)

I.D.

O.D.

Sch 5s to 3/16" Pl.
1/4" Plate & Larger

3/32"
1/8"

1/8"
3/16"

- C. Spools shall be fabricated to "Pipe Fabrication Institute" fabricating tolerances ES-3 (1981).
- D. After shop fabrication into pipe spools, exterior welds shall be manually scrubbed or brushed with non metallic pads or stainless steel wire brushes to remove weld discoloration, rinsed with clean water and allowed to air dry.
- E. All fabricated piping shall have openings plugged and flanges secured for storage and/or transport after fabrication. All fabricated piping shall be piece marked with identifying numbers or codes which correspond to Contractors layout and installation drawings. Marks will be located on spools at opposite ends and 180 degrees apart.
- F. Piping supplier during manufacturing, fabrication and handling stages, and Contractor during handling and installation stages, shall use extreme care to avoid contact of any ferrous materials with stainless steel piping. All saws, drills, files, wire brushes, etc. shall be used for stainless steel piping only. Pipe storage and fabrication racks shall be non ferrous or stainless steel or rubber lined. Nylon slings or straps or alloy chains or cable shall be used for handling stainless steel piping. After installation, Contractor shall wash and rinse all foreign matter from piping surface. If rusting of embedded iron occurs, Contractor shall pickle affected surface with Oakite Deoxidizer SS or equal, scrub with stainless steel brushes and rinse clean in field.
- G. Painting of stainless steel pipe is not required. However, Contractor shall be responsible for supplying and installing stainless steel piping with a consistently clean surface. Identifying spool piece marks shall be removed with paint thinner or solvents and the entire stainless steel surface shall be washed with detergent and rinsed clean.
- H. After installation, piping system shall be tested by Contractor.

END OF SECTION

SECTION 33 12 00

VALVES, GENERAL

PART 1 - GENERAL

1.01 WORK OF THIS SECTION

- A. Work of this Section includes providing general requirements for valves including epoxy coating, installing, adjusting, and testing of valves and where buried valves are indicated, valve boxes to grade, with covers, stem extensions, and position indicators.

1.02 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, current editions of the following standards apply to Work of this Section:
1. ANSI B16.1 Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800
 2. ANSI B16.5 Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys
 3. ANSI/ASME B1.20.1 General Purpose Pipe Threads (Inch)
 4. ANSI/ASME B31.1 Power Piping
 5. ASTM A 36 Specification for Structural Steel
 6. ASTM A 48 Specification for Gray Iron Castings
 7. ASTM A 126 Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
 8. ASTM A 536 Specification for Ductile Iron Castings
 9. ASTM B 61 Specification for Steam or Valve Bronze Castings
 10. ASTM B 62 Specification for Composition Bronze or Ounce Metal Castings
 11. ASTM B 148 Specification for Aluminum-Bronze Castings
 12. ASTM B 584 Specification for Copper Alloy Sand Castings for General Applications
 13. ANSI/AWWA C500 Gate Valves for Water and Sewerage Systems
 14. ANSI/AWWA C502 Dry-Barrel Fire Hydrants
 15. ANSI/AWWA C503 Wet-Barrel Fire Hydrants
 16. ANSI/AWWA C504 Rubber-Seated Butterfly Valves
 17. ANSI/AWWA C506 Backflow Prevention Devices - Reduced Pressure Principle and Double Check Valve Types
 18. ANSI/AWWA C507 Ball Valves 6 Inches Through 48 Inches
 19. AWWA C508 Swing-Check Valves for Waterworks Service, 2 Inches Through 24 Inches NPS
 20. ANSI/AWWA C509 Resilient-Seated Gate Valves for Water and Sewage Systems
 21. AWWA C550 Protective Interior Coatings for Valves and Hydrants
 22. SSPC-SP-2 Hand Tool Cleaning
 23. SSPC-SP-5 White Metal Blast Cleaning

1.03 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01 33 00 - Submittals:
1. Manufacturer's product data including catalogue cuts.
 2. Manufacturer's installation instructions.
 3. Shop drawings showing details and dimensions.
 4. Manufacturer's certification that products comply with the indicated requirements.
 5. Schedule of valves indicating valve identification and location.
 6. Manufacturer's certification that epoxy coatings have been factory tested and comply with the indicated requirements.

1.04 OWNER'S MANUAL

- A. The following shall be included in Owner's Manual in compliance with Section 01 33 00 - Submittals:

1. Manufacturer's installation and operating instructions.
2. Manufacturer's maintenance procedures.
3. List of special tools.
4. Schedule of valves indicating valve identification and location.

1.05 FACTORY TESTING

- A. General: Valves shall be tested in compliance with AWWA Standards as indicated. Except as otherwise indicated, each valve body shall be tested under a test pressure equal to twice its design water-working pressure.
- B. Proof-of-Design Tests: Contractor shall furnish Engineer three (3) certified copies of a report from an independent testing laboratory certifying successful completion of proof-of-design testing for all valves of sizes 10" and larger unless indicated otherwise in specific valve Section. In lieu of testing valves at an independent testing laboratory, proof-of-design testing may be performed at valve manufacturer's laboratory, but must be witnessed by representative of a qualified independent testing laboratory representative. Proof-of-design testing shall have been performed on not less than three valves, with all three units demonstrating full compliance with test standards. Failure to satisfactorily complete test shall be deemed sufficient evidence to reject all valves of proposed make or manufacturer's model number.

1.06 FIELD TESTING

- A. Testing: Valves shall be field-tested for compliance with indicated requirements.

PART 2 - PRODUCTS

2.01 VALVES

- A. General: Shut-off valves, 6" and larger, shall have operators with position indicators. Where buried, these valves shall be provided with valve boxes and covers containing position indicators, and valve extensions. Valves mounted higher than 7 feet above working level shall be provided with chain operators.
- B. Valve Flanges: Flanges of valves shall be Class 150 unless otherwise noted on Drawings..
- C. Gate Valve Stems: Gate valve stems shall be fabricated with bronze conforming to ASTM B 62, containing not more than 5% of zinc nor more than 2% of aluminum. Gate valve stems shall be designed for minimum tensile strength of 60,000 psi, a minimum yield strength of 40,000 psi, and an elongation of at least 10% in 2", as determined by a test coupon poured from same ladle from which valve stems are poured. Where dezincification is not indicated, bronze conforming to ASTM B 584 may be used.
- D. Protective Coating: Except where otherwise indicated, ferrous surfaces, exclusive of stainless steel surfaces, in water passages of all valves 4" and larger, and exterior surfaces of submerged valves, shall be fusion epoxy coated. Flange faces of valves shall not be epoxy coated.
- E. Nuts and Bolts: All external nuts, bolts and washers used on valve flanges, bodies and supports shall be high strength 316 stainless steel.

2.02 NAMEPLATES, TOOLS AND SPARE PARTS

- A. Nameplates: Except as otherwise indicated, a label shall be provided on all valves exclusive of hose bibs and chlorine cylinder valves. Label shall be 1/16" plastic or stainless steel, minimum 2" by 4" in size, and shall be permanently attached to valve.

PART 3 - EXECUTION

3.01 VALVE INSTALLATION

- A. General: Valves, operating units, stem extensions, valve boxes, and accessories shall be installed in accordance with manufacturer's installation instructions. Valves shall be independently supported to prevent stresses on pipe.
- B. Access: Valves shall be installed to provide easy access for operation, removal, and maintenance and to prevent interferences between valve operators and structural members or handrails.
- C. Valve Accessories: Where combinations of valves, sensors, switches, and controls are indicated, combinations shall be properly assembled and installed to ensure that systems are compatible and operating properly.

END OF SECTION

SECTION 33 12 20

RESILIENT SEATED (WEDGE) GATE VALVES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Resilient Seated (Wedge) Gate Valves 4” through 48” for use with potable water main
- B. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 00 – Proposal Requirements, Contract Forms, and Conditions of Contract
 - 2. Division 01 – General Requirements
 - 3. Section 33 11 05 – Nuts, Bolts, and Gaskets
 - 4. Section 33 11 10 – Ductile Iron Pipe

1.02 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Gate Valve
 - a. Measurement
 - 1) Measurement for this Item shall be per each.
 - b. Payment
 - 1) Work performed and materials furnished in accordance with this Item shall be paid for at unit price bid per each “Gate Valve” installed for:
 - a) Various sizes
 - c. The price bid shall include:
 - 1) Furnishing and installing Gate Valves with connections as specified in Drawings
 - 2) Valve box
 - 3) Extension
 - 4) Extensions for valves in vaults
 - 5) Valve vault and appurtenances (for 16” and larger gate valves)
 - 6) Petrolatum tape for connections to steel flanges
 - 7) 2” risers (for 16” and larger gate valves)
 - 8) Isolation kits when installed with flanged connections
 - 9) Polyethylene encasement
 - 10) Pavement removal
 - 11) Excavation
 - 12) Hauling
 - 13) Disposal of excess material
 - 14) Furnishing, placement and compaction of embedment
 - 15) Furnishing, placement and compaction of backfill
 - 16) Clean-up
 - 17) Cleaning
 - 18) Disinfection
 - 19) Testing
 - 2. Cut-in Gate Valve
 - a. Measurement
 - 1) Measurement for this Item shall be per each.
 - b. Payment
 - 1) Work performed and materials furnished in accordance with this Item shall be paid for at unit price bid per each “Cut-in Gate Valve” installed for:

Resilient Seated (Wedge) Gate Valves

- a) Various sizes
- c. Price bid shall include:
 - 1) Furnishing and installing Gate Valves with connections as specified in Drawings
 - 2) System dewatering
 - 3) Connections to existing pipe materials
 - 4) Valve box
 - 5) Extension
 - 6) Extensions for valves in vaults
 - 7) Valve vault and appurtenances (for 16" and larger gate valves)
 - 8) Petrolatum tape for connections to steel flanges
 - 9) 2" risers (for 16" and larger gate valves)
 - 10) Isolation kits when installed with flanged connections
 - 11) Valve vault and appurtenances (for 16" and larger gate valves)
 - 12) Polyethylene encasement
 - 13) Pavement removal
 - 14) Excavation
 - 15) Hauling
 - 16) Disposal of excess material
 - 17) Furnishing, placement and compaction of embedment
 - 18) Furnishing, placement and compaction of backfill
 - 19) Clean-up
 - 20) Cleaning
 - 21) Disinfection
 - 22) Testing

1.03 REFERENCES

- A. Abbreviations and Acronyms
 - 1. NRS – Non Rising Stem
 - 2. OS&Y – Outside Screw and Yoke
- B. Reference Standards
 - 1. Reference standards cited in this Specification refer to current reference standard published at time of Bid.
 - 2. American Association of State Highway and Transportation Officials (AASHTO).
 - 3. American Society of Mechanical Engineers (ASME):
 - a. B16.1, Gray Iron Pipe Flanges and Flanged Fittings (Classes 25, 125, and 250).
 - 4. American Iron and Steel Institute (AISI).
 - 5. ASTM International (ASTM):
 - a. A48, Standard Specification for Gray Iron Castings.
 - b. A242, Standard Specification for High-Strength Low-Alloy Structural Steel.
 - c. A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
 - d. A536, Standard Specification for Ductile Iron Castings.
 - e. B117, Standard Practice for Operating Salt Spray (Fog) Apparatus.
 - f. B633, Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
 - 6. American Water Works Association (AWWA):
 - a. C509, Resilient-Seated Gate Valves for Water Supply Service.
 - b. C515, Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service.
 - c. C550, Protective Interior Coatings for Valves and Hydrants.
 - d. C900, Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4" through 12", for Water Transmission and Distribution.

