

CONSTRUCTION DOCUMENTS MANUAL
AND
TECHNICAL SPECIFICATIONS

EL PASO COUNTY ARPA 1011 PROJECT
PANORAMA VILLAGE LIFT STATION 19

LVWD BID NO.: 24-0105-01

VOLUME 1 OF 2



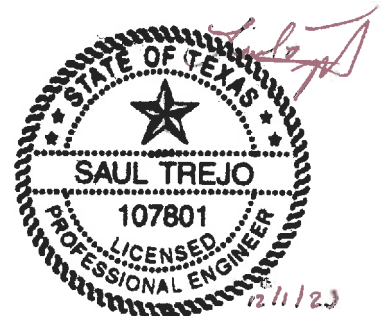
1557 FM ROAD 1110
CLINT, TEXAS 79836

JANUARY 5, 2024

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LOWER VALLEY WATER DISTRICT

LVWD BID NO.: 24-0105-01

INFORMAL NOTICE

Sealed proposals for construction of the **Panorama Village Lift Station 19** will be received by the Lower Valley Water District (LVWD) at the District's Main office located at 1557 FM 1110 or by mail to 1557 FM 1110, Clint, Texas 79836 until **3:00 p.m.**, local time, on **January 5, 2024**, and at that time and place will be publicly opened and read aloud.

The work under this contract shall be for furnishing all labor, materials, transportation and services for the construction and installation of the following work:

- Insurance, Bond, Mobilization, and Demobilization
- Pre- and Post-construction Video Recording
- Trench Safety Systems
- 6-Inch Forcemain Pipe
- 8-Inch PVC Sewer Pipe
- Polymer Concrete Sanitary Sewer Manholes
- Sanitary Sewer Connection (Main to Right-of-Way)
- Private Sewer Service Connection (Right-of-Way to Home)
- De-septic, Pumping, Hauling, Sand, and Permits
- Remove and Replace HMA (Type-D)
- Traffic Control Plan
- Installation of the Lift Station

Contract documents may be examined and obtained at the Purchasing Department of the Lower Valley Water District, 1557 FM 1110, Clint, Texas 79836; (915)791-4480.

A pre-bid meeting will be held on **December 12, 2023**, at **11:00 a.m.** at the Lower Valley Water District, 1557 FM 1110, Clint, Texas.

Each Bid shall be submitted in accordance with the Instructions to Bidders and be accompanied by a Bid Security in the amount of five percent of the amount bid.

The Successful Bidder states he or she must furnish a 100 percent (100%) Performance Bond and a 100 percent (100%) Payment Bond, in accordance with the Instructions to Bidders and the General Conditions.

By submission of the bid, Bidder fully understands the requirements of the Contract Documents and agrees to comply with all requirements thereof.

Wages paid on this project shall be not less than the minimum prevailing wage rates listed in the Contract Documents, Section 00840, General Wage Requirements.

The Lower Valley Water District (LVWD) adheres to the Cone of Silence policy which prohibits any communication regarding the bid between potential bidders (and subcontractors) and LVWD Board Members, Staff, and assigned Consulting Engineers. The provisions do not apply to oral communications with Purchasing Agent or Administrative Analyst, provided the communications is limited strictly to matters of process or procedure already contained in the solicitation document, oral communications at pre-bid conferences, or communications in writing (email preferred) submitted to the Administrative Analyst in response to inquiries regarding the bid. In addition to any other penalties provided by law, violation of the Cone of Silence by any bidder shall render that bidder's bid voidable. Any person having personal knowledge of a violation of these provisions shall report such violations to the LVWD General Counsel and/or the Purchasing Agent in writing.

LOWER VALLEY WATER DISTRICT
EL PASO COUNTY ARPA 1011 PROJECT
PANORAMA VILLAGE LIFT STATION 19
LVWD BID NO.: 24-0105-01

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INVITATION TO BID

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END OF SECTION 00020

SECTION 00100

INSTRUCTIONS TO BIDDERS

1. DEFINED TERMS

Terms used in these Instructions to Bidders which are defined in the Standard General Conditions of the Construction Contract (EJCDC C-700, 2007 ed.) have the meanings assigned to them in the General Conditions. The term "Bidder" means the entity (such as a corporation, partnership or sole proprietor) that submits a Bid directly to Owner, as distinct from a sub-bidder, who submits a Bid to a Bidder. The term "Successful Bidder" means the lowest, responsible and responsive Bidder to whom Owner (on the basis of Owner's evaluation as hereinafter provided) makes an award. The term "Bidding Documents" includes the Advertisement or Invitation to Bid, Instructions to Bidders, the Bid Form, the Bid Bond or other Bid Security, and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids). Other terms are defined in this Section 00100.

Other terms used in the Bidding Documents and not defined elsewhere have the following meanings which are applicable to both the singular and plural thereof:

Texas Resident Bidder - A bidder whose principal place of business is in this state and includes a Contractor whose ultimate parent company or majority owner has its principal place of business in this state.

Nonresident Bidder - A bidder whose principal place of business is not in this state, but excludes a Contractor whose ultimate parent company or majority owner has its principal place of business in this state.

EPCWID #1 - El Paso County Water Improvement District #1 which authorizes dewatering into its facilities under certain terms and conditions and with whom the Owner has negotiated specific basic fees and procedures.

NADB – North American Development Bank

2. COPIES OF BIDDING DOCUMENTS

2.1 Complete sets of the Bidding Documents in the number and for the deposit sum, if any, stated in the Advertisement or Invitation to Bid may be obtained at the Purchasing Department, Lower Valley Water District, 1557 FM 1110, Clint, Texas; (915) 791-4480.

2.2 Complete sets of Bidding Documents must be used in preparing Bids; neither the Owner nor the Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.3 Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids on the Work and do not confer a license or grant for any other use.

3. DETERMINING LOWEST RESPONSIBLE, RESPONSIVE BIDDER

To demonstrate that the Bidder is responsible and able to perform the Work, each Bidder must be prepared to submit written evidence, such as financial data, previous experience, present commitments and other data as may be called for below (or in the Supplementary Instructions). Each Bid must contain evidence of Bidder's qualification to do business in the state where the Project is located or covenant to obtain such qualification prior to Award of the Contract.

In determining the lowest responsible, responsive Bidder, in addition to price, the following elements will be considered:

- (a) the quality, availability and adaptability of the supplies, materials, equipment, or contractual services, to the particular use required;
- (b) the number and scope of conditions attached to the bid;
- (c) the ability, capacity and skill of the entity to perform the contract or to provide the service required;
- (d) whether the bidder can perform the contract and provide the service promptly, or within the time required, without delay or interference;
- (e) the character, responsibility, integrity, reputation, and experience of the bidder;
- (f) the quality of performance of previous services, or contracts;
- (g) the previous and existing compliance by the bidder with laws relating to the contract or service;
- (h) any previous or existing noncompliance by the bidder with specifications, or requirements relating to time of submission of specified data such as samples, models, drawings, certificates, or other information;
- (I) the sufficiency of the financial resources and ability of the bidder to perform the contract or to provide the service;
- (j) the ability of the bidder to provide future maintenance, repair parts, and service for the use of the subject of the contract.
- (k) the ability of the bidder to provide competent personnel for the job, as demonstrated by a listing of the names and the skills of experienced personnel who are currently employed by the bidder and who will be available for performing this work;
- (l) the experience of the bidder in performing work similar in type, size and complexity to this project, as demonstrated by a listing of projects, with verifiable references (names, addresses, phone numbers, etc.), successfully completed.

MINIMUM GENERAL REQUIREMENTS - ALL CONSTRUCTION PROJECTS

PROJECTS WITH VALUE LESS THAN \$1,000,000:

The Bidder, or at least two *Key Personnel employed by the Bidder, must demonstrate **Successful Completion of a project similar in nature and scope to this project within the past five (5) years and a similar project with a value of at least one-third (1/3) the value bid for this project.

PROJECTS WITH VALUE BETWEEN \$1,000,000 AND \$3,000.00:

The Bidder, or at least three *Key Personnel employed by the Bidder, must demonstrate **Successful Completion of one project similar in nature and scope to this project within the past five (5) years and one similar project with a value of at least 50% of the value bid for this project.

PROJECTS WITH VALUE BETWEEN \$3,000,000 AND \$6,000,000:

The Bidder must demonstrate a minimum of four (4) years experience in projects similar in nature and scope to this project. At least four *Key Personnel employed by the Bidder must have a minimum of five (5) years experience in similar construction projects. The Bidder must demonstrate **Successful Completion during the last five (5) years of at least one project comparable in nature and scope to this project and one similar project with a dollar value of at least 60% of the value bid for this project. The Bidder must have an employee, to be dedicated to this project, who is experienced in scheduling, with demonstrated ability in employing scheduling techniques similar to those to be used for this project.

PROJECTS WITH VALUE BETWEEN \$6,000,000 AND \$15,000,000:

The Bidder must have a minimum of five (5) years experience in projects similar in nature and scope to this project. At least four of the Bidder's *Key Personnel must have a minimum of five (5) years experience in similar construction projects. The Bidder must demonstrate **Successful Completion of at least two (2) projects similar in nature and scope to this project and one similar project with a dollar value of at least 75% of the value bid for this project, both within the past five years. The Bidder must demonstrate that it has an experienced employee who will serve as the scheduler; who is dedicated to this project; who has successfully employed scheduling techniques appropriate for this

project. At least two (2) *Key Personnel for this project must have completed at least two (2) projects, similar in scope and nature to the project being bid, as an employee of the Company bidding this project.

*** KEY PERSONNEL:** Defined as individuals who will be directly assigned to this project. Includes, but is not limited to, the Bidder's Project Manager, the Project Superintendent, the Scheduler, the Bidder's Construction Engineer, and Supervisory personnel such as the Foremen who will be directly assigned to this project as well as similar Subcontractor Key Persons. Resumes of Key Personnel must be submitted and accepted by the Owner in order for Bidder to receive the Award. Bidders are encouraged to submit documentation with the Bid but shall submit such documentation to Purchasing, no later than five (5) days after Engineer's Request.

****SUCCESSFUL COMPLETION:** Defined as completion of a project on time, which generally means no more than thirty (30) days later than the original contract time allocated. It also means within budget, which generally means within 5% of the original contract price. If there is any project submitted by the Bidder as qualifying, but which does not meet these requirements, in order to be fully responsive the Bidder is required to submit detailed information on that project demonstrating what caused the increases to cost or time. The name and telephone numbers of the Design Engineer and the Client are to be provided for evaluation as to whether the project may be considered "successful". For any project where liquidated damages were assessed, the Bidder will not be considered to have been on time.

BIDDER MUST MEET THE FOLLOWING MINIMUM PROJECT-SPECIFIC CRITERIA IN ORDER TO QUALIFY FOR AWARD OF THE BID:

1. Key Personnel required are the Project Manager, Scheduler (may be the same as the Project Manager), Superintendent, Foreman, and Master Plumber (Texas Licensed Number and Expiration Date). Bidder must submit the resumes for all Key Personnel assigned to this Project. Bidder must present at least two (2) examples of similar projects successfully executed by all Key Personnel within the past ten (10) years. The Owner reserves the right to review, approve, or reject the persons listed as Key Personnel.
2. The Project involves the installation of 8-inch sanitary sewer pipelines. Key Personnel must demonstrate successful completion of at least two (2) **similar** projects (minimum 2,000 feet of gravity sewer pipe) within the past ten (10) years.
3. The Project involves septic tank decommissions and sanitary sewer service connection. Bidder must demonstrate two (2) successful projects with **similar** septic tank decommissioning and service connections within the past ten (10) years. This requirement may be satisfied by employing the services of a qualified on-site sewage subcontractor with a list of such projects completed successfully.
4. Project involves compacted earthwork for roadbed preparation, installation of base and/or 2-sack flowable fill base material, and installation of Hot Mix Asphalt Cement Pavement. Bidder shall demonstrate at least two (2) successful projects with **similar** Work required under the direction of Key Personnel. This requirement may be satisfied by employing the services of a qualified subcontractor and a list of paving projects.
5. Project involves the installation of a sanitary sewer lift station. Key Personnel employed by the Bidder must demonstrate completion of at least two (2) lift stations **similar** in size and scope with successful completion and operation within the last ten (10) years. This requirement may be satisfied by employing the services of a qualified lift station subcontractor with a list of such projects completed successfully.

**LVWD FUNDED PROJECTS
MANDATORY GOOD FAITH EFFORTS
TO OBTAIN MINORITY PARTICIPATION IN THIS PROJECT**

THE UTILITY'S POLICY FOR ITS PROJECTS IS TO ENCOURAGE THE PARTICIPATION OF SMALL LOCALLY-OWNED BUSINESSES (SMLB), MINORITY BUSINESS ENTERPRISES (MBE) AND WOMEN-OWNED BUSINESS ENTERPRISES (WBE). THE UTILITY'S MINIMUM GOALS FOR THIS PROJECT ARE:

**10% FOR SMALL LOCALLY OWNED BUSINESSES
14% FOR MINORITY-OWNED BUSINESSES
2% FOR WOMEN-OWNED BUSINESSES**

THE BIDDER MUST MEET EACH OF THESE THREE GOALS OR DEMONSTRATE, AT THE TIME OF MAKING THE BID, THAT HE HAS MADE A GOOD FAITH EFFORT TO MEET EACH OF THE THREE GOALS IN ORDER TO QUALIFY FOR AWARD OF THIS PROJECT. THE DEFINITION OF A "GOOD FAITH EFFORT" IS DESCRIBED BELOW. IF THE BIDDER FAILS TO MEET THE GOALS, *AND ALSO FAILS TO PROVIDE EVIDENCE THAT A GOOD FAITH EFFORT HAS BEEN MADE TO MEET EACH GOAL*, THE OWNER RESERVES THE RIGHT TO REQUEST ADDITIONAL INFORMATION FROM THE BIDDER AS SUPPORT TO GOOD FAITH EFFORT DOCUMENTATION. THE BIDDER MAY MEET THE MANDATORY REQUIREMENT IN ONE OF THREE WAYS:

IF GOALS IN EACH CATEGORY ARE FULLY ACHIEVED, THEN THE BIDDER ONLY NEEDS TO PROVIDE ALL THE DETAILS OF THE ACTUAL PARTICIPATION IN THE BID PROPOSAL FORM, SECTION 00300, WHERE SPACE HAS BEEN PROVIDED FOR BIDDER'S USE.