7. American Water Works Association/American National Standards Institute (AWWA/ANSI):
 - a. C105/A21.5, Polyethylene Encasement for Ductile-Iron Pipe Systems.
 - b. C111/A21.11, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - c. C115/A21.15, Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
8. NSF International (NSF):
 - a. 61, Drinking Water System Components - Health Effects.

1.04 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 - Submittals.
- B. All submittals shall be approved by Engineer prior to delivery.

1.05 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS

- A. Product Data
 1. Resilient Seated (Wedge) Gate Valve noting pressure rating and coating system supplied, including:
 - a. Dimensions, weights, material list, and detailed drawings
 - b. Joint type
 - c. Maximum torque recommended by the manufacturer for valve size
 2. Polyethylene encasement and tape
 - a. Whether film is linear low density or high density cross linked polyethylene
 - b. Thickness of film provided
 3. Thrust Restraint, if required by Contract Documents
 - a. Retainer glands
 - b. Thrust harnesses
 - c. Any other means
 4. Instructions for field repair of fusion bonded epoxy coating
 5. Gaskets
- B. Certificates
 1. Furnish an affidavit certifying that all Resilient Seated (Wedge) Gate Valves meet provisions of this Section, each valve meets Specifications, all inspections have been made and that all tests have been performed in accordance with AWWA C509 or AWWA C515.
 2. Furnish a certificate stating that buried bolts and nuts conform to ASTM B117.
 3. Furnish affidavit that Resilient Seated (Wedge) Gate Valve manufacturer has five (5) years experience manufacturing Resilient Seated Gate Valves of similar service and size with experience record.
 4. Furnish affidavit that Resilient Seated (Wedge) Gate Valve manufacturer owns or controls any foreign factory/foundry that supplies valve casings and can certify that Resilient Seated (Wedge) Gate Valve manufacturer is in control of quality control at foreign factory/foundry.

1.06 QUALITY ASSURANCE

- A. Qualifications
 1. Manufacturers
 - a. Valves 16" and larger shall be product of a single manufacturer.
 - 1) Change orders, specials and field changes may be provided by a different manufacturer upon Engineer approval.
 - b. Valves of each size shall be product of a single manufacturer.

Resilient Seated (Wedge) Gate Valves

- 1) Change orders, specials and field changes may be provided by a different manufacturer upon Engineer approval.
- b. Valves shall meet or exceed AWWA C509 or AWWA C515.
- c. For valves equipped with a bypass, bypass valve must be of same manufacturer as main valve.
- d. Resilient Seated Gate Valves shall be new.
- e. Resilient Seated Gate Valve Manufacturer shall not have less than 5 years of successful experience manufacturing of Resilient Seated Gate Valves of similar service and size, and indicated or demonstrate an experience record that is satisfactory to Engineer. This experience record will be investigated by Engineer, and acceptance will be at sole discretion of Engineer.
- f. Casings for Resilient Seated Gate Valve, such as valve body, wedge, and bypass; that are not manufactured within United States of America, shall be manufactured by factories/foundries that are owned such that Resilient Seated Gate Valve Manufacturer can control and guarantee quality at foreign factory/foundry.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Storage and Handling Requirements
 1. Protect all parts so that no damage or deterioration will occur during a prolonged delay from time of shipment until installation is completed and units and equipment are ready for operation.
 2. Protect all equipment and parts against any damage during a prolonged period Site.
 3. Protect finished surfaces of all exposed flanges by wooden blank flanges, strongly built and securely bolted thereto.
 4. Protect finished iron or steel surfaces not painted to prevent rust and corrosion.
 5. Prevent plastic and similar brittle items from being directly exposed to sunlight or extremes in temperature.
 6. Secure and maintain a location to store material in accordance with Division 01.

PART 2 - PRODUCTS

2.01 EQUIPMENT, PRODUCT TYPES AND MATERIALS

- A. Manufacturers
 1. American Flow Control - Series 2500
 2. Clow Valve Company - 2638
 3. Mueller Co. - A2361
 4. EJ (Formerly East Jordan)- FlowMaster
- B. Description
 1. Regulatory Requirements
 - a. Valves shall be new and meet or exceed AWWA C515 and shall meet or exceed all requirements of this Specification.
 - b. All valve components in contact with potable water shall conform to requirements of NSF 61.
- C. Materials
 1. Valve Body
 - a. Valve body: ductile iron per ASTM A536
 - b. Flanged ends: Furnish in accordance with AWWA/ANSI C115/A21.15.
 - c. Mechanical Joints: Furnish with outlets which conform to AWWA/ANSI C111/A21.11.

Resilient Seated (Wedge) Gate Valves

- d. Valve interior and exterior surfaces: Fusion bonded epoxy coated, minimum 5 mils, meeting AWWA C550 requirements
- e. Buried valves: Provide with polyethylene encasement in accordance with AWWA/ANSI C105/A21.5.
 - 1) Polyethylene encasement: Furnish in accordance with Section 33 11 10.
- 2. Wedge (Gate)
 - a. Resilient wedge rated at 250 psig cold water working pressure
 - b. Wedge (gate) for all valve sizes shall be one piece, fully encapsulated with a permanently bonded EPDM rubber.
- 3. Bypass
 - a. For gate valves using a double roller, track and scrapper system, an integrally cast bypass on body of valve is required.
 - 1) Orient the bypass on same side of gate valve as spur gear to allow operation of both valves from manhole opening.
 - 2) Bypass shall be a minimum 4" in size.
- 4. Gate Valve Bolts and Nuts
 - a. Bonnet, Stuffing Box and Gear Box. Provide hex head bolt and hex nut per AISI 304 stainless steel for buried service (all sizes) and for all valves 16" through 36" (non-buried service)
- 5. Bolts and Nuts
 - a. Mechanical Joints
 - 1) Provide bolts and nuts in accordance with Section 33 11 05.
 - b. Flanged Ends
 - 1) Meet requirements of AWWA C115 or AWWA C207 depending on pipe material.
 - 2) Provide stainless steel bolts and nuts in accordance with Section 33 11 05.
 - 3) Flanged isolation kits shall be provided when connecting to buried steel or concrete pressure pipe.
 - 4) Kits shall conform to Section 26 64 00.
- 6. Joints
 - a. Valves: flanged, or mechanical-joint or any combination of these as specified on Drawings or in Specifications
 - 1) Flanged-joints: AWWA/ANSI C115/A21.15, ASME B16.1, Class 125
 - b. Flange bolt circles and bolt holes shall match those of ASME B16.1, Class 125.
 - 1) Field fabricated flanges are prohibited.
 - 2) Steel or concrete pressure pipe
 - a) Use flange-joints unless otherwise specified in Contract Documents.
 - 3) Ductile Iron or PVC pressure pipe
 - a) Use mechanical joints with mechanically restrained retainer glands unless otherwise specified in Contract Documents.
- 7. Operating Nuts
 - a. Supply for buried service valves
 - b. 1-15/16" square at top, 2" at base, and 1-3/4" high
 - c. Cast an arrow showing direction of opening with word "OPEN" on operating nut base.
 - d. Nut shall be painted red per AWWA specifications.
 - e. Connect operating nut to shaft with a shear pin that prevents nut from transferring torque to that shaft or gear box that exceeds manufacturer's recommended torque.
 - f. Furnish handwheel operators for non-buried service, or when shown in Drawings.
- 8. Gearing

- a. Gate valves that are 24" and larger: Equip with a spur gear.
 - b. Bevel gears for horizontally mounted valves are not allowed.
 - c. Spur gear shall be designed and supplied by manufacturer of valve as an integral part of gate valve.
9. Gaskets
- a. Provide gaskets in accordance with Section 33 11 05.

2.02 ACCESSORIES

- A. All gate valves shall have the following accessories provided as part of gate valve installation:
- 1. A keyed solid extension stem of sufficient length to bring operating nut up to within 1 foot of surface of ground, when operating nut on gate valve is 3 feet or more beneath surface of ground. Extension Stems are:
 - a. Not to be bolted or attached to valve-operating nut
 - b. To be of cold rolled steel with a cross-sectional area of 1 square inch, fitting loosely enough to allow deflection
 - 2. Furnish joint components such as gaskets, glands, lubricant, bolts, and nuts in sufficient quantity for assembly of each joint.
 - 3. Cast Iron Valve Boxes: provide for buried service gate valves, cast iron valve boxes and covers
 - a. Each valve box for 4" through 12" valves shall be 2-piece, 5 1/4" shafts, screw type, consisting of a top section and a bottom section.
 - b. Valve box covers shall be so designed that they can be easily removed to provide access to valve operating nut.
 - c. Valve box covers must be designed to stay in position and resist damage under AASHTO HS 20 traffic loads.
 - d. Each cover shall be casted with word "WATER" or "RECLAIMED" in raised letters on upper surface.
 - e. Cast iron valve boxes and covers shall conform to ASTM A48, Class 35B.
 - 1) Valve box covers shall be round for potable water applications and square for reclaimed water applications.
 - f. Box extension material shall be AWWA C900 PVC or ductile iron.