IF GOALS ARE PARTIALLY ACHIEVED IN EACH OF THE CATEGORIES, PROVIDE THE DETAILS OF THE ACTUAL PARTICIPATION IN THE BID PROPOSAL FORM, AND PROVIDE EVIDENCE OF THE GOOD FAITH EFFORT TO MEET EACH GOAL, AS PART OF THE BID PROPOSAL, AT THE TIME THE BID IS SUBMITTED.

IF GOALS ARE NOT ACHIEVED, PROVIDE EVIDENCE OF A DEMONSTRATED GOOD FAITH EFFORT, AS DEFINED BELOW, AS PART OF THE BID PROPOSAL, AT THE TIME THE BID IS SUBMITTED.

Although a single prime contractor, a subcontractor, or a supplier may be a small locally-owned business and also a minority business or a woman-owned business, each firm may be counted in only one category (SMLB, MBE or WBE) for purposes of meeting these goals.

DEFINITION OF "GOOD FAITH EFFORT": Documentation that minority firms were given a genuine opportunity to participate. Evidence of a good faith effort must include a reasonable number of letters, which may be sent certified mail return receipt requested, showing the full details of the work to be performed by the minority firm, sent to bona fide firms in each of the categories described below; copies of responses to the letters; copies of correspondence with Chamber of Commerce (for Locally Owned Small Businesses) and with MBE and WBE associations; newspaper or trade magazine notices; and copies of Bidder's documentation file of the results of its solicitations.

DEFINITION OF "SMALL LOCALLY-OWNED BUSINESS FIRM" (SMLB): A Business corporation, partnership, joint venture, sole proprietorship, or other legal entity, formed for the purpose of making a profit, which has been located within the County of El Paso for at least twelve (12) months and of which 51% of the business must be owned by residents of El Paso County. Furthermore, the business must employ fewer than one hundred (100) employees or have annual gross receipts of less than one million dollars (\$1,000,000.00). It must not be a subsidiary of a business which would not meet these guidelines. Only United States citizens, born or naturalized, will be deemed eligible to be Small Locally-Owned Businesses.

DEFINITION OF "MINORITY BUSINESS ENTERPRISE (MBE)": A business which is:

- 1) certified as socially and economically disadvantaged by the Small Business Administration;
- 2) certified as a minority business enterprise by a US State or Federal agency;
- (3) an independent business concern which is at least 51% owned and controlled by minority group members
 - A. A minority group member is an individual who is a citizen of the United States and one of:
 1. Black American
 2. Hispanic American
 3. Native American
 4. Asian Pacific American
 5. Other groups whose members have been found to be disadvantaged by the Small New Business Act or by the Secretary of Commerce under Executive Order 11625, Sec. 5
 - B. The minority owner's interest must be real, substantial and continuing. This would include such characteristics as risk of loss/share of profit commensurate with proportional ownership and receipt of the customary incidents of ownership such as salary and/or tangible benefits.
 - C. A minority owner must have control of business decisions such as authority to sign bids and contracts, decisions in price negotiations, incurring liabilities for the firm, making staffing decisions, policymaking, etc.
 - D. A qualified MBE firm must perform a useful business function according to custom and practice in the industry. Acting merely as a passive conduit of funds to some other firm where such action is unnecessary to accomplish the project does not constitute a useful business function to practice in the industry.

DEFINITION OF "WOMEN-OWNED BUSINESS ENTERPRISE (WBE)": An independent business concern which is at least 51% owned by a woman or women having the same interests and controls identified in the MBE definition section of this guidance. Only United States citizens will be deemed eligible to be WBE's.

The form entitled "Minority Certification and Participation Summary", which is located at the end of Section 00300, Bid Form, should be completed and submitted by the Successful Bidder within fifteen (15) days of Notice of Award.

It is mandatory that bidder submit with his or her bid a fully executed bid proposal (including the tabulation of proposed subcontractors and suppliers), an original bid bond, the certificate of insurance availability, and minority participation categories reflecting bidder has met minority participation goals OR evidence of bidder's good faith effort to do so. Failure to submit these items with the bid will result in a finding that the bid is non-responsive and the bid will be disqualified.

EVIDENCE OF BIDDER'S GOOD FAITH EFFORT *OR* EVIDENCE OF *FULL* PARTICIPATION IN EACH CATEGORY IS ALSO REQUIRED AT THE TIME OF BID. OWNER RESERVES THE RIGHT TO REQUEST ADDITIONAL INFORMATION FROM THE BIDDER AS SUPPORT TO GOOD FAITH EFFORT DOCUMENTATION.

Bidders shall furnish a financial statement or other evidence of the Bidder's financial sufficiency to perform the contract, a sworn statement of his experience record, and a listing of the equipment available to him or any other statement or documentation required by the Owner as to his capability to complete the Work. The Post-Bid/Pre-Award Checklist and the Qualifications Statement may require submittal of additional documentation. PLEASE REVIEW THE CHECKLISTS PROVIDED AT THE END OF THIS SECTION 00100.

To assist the Owner in evaluating the Bidder's responsibility, the lowest responsive Bidder is required to complete and submit the "Qualification and Financial Disclosure Statement" found at the end of Section 00100 within five (5)

calendar days of the Engineer's request. The Engineer will submit this document and any additional information requested by the Engineer, to the Owner as an attachment to his Recommendation of Award.

The Checklists found at the back of this Section are provided to assist the Bidder in fulfilling these requirements.

The Purchasing Department will evaluate the responsiveness of the Bidder's submittal. Purchasing Agent will forward the bids and results of the Purchasing Department's evaluation to the Engineer for further evaluation of responsiveness, qualifications of the Bidder and other related conditions of this Bid. Engineer will forward the results of their evaluation to the Owner. Owner will review and present its recommendation to the Public Service Board for award.

Bidder is required to submit information regarding his status as a "RESIDENT" or "NONRESIDENT" on the spaces provided in the proposal form.

A "Nonresident Bidder" will not be awarded the Contract if the state of his principal place of business assesses a penalty against out-of-state bidders unless his bid is lower than the lowest bid submitted by a responsible Texas resident bidder by the same amount that a Texas 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.

The terms "Texas Resident Bidder" and "Nonresident Bidder" shall the meanings set forth for those terms in Chapter 2252 of the Tx. Government Code.

4. EXAMINATION OF CONTRACT DOCUMENTS AND SITE

4.1 It is the responsibility of each Bidder, before submitting a Bid, to (a) examine the Contract Documents thoroughly, (b) visit the site to become familiar with local conditions that may affect cost, progress, performance or furnishing of the Work, and to determine the character of equipment and facilities needed preliminary to and during the prosecution of the Work, (c) consider federal, state and local laws and regulations that may affect cost progress, performance or furnishing of the Work, (d) study and carefully correlate Bidder's observations with the Contract Documents, and (e) notify Engineer of all conflicts, errors or discrepancies in the Contract Documents.

When information as to soil conditions, test borings, and existing underground and overhead utility locations is shown on the Plans, Specifications, Drawings, or in preliminary reports prepared by the Engineer or under the Engineer's direction, such information was obtained for the Owner. The correctness of such information is not guaranteed by the Owner or by the Engineer and in no event shall be considered as a part of the contract, an inducement to bidding, or a factor for computation of bids. If such information is used by the Bidder in preparing a proposal, the Bidder must assume all risks that conditions encountered in performing the Work may be different from the approximation shown.

4.2 Reference is made to the Supplementary General Conditions for identification of:

4.2.1 Those reports of explorations and tests of subsurface conditions at the site which have been utilized by Engineer in preparation of the Contract Documents.

4.2.2 Those drawings of physical conditions in or relating to existing surface and subsurface conditions (except Underground Facilities) which are at or contiguous to the site which have been utilized by Engineer in preparation of the Contract Documents.

Copies of such reports and drawings will be made available by Owner to any Bidder on request. Those reports and drawings are not part of the Contract Documents. Technical data has been identified and established in the Supplementary General Conditions.

4.2.3 See SC 17.08. Those certain dewatering issues, procedures, payment terms, submittal requirements, and close out terms which are the responsibility of the Bidder and which may impact Bidder's pricing of this Bid.

4.3 Information and data reflected in the Contract Documents with respect to Underground Facilities at or contiguous to the site is based upon information and data furnished to Owner and Engineer by owners of

such Underground Facilities or others, and Owner does not assume responsibility for the accuracy or completeness thereof.

- 4.4 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders on subsurface conditions, Underground Facilities and other physical conditions, and possible changes in the Contract Documents due to differing conditions appear in Paragraphs 4.2 and 4.3 of the General Conditions, and as may be amended in the Supplementary Conditions.
- 4.5 Before submitting a Bid, each Bidder will, at Bidder's own expense, make or obtain any additional examinations, investigations, explorations, tests and studies and obtain any additional information and data which pertain to the physical 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 and which Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price and other terms and conditions of the Contract Documents.
- 4.6 Each Bidder will be required to get permission from property owners to obtain access to the site to conduct such explorations and tests as each Bidder deems necessary for submission of a Bid. Bidder shall fill all holes, clean up and restore the site to its former condition and to the satisfaction of the Engineer, upon completion of such explorations.
- 4.7 The 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 the Work are identified in the Contract Documents. All additional lands and access thereto required for temporary construction facilities or storage of materials and equipment are to be provided by Contractor. Easements for permanent structures or permanent changes in existing structures are to be obtained and paid for by Owner unless otherwise provided in the Contract Documents.
- 4.8 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the work required by the Contract Documents and such means, methods, techniques, sequences or procedures of construction as may be indicated in or required by the Contract Documents, and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

5. INTERPRETATIONS AND ADDENDA

- 5.1 All questions about the meaning or intent of the Contract Documents are to be directed to Purchasing Department. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda mailed, delivered, and/or e-mailed to all parties recorded by Engineer as having received the Bidding Documents. Questions received less than 7 days prior to the date for opening of Bids will not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.
- 5.2 Addenda may also be issued to modify the Bidding Documents as deemed advisable by Owner or Engineer, with Owner's approval.

6. BID SECURITY

- 6.1 Each Bid must be accompanied by Bid security made payable to Owner in an amount of five percent of the Bidder's maximum Bid price and in the form of a certified or cashier's check or a Bid Bond issued by a surety meeting the requirements of Paragraph 5.1 of the General Conditions and Paragraph 5.1 of the Supplementary General Conditions.
- 6.2 The Bid security of the Successful Bidder will be retained until such Bidder has executed the Agreement and furnished the required contract security and insurance, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Agreement and furnish the required contract security, insurance and other required contract documents within fifteen days after the Notice of Award, Owner may annul the Notice of Award and the Bid security of that Bidder will be forfeited. The Bid security of other

Bidders whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of the seventh day after the Effective Date of the Agreement or the forty-sixth day after the Bid opening, whereupon Bid security furnished by such Bidders will be returned. Bid security with Bids which are not competitive will be returned within seven days after the Bid opening.

The Bidder has agreed by signing this Bid that he fully understands the requirements of the bid documents.

Should the Bidder fail to return the Agreements, acceptable Bonds, Insurance Certificates and insurance policies within fifteen days of receipt of the documents, the Utility may charge excess costs generated by such delay at the rate of \$100 for each day of delay. In the event more than two reviews of insurance submittals are required by the Utility's Risk Manager, the Successful Bidder will additionally reimburse the Utility for those costs at the rate of \$125 per hour which will apply to each fifteen minute fraction thereof charged by the Risk Manager. These reimbursed costs will be deducted from the Bidders first Application for Payment or, in the event a Bid Bond is forfeited, such expenses may be reimbursed from the proceeds of the Bid Bond as part of the excess costs or procurement.

7. CONTRACT TIME

The numbers of Calendar Days within which, or the dates by which, the Work is to be substantially completed and also completed and ready for final payment (the Contract Time) are set forth in the Agreement. Completion within this time is of the essence in the performance of this contract.

8. LIQUIDATED DAMAGES

Provisions for liquidated damages, if any, are set forth in the Agreement and in the Supplementary General Conditions.

9. SUBSTITUTE OR "OR EQUAL" ITEMS

The Contract, if awarded, will be on the basis of materials and equipment described in the Drawings or specified in the Specifications without consideration of possible substitute or "or equal" items. Whenever it is indicated in the Drawings or specified in the Specifications that a substitute or "or equal" item of material or equipment may be furnished or used by Contractor is acceptable to Engineer, application for such acceptance will not be considered by Engineer until after the date of the Notice to Proceed. The procedure for submission of any such application by Contractor and consideration by Engineer is set forth in Paragraphs 6.7.1, 6.7.2, and 6.7.3 of the General Conditions and may be supplemented in the General Requirements.