2.03 INSTALLATION

- A. General
- 1. All valves shall be installed in vertical position when utilized in normal pipeline installation.
 - 2. Valves shall be placed at line and grade as indicated on Drawings.
 - 3. Polyethylene encasement installation shall be in accordance with Section 33 11 10.
 - 4. Excavate and backfill buried valves per Section 31 23 17 - Trenching.

2.04 FIELD QUALITY CONTROL

- A. Field Inspections
- 1. Before acceptance of installed valve, Owner's field operations staff shall have an opportunity to operate valves.
 - 2. Engineer shall be given an opportunity to inspect all buried flanges before they are covered.
 - 3. Operator will be assessing ease of access to operating nut within valve box and ease of operating valve from a fully closed to fully opened position.

END OF SECTION

SECTION 33 12 21

AWWA RUBBER SEATED BUTTERFLY VALVES

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to install butterfly valves. All products furnished shall be in conformance with ANSI/AWWA C504-10 (latest version thereof). All coatings in contact with potable water shall be certified to N.S.F. 61. A proof of design certification shall be provided upon request.

1.02 DEFINITIONS

- A. All definitions are defined according to ANSI/AWWA C504-10
 1. Actuator: A device attached to valve for the purpose of rotating valve disc to an open, closed, or intermediate position; preventing discover travel; and maintaining disc in any position.
 2. Butterfly Valve: A valve that uses a disc rotatable through an angle of approximately 90 degrees as a closure member. Valve is closed when disc is perpendicular to flow way, open when parallel to flow way, or used for throttling when positioned between open and closed.
 3. Disc: Closure member that is positioned in flow stream to permit flow or to obstruct flow (depending on closure position) and that rotates through an angle of 90 degrees from full open to full shutoff.
 4. Rubber Seat: A resilient rubber ring that is securely attached to valve disc or body.
 - a. Rubber seats attached to valve body shall consist of a rubber ring around inside of valve body that is securely attached to valve body to affect a seal against metal seating surface when disc is closed.
 - b. Resilient seats attached to valve disk shall provide a 360 degrees continuous, uninterrupted seating surface. Seats shall be mechanically retained with a stainless steel retaining ring and stainless steel Nylok cap screws, which shall pass through both resilient seat and retaining ring. Resilient seat's mating surface shall be to a 360 degrees continuous, uninterrupted stainless steel body seat ring. Retaining ring shall be continuous or investment cast with overlapping sections serrated grooves, and shoulders. Resilient seats shall be field adjustable and replaceable.

1.03 QUALITY ASSURANCE

- A. Manufacturers shall have an ASME or I.S.O. 9001 registered commercial quality system. If on receipt of butterfly valves they are found to be noncompliant manufacturer shall replace defective butterfly valves according to butterfly valve size with a butterfly valve that meets these Specifications. Defective butterfly valves will be returned to manufacturer, freight collect, and manufacturer shall replace butterfly valve, freight prepaid. If butterfly valve becomes defective during manufacturer's specified warranty period and manufacturer review will ensue. If review determines manufacturing non-conformance manufacturer shall replace butterfly valve according to size with a butterfly valve that meets Specifications. Defective butterfly valve removed from field will be returned to these manufacturer, freight collect, and manufacturer shall replace butterfly valve, freight prepaid. If nonconformance product amounts are excessive and result in increased product replacement by Owner's field staff manufacturer may be subject to time and material charges.
- B. Acceptable Manufacturers:

Manufacturer and Product	AWWA Class 150	AWWA Class 250
Mueller Company - Linseal XP	X	X
Henry Pratt - Ground Hog	X	
Henry Pratt - HP 250		X
Dezurik - BAW	X	X
Crispin Multiplex - K-Flo Models 504 and 47	X	X
Valve Matic - Series 2000	X	X

- C. Experience Requirements: Manufacturer shall have had successful experience in manufacturing tight-closing, rubber-seated butterfly valves for this type service in sizes indicated. Manufacturer shall have at least 10 years' experience in manufacture of valves.
- D. Manufacturer's Representative for Startup and Testing: Valve Vendor or Manufacturer shall provide the services of a competent manufacturer's representative for an indefinite period of time as required to insure proper adjustment, installation, and operation of valve.

1.04 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 - Submittals and shall include:
 - 1. Shop Drawings (needed if electric actuators are used).
 - 2. Operation and Maintenance Manuals.
- B. Product Data
 - 1. Rubber-Seated Butterfly Valves stating:
 - a. Material
 - b. Valve and Actuator Coating System
 - c. Working pressure rating
 - d. Test pressure rating
 - e. Valve classification
 - f. Valve Seat Type and bonding method to disc or body
 - g. Valve-port diameter
 - h. Valve Torque required
 - i. Actuator Type and maximum torque
 - j. Total net assembled weight
 - k. Valve operator and extension stems
 - 2. Opening direction
 - 3. Confirm valve seat type for specific project application with Engineer prior to ordering Rubber-Seated Butterfly Valve.

1.05 STANDARDS

- A. Applicable provisions of the following standards shall apply as if written here in their entirety:
 - 1. American National Standards Institute (ANSI) Standards:
 - a. ANSI B16.1 Cast Iron Pipe Flanges and Fittings
 - 2. American Society for Testing and Materials (ASTM) Standards:
 - a. ASTM A48 Standard Specification for Gray Iron Castings
 - b. ASTM A126 Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings

- c. ASTM A276 Standard Specifications for Stainless Steel Bars
- d. ASTM A536 Standard Specification for Ductile Iron Castings
- e. ASTM B148 Standard Specifications for Aluminum Bronze Coatings
- 3. American Water Works Association (AWWA) Standards:
 - a. AWWAC504-10 Standard for Rubber-seated Butterfly Valves
 - b. AWWA C550 Standard for Protective Interior Coatings for Valves and Hydrants

PART 2 - PRODUCTS

2.01 VALVE CONSTRUCTION

- A. Except as otherwise modified or supplemented herein, AWWA Standard C504, latest revision thereof, shall govern design, component material construction, manufacture and testing of all butterfly valves.
- B. Owner reserves the right to limit purchase of butterfly valves form manufacturers and to models specified, provided such butterfly valves conform to provisions contained herein.
- C. Class 150 valves shall be of short-body type with a 150 psig bidirectional shut-off rating, and a 300 psig hydrostatic body shell test. Class 250 valves shall be of short-body type with a 250 psig bidirectional shut-off rating, and a 500 psig hydrostatic body shell test. All valves shall have a maximum upstream line velocity rating according to table listed below unless specified otherwise.

<u>Diameter</u>	<u>Velocity</u>
4" through 20"	16 feet per second
24" through 72"	8 feet per second

- D. Valve shall be in same alignment as a horizontal pipe and shall be for buried service, unless otherwise specified. Valve shall be configured with a horizontal valve shaft and a vertical actuator shaft with standard 2" AWWA operating nut. Actuator shall be side mounted.
- E. Valve body shall be constructed of Cast Iron conforming to ASTM Specification A-126, Class B, or Ductile Iron ASTM A536, Grade 65-45-12.
- F. Valve body ends shall be flat-faced flanged in accordance with ANSI B16.1, Class 125, for Class 150 Valves, and ANSI B16.1, Class 250 for Class 250 Valves. All valve flanges shall be AWWA Class E with 150 pound bolt pattern. All valves shall conform to AWWA C504-10, Table 2 of Section 4.2.1 Valve Bodies.
- G. Valve shall be of such design that disc will seat at 90 degrees with pipe axis.
- H. Valve shall be of such design that disc will not flutter or vibrate when operated in a throttled position.
- I. Valves disc shall be of Cast Iron A-48, Class 40 Cast Iron A-126, Class B or Ductile Iron ASTM A-536, grade 65-45-12 and shall be of disc design to provide 360 degree uninterrupted seating.
- J. Valve seat shall be natural or synthetic rubber resilient seat applied integrally to disc or body to provide tight shut off at pressure specified. Valve seats shall be epoxy bonded or mechanically retained. For valves 24" or larger, rubber seat shall be capable of mechanical adjustment in field and shall be field replaceable. Special tools required for seat adjustment shall be provided with valve. Special tools required for seat replacement shall be furnished with replacement seat. Mechanical adjustment or attachment of seat and seat ring does not include welding. Mating seat surface shall be type 304 or type 316 stainless steel, ni-chrome or monel. Sprayed or plate mating seat surfaces are not acceptable.

- K. Valve shafts shall be type 304 stainless steel conforming to ASTM A-276 and shall have a diameter equal to or greater than that shown for Class 150B and Class 250B in Table 3 of AWWA C504-10, Section 4.2.3 Valve Shafts. Shafts shall conform to requirements of Section 4.2.3, Valves Shaft of AWWA C504-10 for one-piece or stub shaft types. Connection between shaft and disc shall be dowel or taper pins, which are mechanically secured.
- L. Valve assembly shall be furnished with a factory-set, non-adjustable disc shaft thrust bearing that insures valve disc is centered within valve body seat at all times.
- M. Valve shaft bearings shall be permanent, self-lubricated, bearings, which provides continuous, low-friction maintenance-free operation. Shaft bearing shall be contained in integral hubs of valve body.
- N. Valve shaft seal shall consist of O-ring, V-type, or U-cup type packing where shaft projects through valve body for actuator connection.
- O. Valve shall be provided with a fully enclosed, permanently lubricated actuator of traveling nut or worm gear design. Actuator shall be connected to valve shaft by means of a key and keyway connection.
- P. All actuators shall have adjustable, mechanical stop limits in accordance with AWWA C504, Section 4.2.8.
- Q. Valves for below ground applications shall be provided with an AWWA wrench nut. Wrench nut shall have an arrow cast thereon, indicating direction on of opening. Wrench nut shall be suitably fastened to actuator input shaft. If shaft is smooth, wrench nut shall be fastened to input shaft by means of a minimum 5/16" diameter steel pin passing entirely through shaft and wrench nut. Key with keyway will be acceptable. If shaft is splined, wrench nut shall be formed to fit splined shaft. Actuator shall be designed to produce specified torque with a maximum input of 150 ft-lbs applied to wrench nut.
- R. Valves for aboveground applications shall be provided with a handwheel. Handwheel shall have an arrow thereon, indicating direction of opening. Handwheel shall be suitably fastened to actuator input shaft. Actuators equipped with handwheels shall be designed to produce specified torque with a maximum pull of 80 pounds of handwheel rim.
- S. Requirement for either wrench nut or handwheel and the direction of opening will be specified on each purchase order.
- T. Contractor shall submit three sets of certified drawings showing principal dimensions, general construction and material specification of valve proposed. Number of turns to open (close) shall be clearly noted in valve information submitted.
- U. Supplier/manufacturer shall provide Affidavit of Compliance with applicable sections of AWWA C504 to include the following:
 - 1. Results of ASTM testing procedures and requirements for materials will be provided to Engineer upon request,
 - 2. Manufacturer's Quality Assurance Program, leak-tightness testing and proof of design testing of representative actuators in accordance with AWWA C504.
 - 3. Compliance assurance will be required in accordance with AWWA C504, Section 5.1.2, Affidavits.
 - 4. Results of performance tests, proof of design test, AWWA C504, Section 5.1.4, hydrostatic test, leakage test,
 - 5. Affidavit of Compliance shall be provided with the bid or with shipping documents and shall be approved by Engineer.