10. SUBCONTRACTORS, SUPPLIERS AND OTHERS

10.1 The Bidder is required to identify all Subcontractors and Suppliers; to provide the value of each proposed subcontract or purchase order; and to provide their own and their subcontractor's business classification (Small Locally-Owned Business Enterprise, Minority Business Enterprise, Woman Owned Business Enterprise, or Other). The Bidder shall submit with his Bid a list of all proposed Subcontractors and Suppliers. Space for this submittal is provided within the Bid Proposal, Section 00300. Use additional sheets as necessary. The Bidder is encouraged to submit the MWBE Certification and Participation Summary Form with his Bid; the Form is not mandatory at the time bids are opened, but it must be submitted prior to Award. If requested by Engineer or by Owner, Bidder shall provide an experience statement with pertinent information regarding similar projects and other evidence of qualifications for each such Subcontractor, Supplier, person or organization. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, other person or organization, either Owner or Engineer may, before the Notice of Award is given, request the apparent Successful Bidder to submit an acceptable substitute, in which case the apparent Successful Bidder shall submit an acceptable substitute, that Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution and Owner may consider such price adjustment in evaluating Bids and making the Contract Award.

After Award, Bidder shall provide a copy of the proposed subcontracts (unexecuted copies are acceptable at this time) to Purchasing indicating the scope and the value of work to be subcontracted or to be obtained through a purchase order to a Supplier. After execution of this Agreement by Owner and Bidder, contractor shall provide copies of the executed subcontracts and purchase orders to Suppliers to the Owner's Contracts

Department prior to submittal of the first Application for Payment.

- 10.2 No Contractor shall be required to employ any Subcontractor, Supplier, other person or organization against whom Contractor has reasonable objection.
- 10.3 The Bidder shall submit a Final Report of total payments made to each subcontractor and supplier, as part of the required close out documents.

This submittal shall be made as a condition precedent to Final Payment.

11. BID FORM

- 11.1 The Bid Form is included with the Bidding Documents; additional copies may be obtained from Owner.
- 11.2 All blanks on the Bid Form must be completed in ink. Bids which do not have all blanks filled in or completed may be rejected at the Owner's option.
- 11.3 Bids by corporations must be executed in the corporate name by the president or a vice president (or other corporate officer accompanied by evidence of authority to sign) and the corporate seal must be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation must be shown below the signature.
- 11.4 Bids by partnerships must be executed in the partnership name and signed by a partner, whose title must appear under the signature and the official address of the partnership must be shown below the signature.
- 11.5 All names must be printed below the signature.
- 11.6 The Bid shall contain an acknowledgment of receipt of all Addenda (the numbers of which must be filled in on the Bid Form).
- 11.7 The address and telephone number for communications regarding the Bid must be shown.

12. SUBMISSION OF BIDS

Bids shall be submitted at the time and place indicated in the Advertisement or Invitation to Bid and shall be enclosed in an opaque sealed envelope, marked with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted) and name and address of the Bidder and accompanied by the Bid security and other required documents. If the Bid is sent through the mail or other delivery system, the sealed envelope shall be enclosed in a separate envelope with the notation "BID ENCLOSED" on the face of it. The Bid proposal packet must include an electronic version of the bid (e.g., saved on a compact disk).

13. MODIFICATION AND WITHDRAWAL OF BIDS

- 13.1 Bids may be modified or withdrawn by an appropriate document duly executed (in the manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the opening of Bids.
- 13.2 If, within twenty-four hours after Bids are opened, any Bidder files a duly signed, written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid; that the mistake is clerical; that the mistake is so serious that enforcement of the Bid would be unconscionable; and that the mistake has occurred despite the exercise of ordinary care; that Bidder may withdraw its Bid and the Bid security will be returned. Thereafter, that Bidder will be disqualified from further bidding on the Work to be provided under the Contract Documents.

14. OPENING OF BIDS

Bids will be opened and (unless obviously nonresponsive) read aloud publicly. An abstract of the amounts of the base Bids and major alternates (if any) will be made available to Bidders after the opening of Bids.

15. BIDS TO REMAIN SUBJECT TO ACCEPTANCE

All Bids will remain subject to acceptance for forty-five (45) days after the day of the Bid opening, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to that date. In the case of State, Federal, or NADBank-funded projects, all Bids will remain subject to acceptance for ninety (90) days or such reasonable time as the funding agency may require.

16. AWARD OF CONTRACT

16.1 Owner reserves the right to reject any and all Bids, to waive any and all informalities not involving price, time or changes in the Work and the right to disregard all immaterial, nonconforming, nonresponsive, unbalanced or conditional Bids. Also, Owner reserves the right to reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Project to make an award to the Bidder, whether because the Bid is not responsive or the Bidder is not responsible because the Bidder is deemed to be unqualified or of doubtful financial ability or fails to meet any other pertinent criteria established by Owner under Paragraph 3 hereof. Discrepancies in the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Any bids submitted in which there is a material failure to comply with the Bid requirements or specifications will be rejected and the contract will be awarded to the lowest responsible Bidder conforming to the specifications unless the Owner decides to reject all Bids.

16.2 In evaluating Bids, Owner will consider the responsiveness of the Bid, responsibility of the Bidders, whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.

16.3 Owner may consider the qualifications and experience of Subcontractors, Suppliers, and other persons and organizations proposed for those portions of the Work as to which the identity of Subcontractors, Suppliers, and other persons and organizations must be submitted as provided in the Supplementary General Conditions or other sections of this bid document. Owner also may consider the operating costs, maintenance requirements, performance data and guarantees of major items of materials and equipment proposed for incorporation in the Work when such data is required to be submitted prior to the Notice of Award or as a substitute.

16.4 Owner may conduct such investigations as Owner deems necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications and financial ability of Bidders, proposed Subcontractors, Suppliers and other persons and organizations to perform and furnish the Work in accordance with the Contract Documents to Owner's satisfaction within the prescribed time.

16.5 If the contract is to be awarded, it will be awarded to the lowest Bidder whose responsibility has been evaluated in accordance with these Instructions to Bidders.

16.6 If the contract is to be awarded, Owner will give the Successful Bidder a Notice of Award within forty-five (45) days after the day of the Bid opening. In the case of State or Federally-funded projects, Owner will give the Successful Bidder a Notice of Award within ninety (90) days after the day of the Bid opening, or such reasonable time as the funding agency may require.

17. CONTRACT SECURITY

Paragraph 5.1 of the General Conditions and the Supplementary General Conditions set forth Owner's requirements as to performance and payment Bonds. When the Successful Bidder delivers the executed Agreement to Owner, it must be accompanied by the required Performance and Payment Bonds and the Certificate of Insurance and insurance policies. A Payment Bond must be provided for contracts \$25,000.00 or greater in value. If the contract requires an expenditure of less than \$100,000, the Owner reserves the right to waive the requirement for a Performance Bond, provided that payment is not due to the Contractor until the Work is completed and accepted by the Owner. Any provision in any bond furnished in attempted compliance with House Bill No. 31 that expands or restricts the rights or liabilities provided under this Act shall be disregarded and the provisions of this Act shall be read into that Bond.

18. SIGNING OF AGREEMENT

When Owner gives a Notice of Award to the Successful Bidder, it will be accompanied by the required number of unsigned counterparts of the Agreement with all other written Contract Documents attached. Within ten days after, Contractor shall sign and deliver the required number of counterparts of the Agreement and attached documents to Owner with the required Bonds and a copy of the Certificate of Insurance along with a copy or copies of the actual Insurance policy or policies. Owner shall deliver fully signed final contract to Contractor when all pre-construction contract requirements have been met.

19. PRE-BID CONFERENCE

A pre-bid conference will be held on **December 12, 2023**, at **11:00 a.m.**, local time at 1557 FM 1110, Clint, Texas. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference. Engineer will transmit to all prospective Bidders of record such Addenda as Engineer considers necessary in response to questions arising at the conference.

20. SALES AND USE TAXES

Owner is exempt from Municipal and State Sales and Use Taxes on materials and equipment to be incorporated in the Work. Said taxes shall not be included in the Contract Price. Refer to Supplementary General Conditions SC-6.15 for additional information.

QUALIFICATION AND FINANCIAL DISCLOSURE STATEMENT

BIDDER:

PROJECT NAME:

Panorama Village Lift Station 19

1. ORGANIZATION

- 1.1 How many years has your organization been in business as a Contractor?

- 1.2 How many years has your organization been in business under its present business name?
 - 1.2.1 Under what other or former names has your organization operated?

- 1.3 If your organization is a corporation, answer the following:
 - 1.3.1 Date of incorporation: _____
 - 1.3.2 State of incorporation: _____
 - 1.3.3 President's name: _____
 - 1.3.4 Vice-president's name(s): _____

 - 1.3.5 Secretary's name: _____
 - 1.3.6 Treasurer's name: _____

- 1.4 If your organization is a partnership, answer the following:
 - 1.4.1 Date of organization: _____
 - 1.4.2 Type of partnership
(if applicable): _____
 - 1.4.3 Name(s) of general
partner(s): _____

- 1.5 If your organization is individually owned, answer the following:
 - 1.5.1 Date of organization: _____
 - 1.5.2 Name of owner: _____

- 1.6 If the form of your organization is other than those listed above, describe it and name the principals:

2. LICENSING

- 2.1 List jurisdictions and trade categories in which your organization is legally qualified to do business, and indicate registration or license numbers, if applicable. Indicate name, license number and expiration date for Master Electrician or other trade required under the Instructions to Bidders section of this Bid.
- 2.2 List jurisdictions in which your organization's partnership or trade name is filed.

3. EXPERIENCE

- 3.1 List the categories of work that your organization normally performs with its own forces.
- 3.2 Claims and Suits. (If the answer to any of the questions below is yes, please attach details.)
 - 3.2.1 Has your organization ever failed to complete any work awarded to it?
 - 3.2.2 Are there any judgments, claims, arbitration proceedings or suits pending or outstanding against your organization or its officers?
 - 3.2.3 Has your organization filed any lawsuits or requested arbitration with regard to construction contracts within the last five years?
- 3.3 Within the last five years, has any officer or principal of your organization ever been an officer or principal of another organization when it failed to complete a construction contract? (If the answer is yes, please attach details.)
- 3.4 On a separate sheet, list major construction projects your organization has in progress, giving the name of project, owner, architect, contract amount, percent complete and scheduled completion date.
 - 3.4.1 State total worth of work in progress and under contract:
- 3.5 On a separate sheet, list the major projects your organization has completed in the past five years, giving the name of project, owner, architect, contract amount, date of completion and percentage of the cost of the work performed with your own forces.
 - 3.5.1 State annual amount of construction work performed each year during the past five years:
- 3.6 On a separate sheet, list the construction experience and present commitments of the key individuals of your organization. Submit resumes of Key Personnel (as defined in Section 00100, Instructions to Bidders). Bidder hereby certifies that the Resident Superintendent has the authority to act on behalf of the Contractor at all times. No substitution shall be made without the written authorization of the Owner and the Engineer based upon acceptance of the qualifications of the proposed substitute.
- 3.7 On a separate sheet, provide evidence that the Bidder meets the minimum criteria called out in Section 00100, Instructions to Bidders. Provide similar evidence for Subcontractors, if required by Bid or by Engineer.
- 3.8 Provide the MWBE CERTIFICATION SUMMARY FORM found at the end of Section 00300.

4. REFERENCES

4.1 Trade References:

4.2 Bank References:

4.3 Surety:

Name and telephone number of Bonding Company: _____

Name, telephone and address of Agent: _____

5. FINANCING

5.1 Financial Statement

5.1.1 Attach a financial statement, preferably audited, including your organization's latest balance sheet and income statement showing the following items:

- a. Cash Flow Statement
- b. Notes to Financial Statement
- c. Auditor Statement
- d. Comparison Statements, if available

5.1.2 Name and address of firm preparing attached financial statement, and date thereof.

5.1.3 Is the attached financial statement for the identical organization named on page one?

5.1.4 If not, explain the relationship and financial responsibility of the organization whose financial statement is provided (e.g., parent-subsiary).

5.2 Will the organization whose financial statement is attached act as guarantor of the contract for construction?

6. SIGNATURE

6.1 To be executed by a Principal of the firm authorized to certify the foregoing information:

_____, being duly sworn, deposes and says that the information provided herein is true and sufficiently complete so as not to be misleading.

6.2 Dated at _____ this _____ day of _____, 20__.

Name of Organization: _____

By: _____

(Printed Name)

Title: _____

BID PROPOSAL CHECKLIST	
Section 00100/00300	1. <u>MANDATORY</u> : Signed Bid Form with all blanks filled in, including acknowledgement of any issued addenda and names of all Subcontractors and Suppliers.
Section 00100/00300	2. <u>MANDATORY</u> : Original and Notarized Bid Security or Bond
Section 00100/00300	3. <u>MANDATORY</u> : Certificate of Insurance Availability
Section 00100/00300	4. <u>MANDATORY</u> : Names and categories (SMLB, MBE OR WBE) of all Subcontractors and Suppliers with SMLB, MBE OR WBE certifications
Section 00100/00300	5. <u>MANDATORY</u> : Evidence of Good Faith Efforts if Minority Participation Goals are not met
Section 00510	6. <u>MANDATORY</u> : Statement of Nondivestment From Israel
Section 00100	7. <u>MANDATORY</u> : Electronic version of the Bid Proposal (saved on a Compact Disk)

POST-BID/PRE-AWARD CHECKLIST	
Section 00100/00810	1. <u>MANDATORY</u> : Evidence of Worker's Compensation Insurance Coverage: a Certificate of Insurance or Form DWC-81, DWC-82, DWC-83, DWC-84, DWC-85 or if self-insured, a coverage agreement filed with the Texas Worker's Compensation Commission's Division of Self Insurance Regulation.
Section 00100/00810	2. <u>MANDATORY</u> : If employees provided by leasing company, evidence of Texas State License and copy of their Worker's Compensation policy. If no leased employees will be used, provide a letter on Contractor's letterhead stating so.
Section 00100/00300	3. <u>MANDATORY</u> : Financial Statements
Section 00100/00300	4. <u>MANDATORY</u> : Qualification Statement and Qualifications of Key Personnel (included in Section 00100)
Section 00100/00300	5. <u>MANDATORY</u> : Updated Minority Certification And Participation Summary

SECTION 00300

BID FORM

PROJECT IDENTIFICATION: Lower Valley Water District

 Panorama Village Lift Station 19

LVWD BID NO.: 24-0105-01

Name and Address of OWNER: Lower Valley Water District
 1557 FM 1110
 P.O. Box 909
 Clint, Texas 79836

1. The undersigned BIDDER proposes and agrees, if this Bid is accepted, to enter into an agreement with OWNER in the form included in the Contract Documents to perform and furnish all Work as specified or indicated in the Contract Documents for the Contract Price and within the Contract Time indicated in this Bid and in accordance with the other terms and conditions of the Contract Documents.

2. BIDDER accepts all of the terms and conditions of the Advertisement or Invitation to Bid and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for forty-five days after the day of Bid opening. In the case of State, Federal, or NADBank-funded projects, all Bids will remain subject to acceptance for 90 days or such reasonable time as the funding agency may require. BIDDER will sign and submit the Agreement with the Bonds and other documents required by the Bidding Requirements within fifteen days after the date of OWNER's Notice of Award.

3. In submitting this Bid, BIDDER represents, as more fully set forth in the Agreement, that:
 - A. BIDDER has examined copies of all the Bidding Documents and of the following Addenda (receipt of all which is hereby acknowledged):

Date	Number
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

- B. BIDDER has familiarized itself with the nature and extent of the Contract Documents, Work, site, locality, and all local conditions and Laws and Regulations that in any manner may affect cost, progress, performance or furnishing of the Work.

- C. BIDDER has studied carefully all reports and drawings of subsurface conditions and drawings of physical conditions which are identified in the Supplementary Conditions as provided in

Paragraph 4.2 of the General Conditions, and accepts the determination set forth in Paragraph SC-4.2 of the Supplementary Conditions of the extent of the technical data contained in such reports and drawings.

- D. BIDDER has obtained and carefully studied (or assumes responsibility for obtaining and carefully studying) all such examinations, investigations, explorations, tests and studies (in addition to or to supplement those referred to in "C." above) which pertain to the subsurface or physical conditions at the site or otherwise may affect the cost, progress, performance or furnishing of the Work as BIDDER considers necessary for the performance or furnishing of the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of Paragraph 4.2 of the General Conditions.
- E. BIDDER has reviewed and checked all information and data shown or indicated on the Contract Documents with respect to existing Underground Facilities at or contiguous to the site and assumes responsibility for the accurate location of said Underground Facilities.
- F. BIDDER has correlated the results of all such observations, examinations, investigations, explorations, tests, reports and studies with the terms and conditions of the Contract Documents.
- G. BIDDER has given ENGINEER written notice of all conflicts, errors or discrepancies that it has discovered in the Contract Documents and the written resolution thereof by ENGINEER is acceptable to BIDDER.
- H. This Bid 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; BIDDER has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; BIDDER has not solicited or induced any person, firm or corporation to refrain from bidding; and BIDDER has not sought by collusion to obtain for itself any advantage over any other Bidder or over OWNER.

4. Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

BASE BID A

<u>Item No.</u>	<u>Estimated Quantity</u>	<u>UOM</u>	<u>Brief Description of Item</u>	<u>Unit Bid Price</u>	<u>Extended Amount (Qty x Unit Price)</u>
1	1	LS	Insurance, Bonds, Mobilization, Demobilization	\$ _____	\$ _____
2	1	LS	Preconstruction Video	\$ _____	\$ _____
3	11,158	LF	Trench Safety System	\$ _____	\$ _____
4	1	LS	Traffic Control Plan	\$ _____	\$ _____
5	1,842	LF	6-inch PVC Forcemain DR-18	\$ _____	\$ _____
6	9,316	LF	8-inch PVC Sewer Pipe SDR-35	\$ _____	\$ _____

<u>Item No.</u>	<u>Estimated Quantity</u>	<u>UOM</u>	<u>Brief Description of Item</u>	<u>Unit Bid Price</u>	<u>Extended Amount (Qty x Unit Price)</u>
7	36	EA	48-inch Polymer Sanitary Sewer Manhole (0-6')	\$ _____	\$ _____
8	122	VF	48-inch Polymer Sanitary Sewer Additional Vertical Depth	\$ _____	\$ _____
9	216	EA	4-inch Sanitary Sewer Service Connection (Main to ROW)	\$ _____	\$ _____
10	118	EA	4-inch Private Service (ROW to House)	\$ _____	\$ _____
11	118	EA	De-Septic, Pump, Haul, Sand, Permits	\$ _____	\$ _____
12	8,075	SY	Remove and Replace Pavement and Install (Type D) HMAC	\$ _____	\$ _____
13	1	LS	Lift Station	\$ _____	\$ _____
14	1	LS	Odor Control System	\$ _____	\$ _____

BASE BID B

<u>Item No.</u>	<u>Estimated Quantity</u>	<u>UOM</u>	<u>Brief Description of Item</u>	<u>Unit Bid Price</u>	<u>Extended Amount (Qty x Unit Price)</u>
15	36	EA	48-inch Concrete Sanitary Sewer Manhole (0-6') with Triplex Coating	\$ _____	\$ _____
16	122	VF	48-inch Polymer Sanitary Sewer Additional Vertical Depth with Triplex Coating	\$ _____	\$ _____

TOTAL BASE BID A (ITEMS 1 THROUGH 14) _____
TOTAL BASE BID (in words)

TOTAL BASE BID B (ITEMS 15 THROUGH 16) _____
TOTAL BASE BID (in words)

In accordance with Section 151.311 of the Texas Tax Code (V.A.T.C.S.), regarding taxes on materials and services, and requiring a separate contract, the following is the breakdown of cost for materials and cost for labor for this bid:

MATERIALS TO BE INCORPORATED IN PROJECT NOT SUBJECT TO SALES TAX: \$ _____

LABOR TO BE INCORPORATED IN PROJECT NOT SUBJECT TO SALES TAX: \$ _____

RENTAL EQUIPMENT AND OTHER TAXABLE ITEMS: \$ _____

OTHER (I.E. BONDS, INSURANCE, CAPITAL EQUIPMENT, ETC.) \$ _____

***TOTAL CONTRACT (TOTAL MUST EQUAL TOTAL BID PRICE):** \$ _____

5. BIDDER agrees that the Work will be complete within **350** Calendar Days after the date when the Contract time commences to run as provided in Paragraph 2.3 of the General Conditions as modified in the Supplementary Conditions.

BIDDER accepts the provisions of the Supplementary Conditions and the Agreement as to liquidated damages in the event of failure to complete the Work on time.

6. BIDDER MUST ANSWER THE FOLLOWING QUESTIONS: (Refer to INSTRUCTIONS TO BIDDERS for definitions.)

A. Is the bidder that is making and submitting this bid a "RESIDENT BIDDER" or a "NONRESIDENT BIDDER"?

Answer: _____

B. If the bidder is a "NONRESIDENT BIDDER", does the state in which the Nonresident Bidder's principal place of business is located have a law requiring a Nonresident Bidder of that state to bid a certain amount of percentage under the bid or a Resident Bidder of that state in order for the nonresident bidder of that state to be awarded a contract on his bid in such state?

Answer: _____

- C. If the answer to Question Number 2 is "yes", then what amount or percentage must a Texas Resident Bidder bid under the bid of a Resident Bidder of that state in order to be awarded a contract on such bid in said state?

Answer: _____

7. The following documents are attached to and made a condition of this Bid:

A. Required Bid Security in the form of _____

- B. A tabulation of all Subcontractors who will provide labor at the site of the work or render services to the CONTRACTOR in or about the construction of the work and Suppliers and other persons and organizations is required to be identified in this Bid. Complete the following table, designating each as Small Locally-Owned Business Enterprise (SMLB), Minority Business Enterprise (MBE), Women-Owned Business Enterprise (WBE), Small Business Enterprise (SBE), Small Business in Rural Areas (SBRA), or Other (not either SMLB, WBE MBE, SBE or SBRA) is required. Only one category may be checked. Include the work item and value of work to be provided by the Prime Contractor, as well as its category.

Tabulation of Subcontractors and Suppliers

SUBCONTRACTOR/SUPPLIER	WORK ITEM	SUBCONTRACT OR PURCHASE ORDER VALUE (If value is unknown, please list <i>Pending</i>)	S	M	W	S	S	OTHER
			M L B	B E	B E	B E	B R A	
			Please check one box					
Prime Contractor:								

- C. Will the Contractor meet the Small Locally Owned Business Enterprise, Minority Business Enterprise and Women-Owned Business Enterprise goals as required by these contract documents and the funding agencies?

YES _____ NO _____

If "YES", include above each of the firms to be used, their business status as a MBE, WBE or

SMLB, the proposed dollar value and type of work to be performed.

If "NO", documentation supporting good faith effort is required.

8. Communications concerning this Bid shall be addressed to the following named individual, address, telephone number, and facsimile number:

Name: _____
Address: _____

Phone: _____ Fax: _____

E-Mail _____

9. The terms used in this Bid which are defined in the General Conditions of the Construction Contract included as part of the Contract Documents have the meanings assigned to them in the General Conditions.

SUBMITTED on _____, 20__.

If BIDDER is:

An Individual

By _____(SEAL)
(Name of Bidder)

(Title) (Signature)

doing business as _____

Business address: _____

Phone No.: _____

A Partnership

By _____(SEAL)
(Firm Name)

(Signature - general partner)

Business address: _____

Phone No.: _____

A Corporation

By _____
(Corporation Name)

(state of incorporation)

By _____
(name of person authorized to sign)

(Title)

(Signature)

(Corporate Seal)

Attest _____
(Secretary)

Business address: _____

Phone No.: _____

Federal Tax Identification Number _____

When proposing as a Corporation, Bidder swears and affirms by signing this Bid that the proposing Corporation is currently in existence, is currently authorized to do business in the State of Texas (or State of incorporation) and that no franchise tax reports or payments are delinquent as of the date of this Bid Proposal. The Bidder will provide a Certificate of Account Status with the signed Contract Documents. See the Agreement, Section 00500, for the sample form which is to be obtained by the successful Contractor from the Texas (or other state) Comptroller of Public Accounts and submitted as part of the final, executed Contract Documents.

CERTIFICATION OF INSURANCE AVAILABILITY

Date _____

I, _____ (Name of Insurance Agent), certify that I have reviewed the insurance requirements listed in Article 5 of the Supplementary Conditions of the specifications for the **Panorama Village Lift Station 19**, Bid No. **24-0105-01** and further certify that _____ (Name of Bidder) has or can obtain the insurance coverage required by this Project so that a certificate of insurance and a copy(s) for the actual insurance policies can be submitted to the Owner within fifteen (15) days of the Notice of Award.

Signed _____

Title _____

Insurance Agency _____

Address _____

Telephone _____

**MINORITY CERTIFICATION
AND
PARTICIPATION SUMMARY**
(LVWD FUNDED PROJECTS)

BID NUMBER: 24-0105-01

BID TITLE: Panorama Village Lift Station 19

I certify that the Minority (MBE) and Women's Business Enterprises (WBE) and Small Locally Owned Businesses (SMLB) participating in this project are qualified in accordance with the Minority requirements included in the above listed Bid Documents and that we will ensure all consultants, contractors, suppliers and subcontractors will comply with the Minority guidelines. Definitions of each category are found in the 00100, Instructions to Bidders Section. Attached are:

Solicitation Documents: _____

Proposed Subcontracts for the below listed firms: _____

MBE, WBE or SMLB FIRM NAME	ADDRESS	PHONE	CONTRACT AMOUNT	MBE	WBE	SMLB

The attached documents outline the efforts taken in complying with the Minority Guidelines.

CONTRACTOR

SIGNATURE OF AUTHORIZED REPRESENTATIVE

DATE

PRINTED NAME OF AUTHORIZED REPRESENTATIVE

The logo for ACME CONSTRUCTION features the company name in white, uppercase letters inside a blue oval. A yellow swoosh is positioned above the oval, extending from the left side towards the top right.

ACME CONSTRUCTION

**10518 Burr Oak Drive
San Antonio, Texas 78609**

512-557-7089
Fax 512-557-2097

January 5, 2008

CERTIFIED MAIL / RETURN RECEIPT REQUESTED

Amazing Results Landscape and Supply Company
111 Red Rock Terrace
Lignite, Texas 72533

Gentlemen:

We are actively seeking MWBE Contractors and suppliers for work to be done under Project Number 123456, Sewer System Improvements, City of Anywhere, Texas. The work will consist of utility worm, concrete, paving, fencing, landscaping, masonry, excavation and trucking, barricades, back-hoe work and supplies and materials.