PART 3 - EXECUTION

3.01 WORKMANSHIP

- A. All parts of butterfly valve shall be designed and manufactured to tolerances specified in ANSI/AWWA C504, latest version thereof, and this Specification.
- B. All parts of butterfly valve manufactured by a given manufacturer shall be interchangeable with like parts from another butterfly valve of same model and size and by same manufacturer.

3.02 PAINTING

- A. Shop Coating:
 - 1. All interior and exterior ferrous surfaces of the valve, including disc, shall be coated with epoxy, N.S.F. 61 certified. Epoxy shall have a nominal thickness of 8 mils, and shall be in accordance with AWWA C550, latest revision
 - 2. Coating shall be holiday tested and holiday free in accordance with AWWA C550.
- B. Field Coating: Valves installed above grade, exposed valves, and valves in vaults shall be shop coated, and shall receive additional field coating protection in accordance with Section 09 90 00 - Painting.

3.03 INSTALLATION

- A. Installation shall be in accordance with Manufacturer's instructions. Valve shaft shall be truly vertical or horizontal as indicated.

3.04 FIELD QUALITY CONTROL

- A. Upon completion of installation of butterfly valves an acceptance test shall be conducted to verify satisfactory operation of valves. Valves must perform in a manner acceptable to Engineer before final acceptance will be made by Owner.

3.05 TESTING

- A. Testing of butterfly valves shall be conducted in coordination with Section 33 26 90.
- B. Performance Tests: Performance tests shall be performed on each valve in accordance with Section 5.1.1 Testing of ANSI/AWWA C504, latest revision thereof.
- C. Leakage Tests: Leakage tests shall be performed on each valve in accordance with Section 5.1.2 Testing of ANSI/AWWA C504, latest revision thereof.
- D. Hydrostatic Tests: Hydrostatic tests shall be performed on each valve in accordance with Section 5.1.3 Testing of ANSI/AWWA C504, latest revision thereof.
- E. Proof-of-Design Tests: Proof-of-Design tests shall be performed on each valve in accordance with Section 5.1.4 Testing of ANSI/AWWA C504, latest revision thereof.
- F. An Affidavit of Compliance certifying that all required tests have been performed shall be provided.
- G. Affidavit of Compliance and the records of all tests performed on valves shall be kept and provided in a single hard cover bound notebook.

END OF SECTION

SECTION 33 12 30

COMBINATION AIR VALVES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
1. 2" through 8" Combination Air-Release and Air/Vacuum Valve Assemblies (Combination Air Valves) for potable water systems including:
 - a. Combination air-release and air/vacuum valve
 - b. Tap to water main
 - c. Lead-free Inlet piping and appurtenances
 - d. Vent piping and appurtenances
 - e. Vault enclosure and appurtenances
- B. Related Specification Sections include, but are not necessarily limited to:
1. Division 00 – Proposal Requirements, Contract Forms, and Conditions of Contract
 2. Division 01 – General Requirements
 3. Section 33 01 30 – Frames, Gates, Rings, and Covers
 4. Section 33 11 10 – Ductile Iron Pipe
 5. Section 33 11 11 – Ductile Iron Fittings
 6. Section 33 11 14 – Buried Steel Pipe and Fittings
 7. Section 33 12 20 – Resilient Seated (Wedge) Gate Valves
 8. Section 33 05 14 – Precast Concrete Manholes

1.02 REFERENCES

- A. Definitions
1. Combination Air Valve: A device having features of both an air-release valve and an air/vacuum valve
 2. Inlet: Opening at the base of Combination Air Valve mechanism through which air and water from pipeline enters
 3. Inlet Piping: Piping and appurtenances between pipeline and valve inlet
 4. Lead-free: Lead-free pipes and plumbing fittings and fixtures shall contain less than 0.25% lead in accordance with reduction of Lead in Drinking Water Act (P.L. 111-380).
 5. Orifice: Opening in Combination Air Valve mechanism through which air is expelled from or admitted into pipeline or piping system. Some valves may have multiple orifices.
 6. Outlet: Opening at top of Combination Air Valve mechanism, including orifice, through which air enters or exits Air Valve
 7. Vent Piping: Piping and appurtenances from Combination Air Valve outlet to its termination point outside vault
- B. Reference Standards
1. Reference standards cited in this Specification refer to current reference standard published at time of Bid.
 2. American Iron and Steel Institute (AISI).
 3. ASTM International (ASTM):
 - a. A536, Standard Specification for Ductile Iron Castings.
 4. American Water Works Association (AWWA):
 - a. C512, Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service.
 - b. M51, Air-Release, Air/Vacuum, and Combination Air Valves.
 5. NSF International (NSF):
 - a. 61, Drinking Water System Components - Health Effects.
 6. Reduction of Lead in Drinking Water Act
 - a. Public Law 111-380 (P.L. 111-380)

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00.
- B. All submittals shall be approved by Engineer prior to delivery.

1.04 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS

- A. Product Data
 - 1. Combination Air Valves
 - a. Application type
 - b. Working pressure rating
 - c. Test pressure rating
 - d. Surge pressure rating
 - e. Inlet size
 - f. Small orifice size
 - g. Large orifice size
 - 2. Valve vault and appurtenances
 - 3. Tapping appurtenances
 - 4. Isolation valves
 - 5. Fittings
 - 6. Vent piping
 - 7. Vent cover and/or enclosure
 - 8. Vent enclosure and/or pipe bollard protection

1.05 QUALITY ASSURANCE

- A. Qualifications
 - 1. Manufacturers
 - a. Combination Air Valves of same size shall be product of a single manufacturer, unless approved by Engineer.
 - b. Combination air valves shall be in conformance with AWWA C512.
- B. Certifications
 - 1. Obtain an Affidavit of Compliance from valve manufacturer in accordance with AWWA C512.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Storage and Handling Requirements
 - 1. Protect all parts such that no damage or deterioration will occur during a prolonged delay from time of shipment until installation is completed and units and equipment are ready for operation.
 - 2. Protect all equipment and parts against any damage during a prolonged period at Site.
 - 3. Protect finished surfaces of all exposed flanges by wooden blank flanges, strongly built and securely bolted thereto.
 - 4. Protect finished iron or steel surfaces not painted to prevent rust and corrosion.
 - 5. Prevent plastic and similar brittle items from being directly exposed to sunlight or extremes in temperature.
 - 6. Secure and maintain a location to store material in accordance with Division 01 requirements.

1.07 WARRANTY

- A. Manufacturer Warranty
 - 1. Manufacturer's Warranty shall be in accordance with Division 01.

PART 2 - PRODUCTS

2.01 EQUIPMENT, PRODUCT TYPES, AND MATERIALS

- A. Manufacturers
 - 1. Approved Manufacturers
 - a. GA Industries, Inc.- Empire Air and Vacuum Valve, Model 935.
 - b. Multiplex Manufacturing Co. - Crispin Air and Vacuum Valves.
 - c. Valve and Primer Corp.- APCO #143C, #145C and #147C.
 - 2. Listed manufacturers must comply with this Specification and related sections.
 - 3. Combination Air Valve shall be new and product of a manufacturer regularly engaged in manufacturing of air release/air vacuum valves having similar service and size.

- B. Description
 - 1. Regulatory Requirements
 - a. Combination Air Valves shall meet or exceed latest revisions of AWWA C512 and shall meet or exceed requirements of this Specification.
 - b. All Combination Air Valve components in contact with potable water shall conform to requirements of NSF 61.
 - c. All materials shall conform to Reduction of Lead in Drinking Water Act (P.L. 111-380). This Act defines "Lead-free" for pipes and other appurtenances to be less than 0.25% lead.

- C. Performance / Design Criteria
 - 1. Capacities
 - a. Water Application = Potable Water
 - b. Working Pressure from 10 psi to 150 psi
 - c. Test Pressure = 225 psi
 - d. Surge Pressure = 100 psi minimum, unless stated otherwise in Contract Documents
 - e. Size
 - 1) Each orifice size must be sufficient to meet requirements set forth in AWWA M51 and indicated on Drawings.
 - 2. Function
 - a. High volume discharge during pipeline filling
 - b. High volume intake through large orifice
 - c. Pressurized air discharge
 - d. Surge Dampening/Controlled discharge rates
 - 1) Valve shall have an integral surge alleviation mechanism which shall operate automatically to limit transient pressure rise or shock induced by closure due to high velocity air discharge or the subsequent rejoining of separated water columns. Limitation of pressure rise shall be achieved by decelerating approaching water prior to valve closure.

- D. Materials
 - 1. Combination Air Valve
 - a. Internal parts
 - 1) Non-corroding material such as stainless steel or high density polyethylene
 - b. Valve body
 - 1) AISI 304 stainless steel or ASTM A536 ductile iron
 - 2) Equipped with intake and discharge flanges
 - c. Inlet/Discharge orifice area
 - 1) Equal to the nominal size of valve

- E. Finishes
 - 1. Finish Materials

- a. Supply all ductile iron Combination Air Valves with a factory applied fusion bonded epoxy coating with a final coating thickness of 16 mils minimum.

2.03 ACCESSORIES

- A. For 2" Combination Air Valve Assemblies:
 - 1. Tap
 - a. 304 stainless steel tapping saddle and 2" corporation valve (C.C. thread with flare).
 - 2. Inlet Piping
 - a. 2" outlet between tap and isolation valve with the following:
 - 1) Threaded, lead-free brass piping
 - 2) Threaded, lead-free brass tee
 - 3) Threaded, lead-free brass hand wheel valves
 - 3. Vent Piping
 - a. 4" minimum diameter, in accordance with Drawings
 - 4. Vent Screen
 - a. Stainless Steel (AISI 316)
 - 5. Dropover Enclosure
 - a. Channell SPH-1420 thermoplastic enclosure, or approved equal
 - 6. Vault
 - a. Provide a flat top concrete manhole in accordance with Section 33 39 20.
 - b. Provide a 32" hinged cover with frame and grade ring in accordance with Section 33 05 13.
 - c. Secure Air Valve to vault wall using a stainless steel bracket manufactured by Grinell, or equal, in accordance with Drawings
- B. For 3" to 8" Combination Air Valve Assemblies:
 - 1. Tap
 - a. For 24" diameter mains:
 - 1) Provide 24" blind flange outlet
 - b. For mains with 30" and greater diameter:
 - 1) Provide 30" blind flange outlet
 - c. For ductile iron and PVC mains, provide mechanical joint x flange tee with tapped flange.
 - 2. Inlet Piping
 - a. Flanged ductile iron or steel, depending on main material, in accordance with Drawings
 - b. Brass corporation stops.
 - 3. Isolation Valves
 - a. Gate valve (flanged) in accordance with Section 33 12 20 with:
 - 1) 2" operating nut, non-rising stem with enclosed miter gearing for 3" and larger gate valves
 - 4. Vent Piping
 - a. 4" minimum, in accordance with Drawings
 - 5. Vent Screen
 - a. Stainless Steel (AISI 316)
 - 6. Dropover Enclosure
 - a. Channel SPH-1420 thermoplastic enclosure, or approved equal
 - 7. Vault
 - a. Provide a flat top, concrete manhole.
 - b. Manhole dimensions shall be in accordance with Drawings.
 - c. Provide a 32" hinged cover with frame and grade ring in accordance with Section 33 05 13.
 - d. Secure Air Valve to vault wall using a stainless steel bracket manufactured by Grinell, or equal, in accordance with Drawings
- C. Finishes

1. Primer Materials
 - a. Prime Vent Piping within vault, as well as above ground per Division 09 requirements.
2. Finish Materials
 - a. Paint Vent Piping within vault, as well as above ground per Division 09 requirements.
 - b. Color to be selected by Owner.

2.04 SOURCE QUALITY CONTROL

- A. Tests and Inspections
 1. Testing and inspection of Combination Air Valves shall be in accordance with AWWA C512.
- B. Markings
 1. Each Combination Air Valve shall be marked in accordance with AWWA C512.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General
 1. Install in accordance with manufacturer's recommendations and as shown on Drawings.
 2. Above ground and vault interior ductile iron piping and valves shall be painted in accordance with Division 09 requirements, unless otherwise stated in Drawings.
 3. Wrap all buried ductile iron pipe and fittings with polyethylene encasement in accordance with Section 33 11 10 and Section 33 11 11 respectively.

3.02 FIELD QUALITY CONTROL

- A. Field Inspections
 1. Pipe large and small orifices directly to vent piping. There shall be no direct discharge of an orifice to an underground vault.
 2. Valve shall perform as intended with no deformation, leaking or damage of any kind for pressure ranges indicated.
 3. Before acceptance of installed valve, Owner's operations staff shall have an opportunity to inspect and operate valve.
 4. Owner will assess ease of access to operating nut and ease of operating corporation stop.
 5. If access and operation of valve and its appurtenances meet requirements of Contract Documents, then valve will be accepted as installed.
 6. Combination Air Valve assembly shall be free from any leaks.
- B. Non-Conforming Work
 1. If access and operation of valve or its appurtenances does not meet criteria of Contract Documents, Contractor will remedy situation until it meets Owner's criteria, at Contractor's expense.

END OF SECTION

SECTION 33 20 09

FLEXIBLE PIPE COUPLINGS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Section governs furnishing and installation of flexible pipe couplings, flanged coupling adapters, and restrained flexible couplings for pipe. All other piping components covered in other sections of Division 33.

1.2 SUBMITTALS

- A. Product Data and Shop Drawings. Submit product data and shop drawings on each type of pipe, fittings and accessories pursuant to Division 01 - General Requirements.
- B. Named Manufacturer. Inclusion of a specific manufacturer's name does not imply that specific standard product is acceptable. Specified manufacturers standard product shall be modified to meet requirements of this Section.

PART 2 - PRODUCTS

2.01 DUCTILE IRON PIPE COUPLINGS

- A. Flexible Couplings.
 - 1. Manufacturers. Shall be Dresser Industries, Style 153; Romac Industries, Style 501; or Smith Blair Series 144.
 - 2. Materials. Center sleeves and follower flanges shall be ductile iron (ASTM A536). Hex nuts and bolts shall be 304 stainless steel for above ground applications and 316 SS for all buried, submerged, or below grade installations.
 - 3. Coatings. Apply shop primer which is compatible to finish coating required by Section 09 90 00 to be applied in field.
- B. Flanged Coupling Adapters (12" and smaller).
 - 1. Manufacturers. Shall be Dresser Industries, Style 127; Romac Industries, Style FCA501; or Smith Blair, Series 912.
 - 2. Materials. Flanged body and follower ring shall be ductile iron (ASTM A536). Flange shall be designed in accordance with AWWA Class D with ANSI 150# drilling. Hex nuts and bolts shall be 304 stainless steel for above ground applications and 316 SS for all buried, submerged, or below grade installations.
 - 3. Coatings. Apply shop primer which is compatible to finish coating required by Division 9 to be applied in field
- C. Flanged Coupling Adapters (larger than 12")
 - 1. Manufacturers. Shall be Dresser Industries, Style 128-W, Romac Industries, Style FC400, or Smith Blair, Series 913.
 - 2. Materials. Flange and flanged body and follower ring shall be steel (ASTM A53 or ASTM A512). Flange shall be designed in accordance with AWWA Class D with ANSI 150# drilling. Hex nuts and bolts shall be 304 stainless steel for above ground applications and 316 SS for all buried, submerged, or below grade installations.
 - 3. Coatings. Apply shop primer which is compatible to finish coating required by Division 09 to be applied in field.
- D. Restrained Flexible Couplings
 - 1. Manufacturers. For the restraint of two pipes of either same or differing materials use EBAA Iron Series 3800 Mega-Coupling.

2. Materials. End rings and sleeves shall be of ductile iron (ASTM A536). Hex nuts and bolts shall be 304 stainless steel for above ground applications and 316 SS for all buried, submerged, or below grade installations.
 3. Coupling System. Restraint mechanism shall have individually actuated gripping surfaces with torque limiting twist off nuts to insure proper actuating of restraint.
 4. Coating. Coupling sleeve shall be coated with a minimum of 15 mils of fusion bonded epoxy conforming to ANSI/AWWA C213 and be holiday tested with a 1500 volt (dc) spark test. Lining shall be fusion bonded epoxy in accordance with NSF 61.
- E. Dismantling Joints (Restrained).
1. Manufactures. Viking Johnson Dismantling Joint; Romac Industries Model DJ 400, or Smith Blair Style 975.
 2. Materials. Dismantling joints shall comply with AWWA C219 for restrained couplings where applicable. Flanged shall be Schedule 40 steel pipe in diameters 12' and less and steel pipe (ASTM A 36) in sizes greater than 12'. End ring and body shall be ductile iron for Schedule 40 and ASTM A36 or A53 for steel pipe. Follower ring shall be either ductile iron (ASTM A536) or steel (ASTM A36 or ASTM A576). Hex nuts and bolts shall be 304 stainless steel for above ground applications and 316 SS for all buried, submerged, or below grade installations. Tie rods shall be high tensile stainless steel. Flange shall be designed in accordance with AWWA Class D with ANSI 125# or 150# drilling
 3. Coatings. Ferrous materials shall be coated with a factory fusion bonded epoxy, NSF 61 certified.

2.02 FITTINGS

- A. General. Use fittings of same size as pipe they serve. Reducers are not permitted to facilitate on off-size fitting. Reducing bushings are also prohibited. Reduction in piping size will be made as shown on Drawings. Fittings shall be lined and coated as specified for pipe they serve.
- B. Dissimilar Metals. Make joints between copper or steel pipe and equipment using insulating unions such as Crane Company No. 1259, EPCO as manufactured by EPCO Sales, Inc.; or approved substitution.
- C. Flanged Fittings. Fittings for use with flanged joints on ductile or cast iron pipe or on steel pipe shall be cast iron or ductile iron fittings conforming to ANSI B16.1 or AWWA C110. Flanges shall be faced and drilled in accordance with ANSI B16.1, Class 125. All fittings shall be pressure rated at 250 psig.
- D. Flanges. Flanges for ductile iron pipe shall be ductile or cast iron flanges screwed on threaded ends of pipe. Flanges shall conform to ANSI B16.1, Class 125. Screwed-on flanges shall be attached to pipe in shop; attachment, aligning and facing shall conform to AWWA C115. All flanged pipe, including flange-by-plain end pieces, shall be hydrostatically tested to 125 psig and certification furnished to Engineer.
- E. Mechanical Joint Fittings. Mechanical joint fittings shall not be used on above grade applications.
- F. Use only stainless steel bolts, nuts, and washers shall be per Section 33 11 05

2.03 TRANSITION COUPLINGS

- A. Use transition couplings with function and design similar to flexible couplings and flanged coupling adapters for connecting pipes of differing outside diameters. Install transition couplings specifically designed and manufactured for the application.

2.04 GASKETS FOR FLEXIBLE COUPLINGS AND FLANGED COUPLING ADAPTERS

- A. Provide gasket material of EPDM for process pipe applications unless otherwise noted on Drawings.

2.05 FLEXIBLE COUPLINGS FOR STAINLESS STEEL PIPE

- A. Manufacturers. Dresser Style 38
- B. Materials. Center sleeve, follower flanges, and hex nuts and bolts shall be 316L stainless steel. Dimensions shall be in accordance with requirements for stainless steel piping.