Plans and specifications may be viewed or obtained at the project engineer's general offices, Bing, Campbell and Associates, 19510 Jackson Blvd., Muleshoe, Texas 76698.

All bids must be submitted to the above mentioned address by Noon, Friday, February 16, 2008.

Sincerely,

John Q. Doe, Project Director
Acme Construction



Amazing Results
Landscaping

January 12, 2008

Mr. John Q. Doe, Project Director
Acme Construction
10518 Burr Oak Drive
San Antonio, Texas 78609

RE: PROJECT NO. 123456, ANYWHERE TEXAS SEWER SYSTEM IMPROVEMENTS PROJECT

Dear Mr. Doe:

We wish to submit the following bid for the above mentioned project:

St. Augustine sod – 900 square yards at \$1.75 per square yard
(Includes installation, rolling, fertilizing, and days of watering) \$1,575.00

Hydro-Mulch – 15 acres at \$1,175 per acre \$17,625.00
(5-acre minimum pre trip; No water; No maintenance; areas that do not
germinate will be reseeded) Proper watering is the responsibility of
customer.

Hay Bales – We will furnish and install at a rate of \$15.00 per bale

We look forward to hearing from you concerning our bid. Thank you.

Sincerely,

Theodore T. "Red" Robbins
Manager

*** A Certified MBE FIRM ***

1111 Red Rock Terrace
Lignite, Texas 72533
(512) 489-5678 (800) 549-0000
(512) 489-5679 fax
www.amazingresults.com

The logo for ACME CONSTRUCTION features the company name in white, uppercase letters inside a blue oval. A yellow swoosh underline is positioned above the oval, extending from the left side of the page towards the right.

ACME CONSTRUCTION

**10518 Burr Oak Drive
San Antonio, Texas 78609**

512-557-7089
Fax 512-557-2097

January 5, 2008

CERTIFIED MAIL / RETURN RECEIPT REQUESTED

Rider Excavation Services
7856 Dry Gulch
Little Indian Mound, Texas 74561

Gentlemen:

We are actively seeking MWBE Contractors and suppliers for work to be done under Project Number 123456, Sewer System Improvements, City of Anywhere, Texas. The work will consist of utility worm, concrete, paving, fencing, landscaping, masonry, excavation and trucking, barricades, back-hoe work and supplies and materials.

Plans and specifications may be viewed or obtained at the project engineer's general offices, Bing, Campbell and Associates, 19510 Jackson Blvd., Muleshoe, Texas 76698.

All bids must be submitted to the above mentioned address by Noon, Friday, February 16, 2008.

Sincerely,

John Q. Doe, Project Director
Acme Construction



Rider Excavation Services

January 8, 2008

Mr. John Q. Doe, Project director
Acme Construction
10518 Burr Oak Drive
San Antonio, Texas 78609

RE: PROJECT NO. 123456
ANYWHERE TEXAS SEWER SYSTEM IMPROVEMENTS PROJECT

Dear Mr. Doe:

Thank you for your letter of January 5, 2008 requesting bids for the Anywhere, Texas Sewer System Improvements Project. We will not be submitting a bid because we are scheduled to begin work on another project that is projected to start on approximately the same date as ours.

We appreciate the opportunity to participate in your project. Please contact us again for any future projects.

Sincerely,

Easy Rider President
Rider Excavation Services

The logo for ACME CONSTRUCTION features the company name in white, uppercase letters inside a blue oval. A yellow swoosh underline is positioned above the oval.

ACME CONSTRUCTION

**10518 Burr Oak Drive
San Antonio, Texas 78609**

512-557-7089
Fax 512-557-2097

January 5, 2008

CERTIFIED MAIL / RETURN RECEIPT REQUESTED

Shadow Paving
P. O. Box 903
Pharr, Texas 72579

Gentlemen:

We are actively seeking MWBE Contractors and suppliers for work to be done under Project Number 123456, Sewer System Improvements, City of Anywhere, Texas. The work will consist of utility worm, concrete, paving, fencing, landscaping, masonry, excavation and trucking, barricades, back-hoe work and supplies and materials.

Plans and specifications may be viewed or obtained at the project engineer's general offices, Bing, Campbell and Associates, 19510 Jackson Blvd., Muleshoe, Texas 76698.

All bids must be submitted to the above mentioned address by Noon, Friday, February 16, 2008.

Sincerely,

John Q. Doe, Project Director
Acme Construction

SHADOW PAVING



January 8, 2008

Acme Construction
John Q. Doe, Project Director
10518 Burr Oak Dr.
San Antonio, TX 78609

Dear Mr.Doe:

Thank you for your letter of January 5, 2008 requesting a bid for the paving portion of the Anywhere, Texas Sewer System Improvements Project. Because of the distance of the project from our offices, we will not be interested in submitting a bid.

We appreciate your interest in our services. Please keep us in mind for future projects that may require expertise and services.

Sincerely,

Elmer A. Paver
Office Manager, Shadow Paving

The logo for ACME CONSTRUCTION features the company name in white, uppercase letters inside a blue oval. A yellow swoosh underline is positioned above the oval, extending from the left side of the page towards the right.

**10518 Burr Oak Drive
San Antonio, Texas 78609**

512-557-7089
Fax 512-557-2097

January 5, 2008

CERTIFIED MAIL / RETURN RECEIPT REQUESTED

Construction Trades Newsletter
100 Someplace Dr.
P. O. Box 500
Anywhere, Texas 08654

Attn: Ms. Glory Everett, Editor

Dear Ms. Everett:

Please publish the following in the "Public Notices" section of your weekly newsletter on the following dates: 1/11/08; 1/18/08; 1/25/08; and 2/1/08.

"Acme Construction is soliciting subcontract and material bids in connection with the Improvements to the Sewer System for the City of Anywhere, Texas. Qualified MBE and WBE firms are encouraged to submit bids in response to this invitation. The work will consist of utility work, concrete, paving, fencing, landscaping, masonry, excavation and trucking, barricades, back-hoe work and supplies and materials. Plans and specifications may be viewed or obtained at the project engineer's general offices, Bing, Campbell and Associates, 19510 Jackson Blvd., Muleshoe, Texas 76698. Telephone No. 512-557-2091, Fax 512-557-2090. All bids must be submitted to the above mentioned address by Noon, Friday, February 16, 2008".

Please bill Acme Construction, 10518 Burr Oak Drive, San Antonio, Texas 78609. The person authorizing the placement of this ad is B. J. Tenfold. If you have any questions, you may contact Mr. Tenfold at 512-557-7000.

Sincerely,

B. J. Tenfold
Manager of Accounts

**10518 Burr Oak Drive
San Antonio, Texas 78609**

512-557-7089
Fax 512-557-2097

January 5, 2008

CERTIFIED MAIL / RETURN RECEIPT REQUESTED

Anywhere Weekly Courier
1111 Main Street
P. O. Box 1
Anywhere, Texas 08654

Attn: Mr. Bucky Beaver, Circulation Manager

Dear Mr. Beaver:

Please publish the following in the "Public Notices" section of your weekly newspaper editions on the following dates: 1/11/08; 1/18/08; 1/25/08; and 2/1/08.

"Acme Construction is soliciting subcontract and material bids in connection with the Improvements to the Sewer System for the City of Anywhere, Texas. Qualified MBE and WBE firms are encouraged to submit bids in response to this invitation. The work will consist of utility work, concrete, paving, fencing, landscaping, masonry, excavation and trucking, barricades, back-hoe work and supplies and materials. Plans and specifications may be viewed or obtained at the project engineer's general offices, Bing, Campbell and Associates, 19510 Jackson Blvd., Muleshoe, Texas 76698. Telephone No. 512-557-2091, Fax 512-557-2090. All bids must be submitted to the above mentioned address by Noon, Friday, February 16, 2008".

Please bill Acme Construction, 10518 Burr Oak Drive, San Antonio, Texas 78609. The person authorizing the placement of this ad is B. J. Tenfold. If you have any questions, you may contact Mr. Tenfold at 512-557-7000.

Sincerely,

B. J. Tenfold
Manager of Accounts

THE STATE OF TEXAS }
COUNTY OF GHI }

Before me Homer Shortcut, a Notary Public in and for GHI County, Texas on this day personally appeared Bucky Beaver, Circulation Manager for Small Town Newspapers Group, Inc., publishers of the Anywhere Weekly Courier, who being by me duly sworn did depose and say that said newspaper has been published continuously for more than fifty-two weeks prior to the first insertion of this Legal Notice Number 879 at GHI County, Texas and the attached printed copy of the legal notice is a true copy of the original and was printed weekly on the following date(s): 1/11/08; 1/18/08; 1/25/08; 2/1/08.

Circulation Manager
Anywhere Weekly Courier
Small Town Newspaper Group, Inc.

Appeared and sworn to before me on this
21st day of January, 2008

NOTARY PUBLIC in and for the State of Texas
My Commission expires 12/28/2010

Legal Notice as Published

Acme Construction is soliciting subcontract and material bids in connection with the Improvements to the Sewer System for the City of Anywhere, Texas. Qualified MBE and WBE firms are encouraged to submit bids in response to this invitation. The work will consist of utility work, concrete, paving, fencing, landscaping, masonry, excavation and trucking, barricades, back-hoe work and supplies and materials. Plans and specifications may be viewed or obtained at the project engineer's general offices, Bing, Campbell and Associates, 19510 Jackson Blvd., Muleshoe, Texas 76698. Telephone No. 512-557-2091, Fax 512-557-2090. All bids must be submitted to the above mentioned address by Noon, Friday, February 16, 2008.

BID BOND¹

KNOW ALL MEN BY THESE PRESENTS, that we the undersigned, _____
as PRINCIPAL, AND _____ as SURETY are held and
firmly bound unto _____ hereinafter called the "Local Public Agency", in the penal sum
of _____ Dollars, (\$ _____), lawful
money of the United States, for the payment for which sum well and truly to be made we bind ourselves, our heirs,
executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that Whereas the Principal has submitted the accompanying
Bid, dated _____, 20____, for Panorama Village Lift Station 19.

NOW, THEREFORE, if the Principal shall not withdraw said Bid within the period specified therein after the opening
of the same, or, if no period be specified, within thirty (30) days after the said opening, and shall within the period
specified therefore, or if no period be specified, within ten (10) days after the prescribed forms are presented to him
for signature, enter into a written Contract with the Local Public Agency in accordance with the Bid as accepted, and
give bond with good and sufficient surety or sureties, as may be required, for the faithful performance and proper
fulfillment of such contract or in the event of the withdrawal of said Bid within the period specified, or the failure to
enter into such Contract and give such bond within the time specified, if the Principal shall pay Local Public Agency
the difference between the amount specified in said Bid and the amount for which the Local Public Agency may
procure the required work or supplies or both, if the latter be in excess of the former, then the above obligation shall
be void and of no effect, otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounded parties have executed this instrument under their several seals this
_____ day of _____, 20____, the name and corporate seal of each corporate party being
hereto affixed and these present signed by its undersigned representative, pursuant to authority of its governing body.

(SEAL)

(SEAL)

Attest:

By: _____

By: _____

Countersigned

By _____

Attorney-in-Fact², State of _____

¹ Forms of Bid Bonds prepared to meet the requirements of local or State laws or the needs of the Local Public Agency should be substituted for this form where necessary.

² Power-of-attorney for person signing for surety company must be attached to bond.

SECTION 00500

**STANDARD FORM OF AGREEMENT BETWEEN OWNER
AND CONTRACTOR ON THE BASIS OF A STIPULATED PRICE**

THIS AGREEMENT is dated as of the _____ day of _____ in the year 202__ by and between Lower Valley Water District (hereinafter called OWNER) and _____

(hereinafter called CONTRACTOR). OWNER and CONTRACTOR, in consideration of the mutual covenants hereinafter set forth, agree as follows:

ARTICLE 1. WORK.

CONTRACTOR shall complete all Work as specified or indicated in the Contract Documents. The work is generally described as follows:

PANORAMA VILLAGE LIFT STATION 19

The work under this contract shall be for furnishing all labor, materials, transportation and services for the construction and installation of the following work:

- Insurance, Bond, Mobilization, and Demobilization
- Pre- and Post-Construction Video Recording
- Trench Safety Systems
- 6-Inch Forcemain Pipe
- 8-Inch PVC Sewer Pipe
- Polymer Concrete Sanitary Sewer Manholes
- Sanitary Sewer Connection (Main to Right-of-Way)
- Private Sewer Service Connection (Right-of-Way to Home)
- De-septic, Pumping, Hauling, Sand, and Permits
- Remove and Replace HMAC (Type-D)
- Traffic Control Plan
- Installation of the Lift Station

ARTICLE 2. ENGINEER.

The Project has been designed by Moreno Cardenas, Inc. who is hereinafter called ENGINEER and who is to act as OWNER's representative, assume all duties and responsibilities and have the rights and authority assigned to ENGINEER in the Contract Documents in connection with completion of the Work in accordance with the Contract Documents.

ARTICLE 3. CONTRACT TIME.