PART 3 - EXECUTION

3.01 PIPING INSTALLATION

- A. Handling. Handle pipe, couplings and accessories to ensure their installation in a sound, undamaged condition. Use equipment, tools and methods to prevent damage in unloading, hauling and laying pipe and fittings. Take particular care not to damage pipe coating or lining.
- B. Cutting. Cut pipe in a neat manner, without damage to pipe or to interior lining, if any. Make cuts smooth, straight, and at right angles to pipe axis. Use mechanical pipe cutters of an approved type.
- C. Cleaning and Inspection. Thoroughly clean the interior of pipe and fittings of foreign matter before installation, and keep interior clean until Work has been accepted. Keep joint contact surfaces clean until jointing is completed. Do not place debris, tools, clothing or other materials in pipe. Before installation, inspect each pipe and fitting for defects. Tap pipe with a light hammer to detect cracks. Reject defective, damaged or unsound pipe and fittings and remove them from Site.

3.02 CLEANING SYSTEMS

- A. All piping systems shall be thoroughly cleaned and flushed and all construction debris and all foreign material removed. Contractor shall provide all temporary connections, equipment and the like for such cleaning.

END OF SECTION

SECTION 33 25 22

PIPE SUPPORTS

PART 1 - GENERAL

1.01 WORK OF THIS SECTION

- A. Work of this Section includes providing pipe supports, hangers, guides, and anchors.

1.02 RELATED SECTIONS

- A. Work of the following Sections applies to Work of this Section. Other Sections of Specifications, not referenced below, shall also apply to extent required for proper performance of this Work.
1. Section 05 50 00 Metal Fabrication
 2. Section 33 11 00, Pipe and Pipe Fittings, General

1.03 SUBMITTALS

- A. Submittals shall comply with Section 01 33 00 - Submittals and shall include:
1. Shop drawings of pipe supports including details of concrete inserts.
- B. Action Submittals:
1. Catalog information and drawings of piping support system, locating each support, sway brace, seismic brace, hanger, guide, component, and anchor for piping 6" and larger. Identify support, hanger, guide, and anchor type by catalog number and Shop Drawing detail number.
 2. For piping 4" and smaller provide catalog information for each type of support.
 3. Revisions to support systems resulting from changes in related piping system layout or addition of flexible joints.
- C. Informational Submittals: Maintenance information on piping support system.

1.04 REFERENCES

- A. Following is a list of standards which may be referenced in this section:
1. American Society of Civil Engineers (ASCE): 7, Minimum Design Loads for Buildings and Other Structures.
 2. American Society of Mechanical Engineers (ASME): B31.1, Power Piping.
 3. ASTM International (ASTM):
 - a. A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - b. A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
 - c. E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
 4. International Code Council (ICC):
 - a. International Building Code (IBC).
 - b. International Mechanical Code (IMC).
 5. Manufacturers' Standardization Society (MSS):
 - a. SP 58, Pipe Hangers and Supports - Materials, Design and Manufacture.
 - b. SP 69, Pipe Hangers and Supports - Selection and Application.
 - c. SP 89, Pipe Hangers and Supports - Fabrication and Installation Practices.
 - d. SP 127, Bracing for piping Systems, Seismic-Wind-Dynamic Design, Selection and Application.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. General: Piping systems including connections to equipment shall be properly supported to prevent deflection and stresses. Supports shall comply with ANSI/ASME B31.1, except as otherwise indicated.
- B. ANSI/MSS Types: Except as otherwise indicated, pipe support components shall comply with types in ANSI/MSS SP-58.
- C. Support Spacing: Supports for horizontal piping shall be properly spaced. Except as otherwise indicated, pipe support spacing shall comply with the following:

1. Support Spacing for Schedule 40 and 80 Steel Pipe:

Pipe Size (inches)	Max. Span (feet)
1/2	6
3/4 & 1	8
1-1/4 to 2	10
3	12
4	14
6	17
8 & 10	19
12 & 14	23
16 & 18	25
20 & Above	30

2. Support Spacing for Copper Tubing and Pipe:

Tube Size (inches)	Max. Span (feet)
1/2 to 1-1/2	6
2 to 4	10
6 & Above	12

3. Support Spacing for Schedule 80 PVC Pipe:

Pipe Size (inches)	Max Span (feet)
1/2	4
3/4	4
1	5
1-1/4	5
1-1/2	5
2	6
3	7
4	8
6	10
8	11
10	12
12	13

4. Support Spacing for Schedule 80 Polypropylene Pipe:

Pipe Size (inches)	Max Span (feet)
1/2	3
3/4	3
1	3
1-1/4	4
1-1/2	4
2	4
3	5
4	6
6	7
8	8

10	8
12	9
5. Support Spacing for Fiberglass Reinforced Plastic (FRP) Pipe:	
Pipe Size	Max. Span
(inches)	(feet)
2	8
3	10
4	11
6	12
8	13
10	14
12	15
14	16
16	17
18 & Above	18

6. Support Spacing for Welded, Fabricated Steel Pipe:
Practical Safe Spans for Simply Supported Pipe in 120-deg Contact Saddles

Size in.	Wall Thickness-in									
	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1
	Span, L-feet									
24	33	37	40	43	45	47				
26	33	37	41	43	45	47				
28	33	38	41	44	46	48				
30	34	38	41	44	47	49				
32	34	38	42	45	47	50				
34	34	38	42	45	48	50				
36	34	39	42	45	48	50	54			
38	34	39	43	46	48	51	55			
40	34	39	42	46	49	51	55			
42	35	39	43	46	49	52	56			
45		39	43	47	50	52	56			
48		40	44	47	50	53	57	61		
51		40	44	47	50	53	58	61		
54		40	44	47	51	53	58	62		
57		40	44	48	51	54	58	62		
60		40	44	48	51	54	59	63	66	69
63		40	44	48	51	54	59	63	67	70
66		40	45	48	52	54	59	64	67	71
72		41	45	49	52	55	60	64	68	72
78		41	45	49	52	55	61	65	69	72
84		41	45	49	53	56	61	66	70	73
90		41	45	49	53	56	61	66	70	74
96		41	46	50	53	56	62	67	71	75

For steel pipe sizes not indicated, the support spacing shall be designed to ensure that the stress on pipe does not exceed 5,000 psi calculated from the following formula:

$$L = \frac{7500tD}{32t+D}$$

t = thickness, in.
D = Diameter, in.
L = Safe span, ft.

Maximum deflection of pipe shall be limited to 1/360th of span.

7. Support Spacing for Ductile Iron Pipe:

<u>Pipe Size</u>	<u>Max. Span</u>
All Sizes	2 Supports per length or 10 feet (One of the 2 supports located at joint)

8. Variances: For temperatures other than ambient temperatures and for other piping materials or wall thicknesses, above spacings shall be modified in accordance with pipe manufacturer's recommendations.

9. Additional Supports: Additional supports complying with ANSI B31.1 shall be provided at critical elbows, valves, gauges, and meters.
- D Thermal Expansion: Wherever expansion and contraction of piping is indicated, a sufficient number of expansion loops or joints shall be provided, with rolling or sliding supports, anchors, guides, pivots, and restraints. They shall permit piping to expand and contract freely in directions away from the anchored points and shall be structurally suitable to withstand all loads imposed.
 - E Heat Transmission: Supports, hangers, anchors, and guides shall be designed and insulated so that excessive heat shall not be transmitted to structure or to other equipment.
 - F Riser Supports: Risers shall be supported on each floor with riser clamps and lugs, independent of connected horizontal piping.
 - G Freestanding Piping: Free-standing pipe connections to equipment, including chemical feeders and pumps, shall be firmly attached to fabricated steel frames made of angles, channels, or I-beams anchored to structure. Exterior, free-standing overhead piping shall be supported on fabricated pipe stands, consisting of pipe columns anchored to concrete footings, with horizontal, welded steel angles and U-bolts or clamps installed to secure piping.
 - H Submerged Supports: Submerged piping shall be supported with hangers, brackets, clips, or fabricated supports and stainless steel anchors complying with Section 05 50 00.
 - I Point Loads: Meters, valves, heavy equipment, and other point loads on PVC, fiberglass, and other plastic pipes, shall be supported on both sides according to manufacturer's recommendations to avoid pipe stresses. Supports on plastic and fiberglass piping shall be equipped with extra wide pipe saddles or galvanized steel shields.

2.02 HANGERS

- A. Clevis: MSS SP-58 and SP-69, Type 1.
 1. Anvil; Figure 260, sizes 1/2" through 30".
 2. For Insulated Pipe: Anvil; Figure 260 with insulated saddle system (ISS) sizes 1/2" through 16".
 3. B-Line; Figure B3100, sizes 1/2" through 30".
- B. Adjustable Swivel Split-Ring Pipe Clamp: MSS SP 58 and MSS SP 69, Type 6.
 1. Anvil; Figure 104, sizes 3/4" through 8".
 2. B-Line; Figure B3171, sizes 3/4" through 8".
- C. Steel Yoke Pipe Rolls and Roller supports: MSS SP 58 and MSS SP 69, Type 41 or Type 43.
 1. Anvil; Figure 181, sizes 2-1/2" through 24 ". Figure 171, 30" and sizes 1 inch through 2 inches.
 2. B-Line; Figure B3110, sizes 2" through 24". Figure B3114, 30".
- D. Pipe Rollers and Supports: MSS SP 58 and MSS SP 69, Type 44.
 1. Anvil; Figure 175, sizes 2" through 30".
 2. B-Line; Figure B3120, sizes 2" through 24".

2.03 SADDLE SUPPORTS

- A. Pedestal Type: Schedule 40 pipe stanchion, saddle, and anchoring flange.
 1. Nonadjustable Saddle: MSS SP 58 and MSS SP 69, Type 37 with U-bolt.
 - a. Anvil; Figure 259, sizes 4" through 36" with Figure 62C base.
 - b. B-Line; Figure B3090, sizes 3/4" through 36" with B3088 base.
 2. Adjustable Saddle: MSS SP 58 and MSS SP 69, Type 38 without clamp.
 - a. Anvil; Figure 264, sizes 2-1/2" through 36" with Figure 62C base.
 - b. B-Line; Figure B3093, sizes 1" through 36" with Figure B3088T base.

- B. Elbow and Flange Supports:
 - 1. Elbow with Adjustable Stanchion:
 - a. Sizes 2-1/2" through 42".
 - 1) Anvil; Figure 62C base.
 - 2. Elbow with Nonadjustable Stanchion:
 - a. Sizes 2-1/2" through 42".
 - 1) Anvil; Figure 63C base.
 - 3. Flange Support with Adjustable Base:
 - a. Sizes 2" through 24".
 - 1) B-Line; B3094, with Figure B3088T base.
 - 2) Standon; Model S89.

2.04 WALL BRACKETS AND SUPPORTS

- A. Welded Steel Wall Bracket: MSS SP 58 and MSS SP 69, Type 33 (heavy-duty).
 - 1. Anvil; Figure 199, 3,000-pound rating.
 - 2. B-Line; Figure B3067, 3,000-pound rating.
- B. Adjustable "J" hanger MSS SP 58 and MSS SP 69, Type 5:
 - 1. Anvil; Figure 67, sizes 1/2" through 8".
 - 2. B-Line; Figure B3690, sizes 1/2" through 8".
- C. Offset Pipe Clamp:
 - 1. Anvil; Figure 103, sizes 3/4" through 8".
 - 2. B-Line; Figure B3148, sizes 1/2" through 12".
- D. Channel Type:
 - 1. Unistrut.
 - 2. Anvil; Power-Strut.
 - 3. B-Line; Strut System.
 - 4. Aickinstrut (FRP).

2.05 PIPE CLAMPS

- A. Riser Clamp: MSS SP 58 and MSS SP 69, Type 8.
 - 1. Anvil; Figure 261, sizes 3/4" through 24".
 - 2. B-Line; Figure B3373, sizes 1/2" through 30".

2.06 STEEL PIPE SADDLES

- A. Provide 120-degree pipe saddle with base plates drilled for anchors bolts; minimum four 7/8" holes for 3/4" anchor bolts.
 - 1. Sizes 20" through 60".
 - 2. Manufacturer: Piping Technology & Products, Inc.; Fig. 2000 as modified per above.

2.07 CHANNEL TYPE SUPPORT SYSTEMS

- A. Channel Size: 12-gauge, 1-5/8" wide minimum steel, or 1-1/2" wide, minimum FRP.
- B. Members and Connections: Design for loads using one half of manufacturer's allowable loads.
- C. Fasteners: Vinyl ester fiber, polyurethane base composite nuts and bolts, or encapsulated steel fasteners.
- D. Manufacturers and Products:
 - 1. B-Line; Strut System.
 - 2. Unistrut.

3. Anvil; Power-Strut.
4. Aickinstrut (FRP System).
5. Enduro-Durostrut (FRP Systems).

2.08 FRP PIPE SUPPORTS SYSTEMS

- A. General:
 1. FRP systems include hangers, rods, attachments, and fasteners.
 2. FRP with vinyl ester resins resistance to the chemicals listed in supplements.
 3. Fire retardant to ASTM E84.
 4. With UV additive and a protective veil.
- B. Clevis Hangers:
 1. Factor of Safety: 3 to 1.
 2. Minimum Design Load: 200 pounds.
- C. Design:
 1. Pipe supports spacing, hanger rod sizing to be designed based upon the manufacturer's recommendations.
 2. Identify and highlight non-FRP fasteners or components in the submittal.
- D. Manufacturers:
 1. Aickinstrut.
 2. Enduro.
 3. Century Composite.

2.09 SEISMIC RESTRAINTS

- A. Solid pipe bracing attachment to pipe clevis with clevis cross brace and angle rod reinforcement.
- B. Manufacturer: Mason Industries.

2.10 ACCESSORIES

- A. Insulation Shields:
 1. Type: Stainless steel, MSS SP 58 and MSS SP 69, Type 40.
 2. Manufacturers and Products:
 - a. Anvil; Figure 167, sizes 1/2" through 24".
 - b. B-Line; Figure B3151, sizes 1/2" through 24".
- B. Welding Insulation Saddles:
 1. Type: MSS SP 58 and MSS SP 69, Type 39.
 2. Manufacturers and Products:
 - a. Anvil; Figure Series 160, sizes 1" through 36".
 - b. B-Line; Figure Series B3160, sizes 1/2" through 24".
- C. Plastic Pipe Support Channel:
 1. Type: Continuous support for plastic pipe and to increase support spacing.
 2. Manufacturer and Product: B-Line; Figure Series B3106V, sizes 1/2" through 6" with Figure B3106 Vee bottom hangers.
- D. Hanger Rods, Clevises, Nuts, Sockets, and Turnbuckles: In accordance with MSS SP 58.
- E. Attachments:
 1. I-Beam Clamp: Concentric loading type, MSS SP 58 and MSS SP 69, Type 21, Type 28, Type 29, or Type 30 which engage both sides of flange.
 2. Concrete Insert: MSS SP 58 and MSS SP 69, Type 18, continuous channel insert with load rating not less than that of hanger rod it supports.

3. Welded Beam Attachment: MSS SP 58 and MSS SP 69, Type 22.
 - a. Anvil; Figure 66.
 - b. B-Line; Figure B3083.
4. U-Channel Concrete Inserts: As specified in Section 05 50 00, Metal Fabrications.
5. Concrete Attachment Plates:
 - a. Anvil; Figure 47, Figure 49 or Figure 52.
 - b. B-Line; Figure B3084, Figure B3085 or Figure B3086.

2.11 INTERMEDIATE PIPE GUIDES

- A. Type: Hold down pipe guide.
 1. Manufacturer and Product: B-Line; Figure B3552, 1-1/2" through 30 ".
- B. Type: U-bolts with double nuts to provide nominal 1/8" to 1/4" clearance around pipe. MSS SP 58 and MSS SP 69, Type 24.
 1. Anvil; Figure 137 and Figure 137S.
 2. B-Line; Figure B3188 and Figure B3188NS.

2.12 PIPE ALIGNMENT GUIDES

- A. Type: Spider.
- B. Manufacturers and Products:
 1. Anvil; Figure 255, sizes 1/2" through 24".
 2. B-Line; Figure B3281 through Figure B3287, sizes: 1/2" through 24".

2.13 PIPE ANCHORS

- A. Type: Anchor chair with U-bolt strap.
- B. Manufacturer and Product: B-Line; Figure B3147A or Figure B3147B.

2.14 ANCHORING SYSTEMS

- A. Size and Material: Sized by equipment manufacturer, 1/2" minimum diameter, and as specified in Section 05 50 00, Metal Fabrications.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General:
 1. Install support systems in accordance with MSS SP 69 and MSS SP 89, unless shown otherwise.
 2. Install pipe hanger rods plumb, within 4 degrees of vertical during shut down, startup or operations.
 3. Support piping connections to equipment by pipe support and not by equipment.
 4. Support large or heavy valves, fittings, and appurtenances independently of connected piping.
 5. Support no pipe from pipe above it.
 6. Support pipe at changes in direction or in elevation, adjacent to flexible joints and couplings, and where shown.
 7. Do not install pipe supports and hangers in equipment access areas or bridge crane runs.
 8. Brace hanging pipes against horizontal movement by both longitudinal and lateral sway bracing and to reduce movement after startup.
 9. Install lateral supports for seismic loads at changes in direction.
 10. Install pipe anchors where required to withstand expansion thrust loads and to direct and control thermal expansion.

11. Repair mounting surfaces to original condition after attachments are made.
- B. Standard Pipe Supports:
1. Horizontal Suspended Piping:
 - a. Single Pipes: Adjustable swivel-ring, split-ring, or clevis hangers.
 - b. Grouped Pipes: Trapeze hanger system.
 2. Horizontal Piping Supported from Walls:
 - a. Single Pipes: Wall brackets or wall clips attached to wall with anchors. Clips attached to wall mounted framing also acceptable.
 - b. Stacked Piping: Wall mounted framing system and clips acceptable for piping smaller than 3" minimal diameter.
 - c. Piping clamps that resist axial movement of pipe through support are not acceptable. Use cast iron hanging rolls supported from wall bracket.
 3. Horizontal Piping Supported from Floors:
 - a. Stanchion Type:
 - 1) Pedestal type; adjustable with stanchion, saddle, and anchoring flange.
 - 2) Use yoked saddles for piping whose centerline elevation is 18" or greater above floor and for exterior installations. Provide minimum 1-1/2" grout beneath base plate.
 - 3) Floor
 - b. Floor
 - 1) Use for piping smaller than 3" nominal diameter running along floors and in trenches at piping elevations lower than can be accommodated using pedestal pipe supports.
 - 2) Attach channel framing to floors with base plate on minimum 1-1/2" grout and with anchor bolts.
 - 3) Attach pipe to channel with clips or pipe clamps.
 - c. Concrete Cradles: Use for piping larger than 3" along floor and in trenches at piping elevations lower than can be accommodated using stanchion type.
 4. Insulated Pipe:
 - a. Pipe hanger and support shall be on outside of insulation and shall not be enclosed within insulation.
 - b. Provide precut 120-degree sections of rigid insulation (minimum length same as the shield), galvanized steel shields and oversized hangers or insulated saddle system. Anvil; Figure 260 (ISS).
 - c. Wall mounted piping clips not acceptable for insulated piping.
 5. Vertical Pipe: Support with wall brackets and base elbow or riser clamps on floor penetrations.
 6. Standard Attachments:
 - a. To Concrete Ceilings: U-Channel Concrete Inserts, U-Channel to Concrete Attachment Plates.
 - b. To Steel Beams: I-beam clamp or welded attachments.
 - c. To Wooden Beams: Lag screws and angle clips to members not less than 2-1/2" thick.
 - d. To Concrete Walls: Concrete inserts or brackets or clip angles with anchor bolts.
 - e. To Concrete Beams: U-Channel Concrete Inserts, or if inserts are not used attach to vertical surface similar to Concrete Wall. Do not drill into beam bottom.
 - f. Existing Walls and Ceilings: Install as specified for new construction, unless shown otherwise.
- C. Intermediate and Pipe Alignment Guides:
1. Provide pipe alignment guides (or pipe supports that provide same function) at expansion joints and loops.
 2. Guide piping on each side of expansion joint or loop at four pipe and 14-pipe diameters from each joint or loop.
 3. Install intermediate guides on metal framing support systems not carrying pipe anchor or alignment guide.
- D. Accessories:

1. Insulation Shield: Install on insulated piping. Oversize rollers and supports.
2. Welding Insulation Saddle: Install on insulated steel pipe. Oversize rollers and supports.
3. Dielectric Barrier:
 - a. Provide plastic coated hangers, or isolation tape such as B-Line Iso Pipe, B-Line B1999 Vibra Cushion, or B-Line B3195 Felt Isolators between painted or galvanized carbon steel members and copper or stainless steel pipe or between stainless steel supports and non-stainless steel ferrous metal piping.
 - b. Install 1/4" by 3" neoprene rubber wrap between submerged metal pipe and oversized clamps.