3.1 The Work will be Substantially completed within **320** Calendar Days from the date when the Contract Time commences to run as provided in Paragraph 2.03 of the General Conditions, and as revised in Supplementary Conditions, and completed and ready for final payment in accordance with Paragraph 14.07 of the General Conditions, and as revised in the Supplementary Conditions, within **350** calendar days. Final completion includes CONTRACTOR'S resolution of all punch list items and CONTRACTOR'S submission of required close-out documentation. Any failure of the CONTRACTOR to complete the project within the contract time will be considered a material breach of this contract.

3.2 Liquidated Damages. OWNER and CONTRACTOR recognize that time is of the essence of this Agreement

and that OWNER will suffer financial loss and public inconvenience if the Work is not completed and the submittals are not submitted within the times specified in Paragraph 3.1 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. They also recognize the delays, expenses, and difficulties involved in proving in a legal proceeding the actual loss suffered by OWNER if the Work is not completed on time. Accordingly, instead of requiring any such proof, OWNER and CONTRACTOR agree that as liquidated damages for delay (but not as a penalty) CONTRACTOR shall pay OWNER the sum of **One Thousand Three Hundred and Seventy (\$1,370)** for each Calendar Day that expires after the time specified in the Agreement for Substantial Completion until the Work is substantially complete. After Substantial Completion, if CONTRACTOR shall neglect, refuse or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by OWNER, CONTRACTOR shall pay OWNER **Nine hundred and Seventy (\$970)** for each Calendar Day that expires after the time specified in the Agreement for completion and readiness for final payment.

ARTICLE 4. CONTRACT PRICE.

4.1 OWNER shall pay CONTRACTOR for completion of the Work in accordance with the Contract Documents in current funds, per the attached CONTRACTOR's Bid in accordance with the below listed separate charges:

MATERIALS TO BE INCORPORATED IN PROJECT NOT SUBJECT TO SALES TAX:	\$ _____
LABOR TO BE INCORPORATED IN PROJECT NOT SUBJECT TO SALES TAX:	\$ _____
RENTAL EQUIPMENT AND OTHER TAXABLE ITEMS:	\$ _____
OTHER (I.E. BONDS, INSURANCE, CAPITAL EQUIPMENT, ETC.)	\$ _____
*TOTAL CONTRACT:	\$ _____
*(TOTAL MUST EQUAL TOTAL BID PRICE)	\$ _____

ARTICLE 5. PAYMENT PROCEDURES.

CONTRACTOR shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by ENGINEER as provided in the General Conditions.

5.1 Progress Payments. OWNER shall make progress payments on account of the Contract Price on the basis of CONTRACTOR's Applications for Payment as recommended by ENGINEER for Work which is completed in accordance with the terms and conditions of the Contract Documents. All progress payments will be on the basis of the progress of the Work measured by the schedule of values established in Paragraph 2.9 of the General Conditions (and in the case of Unit Price Work based on the number of units completed and accepted) or, in the event there is no schedule of values, as provided in the General Requirements. No interest will be paid for late payments.

Prior to Substantial Completion, progress payments will be made in an amount equal to the percentages indicated below, but, in each case, less the aggregate of payments previously made and less such amounts as ENGINEER shall determine, or OWNER may withhold, in accordance with Paragraph 14.7 of the General Conditions.

Ninety-five percent of Work completed (ninety percent for contracts under \$400,000.00), including 95 percent of materials and equipment not incorporated in the Work (but delivered, suitably stored and accompanied by documentation satisfactory to OWNER as provided in Paragraph 14.2 of the General Conditions).

5.2 Final Payment. Upon final completion and acceptance of the Work in accordance with Paragraph 14.13 of

the General Conditions, OWNER shall pay the remainder of the Contract Price as recommended by ENGINEER as provided in said Paragraph 14.13.

ARTICLE 6. CONTRACTOR'S REPRESENTATIONS.

In order to induce OWNER to enter into this Agreement, CONTRACTOR makes the following representations:

- 6.1 CONTRACTOR has familiarized itself with the nature and extent of the Contract Documents, Work, site, locality, and all local conditions and Laws and Regulations that in any manner may affect cost, progress, performance or furnishing of the Work.
- 6.2 CONTRACTOR has studied carefully all reports of explorations and tests of subsurface conditions and drawings of physical conditions which are identified in the Supplementary Conditions as provided in Paragraph 4.2 of the General Conditions, and accepts the determination set forth in Paragraph SC-4.2 of the Supplementary Conditions of the extent of the technical data contained in such reports and drawings.
- 6.3 CONTRACTOR has obtained and carefully studied (or assumes responsibility for obtaining and carefully studying) all such examinations, investigations, explorations, tests, reports and studies (in addition to or to supplement those referred to in Paragraph 6.2 above) which pertain to the subsurface or physical conditions at or contiguous to the site or otherwise may affect the cost, progress, performance or furnishing of the Work necessary for the performance or furnishing of the Work at the Contract Price, within the specifically the provisions of Paragraph 4.2 of the General Conditions. CONTRACTOR understands that the correctness of such information is not guaranteed by the OWNER or the ENGINEER and CONTRACTOR understands that the conditions encountered in performing the work may be different from the approximations shown.
- 6.4 CONTRACTOR has reviewed and checked all information and data shown or indicated on the Contract Documents with respect to existing ground facilities at or contiguous to the site and assumes responsibility for the location of said Underground Facilities as determined by his own field investigations. CONTRACTOR understands that the correctness of such information is not guaranteed by the OWNER or the ENGINEER and CONTRACTOR understands that the conditions encountered in performing the work may be different from the approximations shown.
- 6.5 CONTRACTOR has correlated the results of all such observations, examinations, investigations, explorations, tests, reports and studies with the terms and conditions of the Contract Documents.
- 6.6 CONTRACTOR has given ENGINEER written notice of all conflicts, errors or discrepancies that he has discovered in the Contract Documents and the written resolution thereof by ENGINEER is acceptable to CONTRACTOR.

ARTICLE 7. CONTRACT DOCUMENTS.

The Contract Documents which comprise the entire agreement between OWNER and CONTRACTOR concerning the Work consist of the following:

- 7.1 CONTRACTOR's Bid (Section 00300)
- 7.2 Agreement (Section 00500)
- 7.3 Performance and Payment Bonds, and Certificate of Insurance, and insurance policies identified as Sections 00610, 00630 and 00650.
- 7.4 Bid Bond.
- 7.5 General Conditions (Section 00700)
- 7.6 Supplementary Conditions (Section 00800)
- 7.7 General Wage Rates (Section 00840)

- 7.8 Specifications bearing the title Project Manual for the Construction of **Panorama Village Lift Station 19** consisting of division numbers **0, 1, 2, 3, 4, 7, 10, 11, 13, 15, 25, 26, and 40** as listed in table of contents thereof.
- 7.9 Drawings consisting of a cover sheet and sheets listed in the Index to Drawings, each sheet bearing the following general title:
- PANORAMA VILLAGE LIFT STATION 19**
(Drawings not attached to this Agreement.)
- 7.10 Addenda numbers _____ to _____, inclusive (not attached to this Agreement.)
- 7.11 Documentation submitted by CONTRACTOR prior to Notice of Award (Pages _____ to _____, inclusive).
- 7.12 The Instructions to Bidders, Information Available to Bidders, Bid Form and Bid Security, as well as any supplements to the Bid Form.
- 7.13 The following which may be delivered or issued after the Effective Date of the Agreement and are not attached hereto: All Written Amendments and other documents amending, modifying, or supplementing the Contract Documents pursuant to Paragraphs 3.4 and 3.5 of the General Conditions.
- 7.14 The documents listed in Paragraphs 7.2 et. seq. above are attached to this Agreement (except as expressly noted otherwise above).

There are no Contract Documents other than those listed above in this Article 7. The Contract Documents may only be amended, modified or supplemented as provided in Paragraphs 3.4 and 3.5 of the General Conditions.

ARTICLE 8. MISCELLANEOUS.

- 8.1 Terms used in this Agreement which are defined in Article 1 of the General Conditions will have the meanings indicated in the General Conditions.
- 8.2 No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and specifically but without limitation moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.
- 8.3 OWNER and CONTRACTOR each binds itself, its partners, successors, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representatives in respect of all covenants, agreements and obligations contained in the Contract Documents.
- 8.4 Any contract or contracts awarded under this Invitation for Bids are expected to be funded in part by a loan 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.

ARTICLE 9. OTHER PROVISIONS.

- 9.1 Should any dispute arise under this Contract which culminates in litigation, venue of that suit shall be in a court of competent jurisdiction sitting in El Paso County, Texas. The court shall apply the laws of the State of Texas in construing and interpreting the terms of this Contract and the Contract Documents.
- 9.2 In case any one or more of the provisions contained in this Agreement shall, for any reason, be held to be invalid, illegal, or unenforceable in any respect, that invalidity, illegality, unenforceability shall not affect any other provisions and this Agreement shall be construed as if such invalid, illegal, or unenforceable

provisions had never been included.

- 9.3 The captions or headings of paragraphs in this Contract are inserted for convenience only and shall not be considered in constraining the provisions hereof if any question of intent should arise.
- 9.4 For NADBank-funded projects, Contractor agrees to indemnify and hold harmless North American Development Bank (NADB) and each of its directors, officers, employees, agents and representatives (collectively, "NADB's Associated Persons") against all claims for death, personal injury, damages, or other relief against NADB or NADB's Associated Persons, including costs, expenses and attorney's fees, resulting from negligence or willful acts or failure to act by the Contractor.

IN WITNESS WHEREOF, OWNER and CONTRACTOR have signed this Agreement in triplicate. One counterpart each has been delivered to OWNER, CONTRACTOR and ENGINEER. All portions of the Contract Documents have been signed or identified by OWNER and CONTRACTOR or by ENGINEER on their behalf.

This Agreement will be effective on _____, 20_____.

OWNER: Lower Valley Water District

CONTRACTOR _____

By _____
General Manager

By _____

Name _____

Title _____

Address for giving notices:

1557 FM 1110
Clint, Texas 79836

Address for giving notices:

Date Signed _____

Date Signed _____

Federal Tax I.D. No.

Agent for service of process:

INSTRUCTIONS FOR EXECUTING CONTRACT

If the CONTRACTOR be a corporation, the following certificate should be executed:

I, _____, certify that I am the _____ of the corporation named as CONTRACTOR hereinabove; that, _____ who signed the foregoing Contract on behalf of the CONTRACTOR was then, _____ of said Corporation; that said Contract was duly signed for and in behalf of said Corporation by authority of its governing body and is within the scope of its corporate powers.

Corporate Seal

If the Contract is signed by the secretary of the corporation, the above certificate should be executed by some other officer of the corporation under the corporate seal. In lieu of the foregoing certificate, there may be attached to the Contract copies of so much of the records of the corporation as will show the official character and authority of the officers signing, duly certified by the Secretary or Assistant Secretary under the corporate seal to be true copies.

The full name and business address of the CONTRACTOR should be inserted and the Contract shall be signed with his official signature. Please have the name of the signing party or parties typewritten or printed under all signatures to the Contract.

If the CONTRACTOR should be operating as a partnership, each partner should sign the Contract. If the Contract is not signed by each partner, there should be attached to the Contract a duly authenticated Power of Attorney, evidencing the signer's (signers') authority to sign such Contract for and on behalf of the partnership.

If the CONTRACTOR is an individual, the trade name (if the CONTRACTOR is operating under a trade name) should be indicated in the Contract and the Contract should be signed by such individual. If signed by one other than the CONTRACTOR, there should be attached to the Contract a duly authenticated Power of Attorney evidencing the signer's authority to execute such Contract for and in behalf of the CONTRACTOR.

CONTRACT SUBMITTAL CHECKLIST	
1.	Executed Agreement
2.	Payment and Performance Bonds
3.	Insurance Certificate and Policies
4.	Certificate of Account Status (paid franchise taxes)
5.	If employees provided by leasing company, evidence of Texas State License and copy of their Worker's Compensation policy. If no leased employees will be used, provide a letter on Contractor's letterhead stating so.
6.	Federal Tax Identification Number
7.	Certificate of Account Status (paid franchise taxes)
8.	Final/Updated (if applicable) Minority Certification and Participation Summary
9.	Preliminary Schedule of Values
10.	Preliminary Construction Schedule
11.	Schedule of Shop Drawings
12.	Trench Safety System (sealed by a Professional Engineer)
13.	Trench Safety Plan
14.	SWPPP and NOI
15.	Traffic Control Plan
16.	Buy America Documentation (if necessary)
17.	For TWDB funded projects: Debarment Certificates for all subcontractors and suppliers; proposed Subcontracts and/or Purchase Orders; State issued HUB Certificates for Minority subcontractors and suppliers

Deliver all items to the OWNER's Purchasing Department.

Deliver copies of items 1-17 to ENGINEER.

*Once Notice to Proceed has been issued, provide executed subcontracts and purchase orders to Purchasing Manager.

STATEMENT OF NONDIVESTMENT FROM ISRAEL

The following information is required by the Lower Valley Water District ("LVWD") in order to comply with the provisions of Texas Government Code §§ 2270.002. .

I swear and attest that the following is true and correct as of the date _____("Bidder") submitted its bid on LVWD Bid No. _____. Bidder does not boycott Israel and will not boycott Israel during the term of the contract should it be awarded to Bidder. I further attest that I am an authorized representative of Bidder or have been duly authorized to represent Bidder in this matter. I understand that the information provided is being relied on by LVWD in order for it to comply with state purchasing laws and will materially affect its decisions in this regard. Should it be discovered that the statement by Bidder contained herein is false, any contract entered into between LVWD and Bidder will be void and LVWD may pursue any legal claims it may have against Bidder.