END OF SECTION

SECTION 33 26 90

WATER PIPELINE TESTING AND DISINFECTION

PART 1 - GENERAL

1.01 WORK OF THIS SECTION

- A. Work of this Section includes flushing and testing of all pressure pipelines and appurtenant piping for reclaimed water, potable water and disinfection of all pipelines and appurtenant piping for reclaimed water and potable water, complete, including providing test water and all disposal thereof.

1.02 RELATED SECTIONS

- A. Other Sections of Specifications, not referenced below, shall also apply to extent required for proper performance of this Work.

1.03 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to Work of this Section:
 1. ANSI/AWWA B300 Hypochlorites
 2. ANSI/AWWA B301 Liquid Chlorine
 3. ANSI/AWWA C651 Disinfecting Water Mains
 4. APHA, AWWA, and WEF Standard methods for Examination of Water and Wastewater

1.04 TESTING SCHEDULE

- A. The following shall be submitted:
 1. A testing schedule, including proposed plans for water conveyance, control, and disinfection shall be submitted in writing for approval a minimum of 48 hours before testing is to start. Submittal shall also include Contractor's plan for the release of water from pipelines after testing and disinfection has been completed.

PART 2 - PRODUCTS

2.01 MATERIALS REQUIREMENTS

- A. All test equipment, chemicals for chlorination, temporary valves, temporary blow-offs, bulkheads, or other water control equipment and materials shall be determined and furnished by Contractor. No materials shall be used which would be injurious to pipeline or its future function.
- B. Chlorine for disinfection shall be in form of liquid chlorine, sodium hypochlorite solution, or calcium hypochlorite granules or tablets.
- C. Liquid chlorine shall be in accordance with requirements of ANSI/AWWA B301. Liquid chlorine shall be used only:
 1. In combination with appropriate gas flow chlorinators and ejectors;
 2. Under the direct supervision of an experienced technician;
 3. When appropriate safety practices are observed.
- D. Sodium hypochlorite and calcium hypochlorite shall be in accordance with requirements of ANSI/AWWA B300.

PART 3 - EXECUTION

3.01 GENERAL

- A. Unless otherwise indicated, potable water for testing and disinfecting water pipelines will be furnished by Contractor. Contractor shall also make all necessary arrangements for conveying the water to points of use.
- B. All pressure pipelines shall be tested. Disinfection shall be accomplished by chlorination. All chlorinating and testing operations shall be performed in the presence of Engineer.
- C. Disinfection operations shall be scheduled by Contractor as late as possible during contract time period so as to assure maximum degree of sterility of facilities at time Work is accepted by Owner.

3.02 HYDROSTATIC TESTING OF PIPELINES

- A. Prior to hydrostatic testing, all pipelines shall be flushed or blown out as appropriate. Contractor shall test all pipelines either in sections or as a unit. Test shall be made by closing valves when available, or by placing temporary bulkheads in pipe and filling line slowly with water. Contractor shall be responsible for ascertaining that all test bulkheads are suitably restrained to resist thrust of test pressure without damage to, or movement of, adjacent pipe. Any unharnessed sleeve-type couplings, expansion joints, or other sliding joints shall be restrained or suitably anchored prior to test, to avoid movement and damage to piping and equipment. Contractor shall provide sufficient temporary air tappings in pipelines to allow for evacuation of all entrapped air in each pipe segment to be tested. After completion of tests, such taps shall be permanently plugged. Care shall be taken to see that all air vents are open during filling.
- B. Pipeline shall be filled at a rate which will not cause any surges or exceed rate at which air can be released through air valves at a reasonable velocity and all air within pipeline shall be properly purged. After pipeline or section thereof has been filled, it shall be allowed to stand under a minimum of 30 psi pressure for at least 24 hours to allow mortar linings or gasketing, as applicable, to absorb water and to allow the escape of air from any air pockets. During this period, bulkheads, valves, connections shall be examined for leaks. If leaks are found, corrective measures satisfactory to Engineer shall be taken.
- C. Hydrostatic test shall consist of holding test pressure on the pipeline for 4 hours. Test pressure for distribution and transmission pipelines shall be 100% of pipe pressure class indicated measured at highest point of pipeline section being tested with a maximum allowable pressure drop during test of 5 psi. All visible leaks shall be repaired in a manner acceptable to Engineer.
- D. Pursuant to 30 TAC §290.44(a)(5) of TCEQ rules, hydrostatic leakage rate shall not exceed the amount allowed or recommended by the most current AWWA formulas for PVC pipe, cast iron pipe, and ductile iron pipe pursuant to the following formulas.
 - 1. Hydrostatic leakage rate for polyvinyl chloride (PVC) pipe and appurtenances shall not exceed the amount allowed or recommended by formulas in AWWA C-605 as required in 30 TAC §290.44(a)(5). Contractor shall ensure that the formula for this calculation is correct and most current formula is in use;

$$Q = LD\sqrt{P}/148,000$$
 Where:
 Q = the quantity of makeup water in gallons per hour,
 L = the length of the pipe section being tested, in feet,
 D = the nominal diameter of the pipe in inches, and
 P = the average test pressure during the hydrostatic test in pounds per square inch (psi).
 - 2. Hydrostatic leakage rate for ductile iron (DI) pipe and appurtenances shall not exceed the amount allowed or recommended by formulas in America AWWA C-600 as required in 30 TAC §290.44(a)(5). Contractor shall ensure that the formula for this calculation is correct and most current formula is in use;

$$L = SD\sqrt{P}/148,000$$
 Where:
 L = quantity of makeup water in gallons per hour,
 S = length of pipe section being tested, in feet,

D = nominal diameter of pipe in inches, and

P = average test pressure during the hydrostatic test in pounds per square inch (psi).

3. During hydrostatic tests, no leakage will be allowed for sections of water lines consisting of welded joints.

3.3 DISINFECTING PIPELINES

- A. General: All potable water pipelines except those appurtenant to hydraulic structures shall be disinfected in accordance with requirements of ANSI/AWWA C651 using Continuous-Feed Method as modified herein. Preliminary and final flushing shall be done at ends of mains which have been hydrostatically tested.
- B. Chlorination: A chlorine-water mixture shall be uniformly introduced into the pipeline by means of a solution-feed chlorinating device. Chlorine solution shall be introduced at one end of pipeline through a tap in such a manner that as pipeline is filled with water, dosage applied to water entering the pipe shall be approximately 50 mg/l. Care shall be taken to prevent strong chlorine solution in line being disinfected from flowing back into line supplying the water.
- C. Chlorine Residual Test: Contractor will make 24-hour chlorine residual tests in the presence of Engineer. Contractor will notify Owner of chlorine test result. Chlorinated water shall be retained in pipeline for at least 24 hours. After chlorine-treated water has been retained for required time, free chlorine residual at the pipeline extremities and at other representative points shall be at least 25 mg/l.
- D. Repetition of Test: Disinfection testing procedure shall be repeated if the initial tests fail to produce satisfactory results. Two consecutive satisfactory test results shall be required after any unsatisfactory test. Tablet method shall not be used for repeated disinfection.
- E. Chlorinating Valves: During process of chlorinating the pipelines, all valves and other appurtenances shall be operated while pipeline is filled with heavily chlorinated water.
- F. Final Flushing: Final Flushing shall be done by Owner after he has been notified of a satisfactory chlorine residual test by Contractor. After applicable retention period, the heavily chlorinated water shall be flushed from pipeline until chlorine measurements show that chlorine concentration in water leaving pipeline is no higher than that generally prevailing in system or is acceptable for intended use. If there is any question that chlorinated discharge will cause damage to environment, a reducing agent shall be applied to water to neutralize thoroughly chlorine residual remaining in water at no additional cost to Owner.
- G. Disinfection of Connections: Pipe and appurtenances used to connect the newly installed water main shall also be disinfected in accordance with AWWA C651.
- H. Neutralization of Chlorinated Water: Neutralizing and disposing of chlorinated water shall be in accordance with Appendix "B" of AWWA Standard C651.

3.04 BACTERIOLOGICAL TESTING OF DISINFECTED PIPELINES

- A. Bacteriological Testing (Water Sampling)
 1. General
 - a. Notify Owner when water main is suitable for sampling.
 - b. Contractor shall then take water samples from a suitable tap in presence of Owner operational personnel for analysis by Owner approved testing laboratory.
 - 1) No hose or fire hydrant shall be used in collection of samples.
 - 2) Samples will be taken at locations indicated in ANSI/AWWA C651
 2. Water Sampling
 - a. Complete microbiological sampling prior to connecting new main into existing distribution system in accordance with AWWA C651.

- b. Collect samples for bacteriological analysis in sterile bottles treated with sodium thiosulfate.
 - c. Collect 2 consecutive sets of acceptable samples, taken at least 24 hours apart, from new main.
 - d. Collect at least 1 set of samples from every 1,000 linear feet of new main installed (or at next available sampling point beyond 1,000 linear feet as designated by Owner), plus 1 set from end of line and at least 1 set from each branch.
 - e. If trench water has entered new main during construction or, if in opinion of the City, excessive quantities of dirt or debris have entered new main, obtain bacteriological samples at intervals of approximately 200 linear feet.
 - f. Obtain samples from water that has stood in new main for at least 16 hours after formal flushing.
 - g. Contractor is responsible for cost of initial bacteriological sampling.
3. Repetition of Sampling
- a. Failing test results require a repeat of disinfection process and re-sampling as required above until satisfactory sample is obtained.
 - b. Contractor shall be responsible for cost of all repeat bacteriological testing due to failing samples.

END OF SECTION