[SIGNATURE ON NEXT PAGE]

By: _____
Name: _____
Title: _____
Company: _____

ACKNOWLEDGMENT

STATE OF _____ §
 §
COUNTY OF _____ §

This instrument was acknowledged before me on the _____ day of _____, 20__, by _____, as _____ of _____, a _____.

Notary Public, State of _____

My Commission Expires:

TEXAS STATUTORY PERFORMANCE BOND

(Penalty of this Bond must be 100% of Contract Amount)

Public Work – State of Texas

STATE OF TEXAS }
COUNTY OF _____ }

BOND NUMBER _____

KNOW ALL MEN BY THESE PRESENTS:

That _____ (hereinafter called the Principal), as Principal and _____, a corporation organized and existing under the laws of the State of _____, and whose principal office is located in the City of _____, and duly authorized to do business in the State of Texas (hereinafter called the Surety).

As Surety, are held firmly bound unto _____, hereinafter called the Owner), in the penal sum of _____ Dollars (\$_____) for the payment of which sum well and truly to be made, we bind ourselves, our heirs, administrators, executors, successors and assigns, jointly and severally, by these presents.

WHEREAS, the Principal has entered into a certain written Contract with the Owner, dated the _____ day of _____, 20____, a copy of which is hereto attached and made a part hereof, for _____.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH that if the said Principal shall faithfully perform the work in accordance with the plans, specifications and contract documents, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, HOWEVER, that this Bond is executed pursuant to the provisions of Chapter 2253 of the Texas Government Code and all liabilities on this Bond shall be determined in accordance with the provisions thereof to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this _____ day of _____, 20____.

BY: _____
Principal

WITNESS:

BY: _____
Surety

CERTIFICATE OF INSURANCE

ISSUE DATE

PRODUCER

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

COMPANIES AFFORDING COVERAGE

COMPANY LETTER **A**

COMPANY LETTER **B**

COMPANY LETTER **C**

COMPANY LETTER **D**

COMPANY LETTER **E**

INSURED

COVERAGES

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

CO LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE	POLICY EXPIRATION DATE	ALL LIMITS IN THOUSANDS	
	GENERAL LIABILITY <input type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS MADE <input type="checkbox"/> OCCURRENCE <input type="checkbox"/> OWNERS & CONTRACTORS PROTECTIVE				GENERAL AGGREGATE	\$
					PRODUCTS-COMP/OPS AGGREGATE	\$
					PERSONAL & ADVERTISING INJURY *	\$
					EACH OCCURRENCE	\$
					FIRE DAMAGE (ANY ONE FIRE)	\$
					MEDICAL EXPENSES (ANY ONE PERSON)	\$
	AUTOMOBILE LIABILITY <input type="checkbox"/> ANY AUTO <input type="checkbox"/> ALL OWNED AUTOS <input type="checkbox"/> SCHEDULED AUTOS <input type="checkbox"/> HIRED AUTOS <input type="checkbox"/> NON-OWNED AUTOS <input type="checkbox"/> GARAGE LIABILITY				CSL	\$
					CSL	\$
					CSL	\$
					CSL	\$
	EXCESS LIABILITY <input type="checkbox"/> OTHER THAN UMBRELLA FORM				\$	EACH OCCURRENCE
						AGGREGATE
	WORKERS' COMPENSATION AND EMPLOYERS' LIABILITY				STATUTORY	
					\$	(EACH ACCIDENT)
					\$	(DISEASE-POLICY LIMIT)
					\$	(DISEASE-EACH EMPLOYEE)
	OTHER					

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/RESTRICTIONS/SPECIAL ITEMS

* DELETE EMPLOYEE EXCLUSIONS

ADDITIONAL INSURED / CERTIFICATE HOLDER

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED OR MATERIALLY CHANGED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING COMPANY SHALL PROVIDE 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT.

AUTHORIZED REPRESENTATIVE

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly by



AMERICAN COUNCIL OF ENGINEERING COMPANIES

and

ASSOCIATED GENERAL CONTRACTORS OF AMERICA

AMERICAN SOCIETY OF CIVIL ENGINEERS

PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE
A Practice Division of the
NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

These General Conditions have been prepared for use with the Suggested Forms of Agreement Between Owner and Contractor (EJCDC C-520 or C-525, 2007 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the Narrative Guide to the EJCDC Construction Documents (EJCDC C-001, 2007 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (EJCDC C-800, 2007 Edition).

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the 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 the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.
 3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Asbestos*—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.
 5. *Bid*—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 6. *Bidder*—The individual or entity who submits a Bid directly to Owner.
 7. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda).
 8. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.
 9. *Change Order*—A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.
 10. *Claim*—A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.
 11. *Contract*—The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.
 12. *Contract Documents*—Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop

- Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.
13. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).
 14. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.
 15. *Contractor*—The individual or entity with whom Owner has entered into the Agreement.
 16. *Cost of the Work*—See Paragraph 11.01 for definition.
 17. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.
 18. *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
 19. *Engineer*—The individual or entity named as such in the Agreement.
 20. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.
 21. *General Requirements*—Sections of Division 1 of the Specifications.
 22. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.
 23. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.
 24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
 25. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.
 26. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

27. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.
28. *Notice to Proceed*—A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.
29. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
30. *PCBs*—Polychlorinated biphenyls.
31. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.
32. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
33. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
34. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.
35. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.
36. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.
37. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
38. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.
39. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

40. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
41. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.
42. *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.
43. *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.
44. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.
46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.
47. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.
48. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
49. *Unit Price Work*—Work to be paid for on the basis of unit prices.
50. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.
51. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an

addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 Terminology

A. The words or terms discussed in Paragraph 1.02.B-F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives:*

1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. *Day:*

1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective:*

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents; or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the 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 at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. *Furnish, Install, Perform, Provide:*

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, “provide” is implied.

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

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

- A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

2.03 *Commencement of Contract Times; Notice to Proceed*

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

2.04 *Starting the Work*

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

2.05 *Before Starting Construction*

- A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review:
 - 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;
 - 2. a preliminary Schedule of Submittals; and
 - 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.06 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a 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 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.07 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. 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. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on

Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.
- C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 *Reference Standards*

- A. Standards, Specifications, Codes, Laws, and Regulations
 1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
 2. No provision of any such standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. 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 the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies:*

1. *Contractor's Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.
2. *Contractor's Review of Contract Documents During Performance of Work:* If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) any standard, specification, manual, or code, or (c) 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 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:
 - a. the provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.
- B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:

1. A Field Order;
2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or
3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

A. Contractor and any Subcontractor or Supplier shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or
2. reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

- A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.
- B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.
- C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

4.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
 - 1. those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site; and
 - 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).
- B. *Limited 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. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors 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.

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or
2. is of such a nature as to require a change in the Contract Documents; or
3. differs materially from that shown or indicated in the Contract Documents; or
4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *Engineer's Review:* After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

C. *Possible Price and Times Adjustments:*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and
 - b. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:
 - a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or
 - b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and

contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

- c. Contractor failed to give the written notice as required by Paragraph 4.03.A.
3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

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

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data 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 such information and data;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents;
 - c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and
 - d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated:*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the

consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

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

4.05 *Reference Points*

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

4.06 *Hazardous Environmental Condition at Site*

- A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.
- B. *Limited 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. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

- C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.
- D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. 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 4.06.E.
- E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.
- F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.
- G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

- H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 Performance, Payment, and Other Bonds

- A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.
- B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.
- C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 Licensed Sureties and Insurers

- A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also

meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

- A. Contractor shall deliver to Owner, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.
- B. Owner shall deliver to Contractor, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.
- C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.
- D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.
- E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

5.04 *Contractor's Insurance*

- A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:
 - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
 - 2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;
 - 3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;
 - 4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:

- a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or
 - b. by any other person for any other reason;
5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and
 6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.
- B. The policies of insurance required by this Paragraph 5.04 shall:
1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;
 2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;
 3. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;
 4. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);
 5. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and
 6. include completed operations coverage:
 - a. Such insurance shall remain in effect for two years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 *Owner's Liability Insurance*

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

5.06 *Owner's Property Insurance*

- A. Unless otherwise provided in the Supplementary Conditions, Owner shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee;
 2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions.
 3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
 4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;
 5. allow for partial utilization of the Work by Owner;
 6. include testing and startup; and
 7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued.
- B. Owner shall purchase and maintain such equipment breakdown insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors,

members, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee.

- C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.
- D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.
- E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under this Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

5.07 *Waiver of Rights*

- A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or loss payees thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

- A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the loss payees, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.
- B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

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

- A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's

interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

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

ARTICLE 6 – CONTRACTOR’S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

6.02 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner’s written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

6.03 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the 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 the Work.

- B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- 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 the Contract Documents.

6.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.
 - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 *Substitutes and "Or-Equals"*

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.
 - 1. *"Or-Equal" Items:* If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that:
 - 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 the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and
 - 3) it has a proven record of performance and availability of responsive service.
- b. Contractor certifies that, if approved and incorporated into the Work:
- 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. *Substitute Items:*

- a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.
- b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.
- c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances.
- d. 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. The application:
 - 1) shall certify that the proposed substitute item will:
 - a) perform adequately the functions and achieve the results called for by the general design,
 - b) be similar in substance to that specified, and
 - c) be suited to the same use as that specified;
 - 2) will state:
 - a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,
 - b) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and

- c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;
 - 3) will identify:
 - a) all variations of the proposed substitute item from that specified, and
 - b) available engineering, sales, maintenance, repair, and replacement services; and
 - 4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.
- B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.
- C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.
- D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- E. *Engineer's Cost Reimbursement:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- F. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be

required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.

- B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.
- C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:
1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor
 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.
- D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.
- E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.
- F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner,

Contractor, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 *Patent Fees and Royalties*

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

6.08 *Permits*

- A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 *Taxes*

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

6.11 *Use of Site and Other Areas*

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

- 1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.
- 2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.
- 3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought

by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

- B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.
- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 *Record Documents*

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

6.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
 - 1. all persons on the Site or who may be affected by the Work;
 - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and

shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
- D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or 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 for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

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

6.15 *Hazard Communication Programs*

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

6.16 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is

required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 *Shop Drawings and Samples*

A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*

- a. Submit number of copies specified in the General Requirements.
- b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.

2. *Samples:*

- a. Submit number of Samples specified in the Specifications.
- b. 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 6.17.D.

B. 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.

C. *Submittal Procedures:*

1. Before submitting each Shop Drawing or Sample, Contractor shall have:

- a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
- 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 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 and approval of that 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 both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. 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 will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
3. Engineer's review and approval 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 6.17.C.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's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. Resubmittal Procedures:

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

6.18 *Continuing the Work*

- A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.
- B. 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.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
1. observations by Engineer;
 2. recommendation by Engineer or payment by Owner of any progress or final payment;
 3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 4. use or occupancy of the Work or any part thereof by Owner;
 5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;
 6. any inspection, test, or approval by others; or
 7. any correction of defective Work by Owner.

6.20 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable .

- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
 - 1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 - 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 *Delegation of Professional Design Services*

- A. 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 law.
- B. 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, Shop Drawings 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.
- C. Owner and Engineer 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.
- D. Pursuant to this Paragraph 6.21, 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 6.17.D.1.

- E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 *Related Work at Site*

- A. Owner may perform other work related to the Project at the Site with Owner's employees, or through other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:
 - 1. written notice thereof will be given to Contractor prior to starting any such other work; and
 - 2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.
- B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.
- C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:
 - 1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
 - 2. the specific matters to be covered by such authority and responsibility will be itemized; and
 - 3. the extent of such authority and responsibilities will be provided.

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

7.03 *Legal Relationships*

- A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.
- B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's wrongful actions or inactions.
- C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's wrongful action or inactions.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

8.02 *Replacement of Engineer*

- A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

8.03 *Furnish Data*

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

8.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

- A. Owner's duties with respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

8.06 *Insurance*

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

8.07 *Change Orders*

A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *Limitations on Owner's Responsibilities*

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

8.10 *Undisclosed Hazardous Environmental Condition*

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

8.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents.

8.12 *Compliance with Safety Program*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed pursuant to Paragraph 6.13.D.

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents.

9.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or

continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

- A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Authorized Variations in Work*

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

9.05 *Rejecting Defective Work*

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

9.06 *Shop Drawings, Change Orders and Payments*

- A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.
- B. In connection with 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, see Paragraph 6.21.
- C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.
- D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

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

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

- A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.
- B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.
- C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.
- D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

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

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

- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

9.10 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Engineer has been informed pursuant to Paragraph 6.13.D.

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).
- B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

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

10.03 *Execution of Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:
 - 1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;
 - 2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and
 - 3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 *Notification to Surety*

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

10.05 *Claims*

- A. *Engineer's Decision Required:* All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.
- B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data

shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

- C. *Engineer's Action:* Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:
1. deny the Claim in whole or in part;
 2. approve the Claim; or
 3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.
- D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.
- E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.
- F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

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

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.
2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of

said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
- e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.
- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

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

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.
2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not

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

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.
- C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.
- D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. *Cash Allowances:*
 1. Contractor agrees that:
 - a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 - b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
- C. *Contingency Allowance:*
 1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to

the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

- 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. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.
- 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. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:
 - 1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 - 2. there is no corresponding adjustment with respect to any other item of Work; and
 - 3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

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

12.01 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:
 - 1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
 - 2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or
 - 3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).

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

1. a mutually acceptable fixed fee; or
2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;
 - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;
 - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
 - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

- A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or

neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

- B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. 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.
- C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.
- D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.
- E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

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

13.01 Notice of Defects

- A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. Defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 Access to Work

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, 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.

13.03 *Tests and Inspections*

- A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
- B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:
 - 1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;
 - 2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in Paragraph 13.04.C; and
 - 3. as otherwise specifically provided in the Contract Documents.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.
- E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation.
- F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

- A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.
- B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.

- C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.
- D. 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, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

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

13.06 *Correction or Removal of Defective Work*

- A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).
- B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. repair such defective land or areas; or
 2. correct such defective Work; or
 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.
- 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 or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.
- 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 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

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

13.09 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct, or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 13.09, 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, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.
- C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

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

14.02 *Progress Payments*

A. Applications for Payments:

1. At least 20 days before the date established 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 or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. Review of Applications:

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - 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 Documents; 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. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
 5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
 - d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. Payment Becomes Due:

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

D. Reduction in Payment:

1. Owner may refuse to make payment of the full amount recommended by Engineer because:
 - a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;
 - b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - c. there are other items entitling Owner to a set-off against the amount recommended; or
 - d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.
2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor remedies the reasons for such action.
3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.

14.03 *Contractor's Warranty of Title*

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

14.04 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If,

after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will within 14 days after submission of the tentative certificate to Owner notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will, within said 14 days, execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.

- D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.
- E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the tentative list.

14.05 *Partial Utilization*

- 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, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 - 1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 14.04.A-D for that part of the Work.
 - 2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 - 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 Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

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

14.06 *Final Inspection*

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

14.07 *Final Payment*

A. *Application for Payment:*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.
2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;
 - b. consent of the surety, if any, to final payment;
 - c. a list of all Claims against Owner that Contractor believes are unsettled; and
 - d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner or Owner's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. *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 Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. Payment Becomes Due:

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

14.08 Final Completion Delayed

- A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 Waiver of Claims

- A. The making and acceptance of final payment will constitute:
1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and
 2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *Owner May Suspend Work*

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

15.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will justify termination for cause:
1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);
 2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
 3. Contractor's repeated disregard of the authority of Engineer; or
 4. Contractor's violation in any substantial way of any provisions of the Contract Documents.
- B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:
1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);
 2. 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
 3. complete the Work as Owner may deem expedient.
- C. If Owner proceeds as provided in Paragraph 15.02.B, 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 claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when

so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.
- E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.
- F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.

15.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;
 - 3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and
 - 4. reasonable expenses directly attributable to termination.
- B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days

to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

- 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, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 – DISPUTE RESOLUTION

16.01 *Methods and Procedures*

- A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.
- B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.
- C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:
1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or
 2. agrees with the other party to submit the Claim to another dispute resolution process; or
 3. gives written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.

ARTICLE 17 – MISCELLANEOUS

17.01 *Giving Notice*

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or
2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

- A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 *Cumulative Remedies*

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

17.04 *Survival of Obligations*

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

17.05 *Controlling Law*

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

17.06 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

SECTION 00800

SUPPLEMENTARY CONDITIONS

TABLE OF CONTENTS

INTRODUCTORY STATEMENT

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (EJCDC C-700, 2007 Edition). All provisions which are not so amended or supplemented remain in full force and effect.

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

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added thereto.

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

SC-1.01.A.10 Add the following sentence to Paragraph 1.01.A.10

When submitted, a Claim must be signed by the Designated Authorized Representative.

SC-1.01.A.51 Delete Paragraph 1.01.A.51 in its entirety and insert the following in its place:

Designated Authorized Representative — the representative authorized by the party filing the Claim to execute legally binding agreements on behalf of that party. For Owner, the Designated Authorized Representative shall be the Chief Technical Officer, a Vice President, or President and Chief Executive Officer. For Contractor, the owner or its designee authorized pursuant to a power of attorney.

SC-1.01.A.52 Add the following paragraph immediately after Paragraph 1.01.A.51:

Health and Safety Plan — The part of the Contract Documents prepared by Contractor that describes safety procedures for the Work, identifies the Contractor’s safety representative required by Paragraph 6.14.A, and certifies that the Contractor’s employees have received or will receive training prior to the commencement of the Work on (1) basic health and safety issues; (2) the Health and Safety Plan; (3) the methods and techniques the Contractor will use on the Project; (4) procedures for Contractor entrance into an exit from the Site(s); and (5) informing Owner about any unique hazards presented by the Work or found as a result of the Work.

ARTICLE 2 - PRELIMINARY MATTERS

SC-2.02 Delete Paragraph 2.02.A in its entirety and insert the following in its place:

A. Owner shall furnish to Contractor up to three (3) printed copies of the Drawings and Project Manual and one copy in electronic form, as portable document format (.PDF) files. Additional copies will be furnished upon request at the cost of reproduction.

SC-2.03 Amend the third sentence of Paragraph 2.03.A by changing the word “sixtieth” to read as “seventy-fifth”.

SC-2.05.B Add the following new paragraph immediately after Paragraph 2.05.A.3:

- B. *Health and Safety Plan.* Contractor shall submit a copy of Health and Safety Plan no later than the later of: (1) fifteen days after the bid award; or (2) thirty days before Work at the Site is started. No Work shall proceed until the Owner has accepted the Health and Safety Plan.

SC-2.06 Amend the first sentence of Paragraph 2.06.B to read as follows:

At or prior to this conference Owner and Contractor each shall designate, in writing by Owner and in writing by Contractor as a submittal, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract.

SC-2.07 Amend the first sentence of Paragraph 2.07.A to read as follows:

At the preconstruction conference indicated in Paragraph 2.06 or other time acceptable to the parties and Engineer, Engineer and Contractor will review the acceptability to Engineer, as provided below, of the schedules submitted in accordance with Paragraph 2.05.A.

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

SC-3.01.B.1 Add the following to new paragraph immediately after Paragraph 3.01.B:

SC-3.01.B.1 In resolving such conflicts, errors and discrepancies, the Contract Documents will be given precedence in the following order: Change Orders,, Field Orders; Addenda, Agreement, Performance Bond and Payment Bond, Supplementary Conditions, General Conditions, Specifications and Drawings. Numerical dimensions shown on the Drawings shall govern over scaled dimensions on the Drawings. This Paragraph SC-3.01.B.1 is not, however, a definitive enumeration of what comprises the “Contract Documents”, which definitive enumeration is indicated in the Agreement.

SC – 3.04.A Remove the words “or a Work Change Directive”.

ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

SC 4.01.D Add the following new paragraph immediately after Paragraph 4.01.C:

SC-4.01.D All Work associated with special provisions of easements shall be performed in accordance with the Contract Documents, unless the Contract Documents indicate that easement provisions govern. Should the actions of Contractor or Subcontractors or Suppliers cause the Work to be delayed to the point that the ending date of an easement is exceeded, Contractor shall reimburse Owner for additional costs required to extend the period of rights to the easement to complete the Work. Such delay shall be considered to be within the control of Contractor, in accordance with Paragraph 12.03.

SC-4.02.C Add the following new paragraphs immediately after Paragraph 4.02.B:

SC-4.02.C The following reports of explorations and tests of subsurface conditions at or contiguous to the Site are known to Owner:

1. Geotechnical Report dated October 31, 2023, prepared by LOi Engineers, El Paso, Texas.

- E. The reports and drawings identified above are not part of the Contract Documents, but the “technical data” contained therein upon which Contractor may rely, as expressly identified and established above, are incorporated in the Contract Documents by reference. Contractor is not entitled to rely upon any other information and data known to or identified by Owner or Engineer.

- F. Copies of reports and drawings identified in SC-4.02.C that are not included with the Bidding Documents may be examined at link where the Bid Documents are located.

SC-4.02.A Delete Paragraphs 4.02.A and 4.02.B in their entirety and insert the following in their place:

SC-4.02.A No reports of explorations or tests of subsurface conditions at or contiguous to the Site, or drawings of physical conditions relating to existing surface or subsurface structures at the Site, are known to Owner.

SC-4.02.B Not Used.

SC-4.04.B.2 Amend Paragraph 4.04.B.2 by removing the following after “contract Documents is required,” in the first sentence “

a Work Change Directive or

SC-4.05.A Amend the third sentence of Paragraph 4.05.A to read as follows:

Contractor shall report to Engineer when a reference point, including property boundary stakes or monuments, or an elevation benchmark, is disturbed, lost, or destroyed, or requires relocation because of necessary changes in grades or locations. Contractor shall be responsible for accurately replacing or relocating such reference points by a professional land surveyor licensed by and registered in the State of Texas.

SC-4.06 Delete Paragraphs 4.06.A and 4.06.B in their entirety and insert the following in its place:

SC-4.06.A No reports or drawings related to Hazardous Environmental Conditions at the Site are known to Owner.

SC-4.06.B Not Used.

ARTICLE 5 - BONDS AND INSURANCE

SC-5.01.A Delete Paragraph 5.01.A in its entirety and insert the following in its place:

SC-5.01.A Except as provided in this Paragraph SC-5.01.A, Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all Contractor’s obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds and certificates of insurance as are required by the Contract Documents. Certificates of insurance shall be in the form prescribed by the Contract Documents. Conditions under which a performance bond or payment bond are not required are as follows:

1. Payment bond is not required when the Contract Price is \$25,000 or less.
2. When the Contract Price is less than \$100,000, a performance bond is not required.

SC-5.01.B Delete Paragraph 5.01.B in its entirety and insert the following in its place:

SC-5.01.B All bonds shall be in the form prescribed by the Contract Documents, except as provided otherwise by Laws and Regulations including, but not limited to, Chapter 2253 of the Texas Government Code and Article 7.19-1 of the Texas Insurance Code. The bonds shall be executed by surety which shall be authorized and admitted to do business in the State of Texas, licensed by the State of Texas to issue surety bonds, and carry an A.M. Best Key rating of not less than A VIII. If the amount of the bond is in excess of ten percent of surety's capital and surplus, surety shall furnish to

Owner a written certification that surety has insured that portion of surety's risk that exceeds ten percent of surety's capital and surplus with one or more reinsurers who are duly authorized, accredited or trusted to do business in the State of Texas. If any portion of surety's obligation is reinsured, the amount reinsured shall not exceed ten percent of the reinsurer's capital and surplus. Surety and the reinsurer(s) shall furnish additional information and documentation, if any, required by Owner for Owner to determine whether surety or its reinsurer(s) comply with the requirements of this Paragraph SC-5.01.B. All bonds signed by an agent or attorney-in-fact shall be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.

SC-5.02 Add the following at the end of Paragraph 5.02.A:

Insurance shall be procured from insurers or indemnity companies acceptable to Owner. Insurance or indemnity company furnishing insurance for the Contract shall carry an A.M. Best Key rating of not less than A VIII.

SC-5.04.B.1 Delete Paragraph 5.04.B.1 in its entirety and insert the following in its place:

SC-5.04.B.1 With respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner, Engineer, Engineer's consultants, and entities indicated below under Paragraph SC-5.04.B.1.a, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

- a. In addition to the individuals or entities specified above, include as additional insured, or loss payees as their interest may appear, the following:
 - 1) None

SC-5.04.B.4 Add the following at the end of Paragraph 5.04.B.4:

If, at any time, the required insurance policies are canceled, terminated, or modified so that the insurance is not in full force and effect as required under the Contract Documents, Owner may terminate for cause in accordance with Paragraph 15.02 of the General Conditions or, where possible, obtain insurance coverage equal to that required by the Contract Documents, the full cost of which will be charged to Contractor and deducted from any payments due Contractor.

- a. Each Contractor shall require his subcontractors, at all tiers, to carry insurance coverage satisfactory to the Contractor and to provide evidence of such insurance as specified herein.

For purposes of this Bid, a Payment Bond will be required in an amount equal to the Bid Price and a Performance Bond **will** be required in a like amount.

SC-5.04.B.6.b Delete Paragraph 5.04.B.6.b in its entirety and replace with the following:

SC-5.04.B.6.b. Contractor shall furnish to Owner and each other additional insured identified in the Contract Documents, to whom evidence of insurance has been issued, evidence satisfactory to Owner and other such additional insured of continuation of such insurance at final payment and for a duration thereafter equal to the correction period required under Paragraph 13.07.

SC-5.04.C Add the following new Paragraph 5.04.C:

- C. The limits of liability for the insurance required by Paragraph 5.04 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

1. Workers' Compensation and Employer's Liability Insurance:

- a. State: Statutory
- b. Employer's Liability: In accordance with Table 00800-1 of these Supplementary Conditions.
- c. *Terminology*: The following terms are not defined but when used in this Paragraph SC-5.04.C.1 for workers' compensation insurance, and have the meanings indicated below:
 - 1) Certificate of coverage: A copy of a certificate of insurance, a certificate of authority to self-insure, issued by the Texas Workers Compensation Commission, or a coverage agreement (TWCC-81, TWCC-82, TWCC-83, or TWCC-84), showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on the Project, for the duration of the Project. Contractor shall not execute TWCC Forms 83 or 85 or other form that precludes coverage under Contractor's policy if Contractor hires a Subcontractor or service provider without worker's compensation insurance.
 - 2) Duration of the Project: Is the time from the Contractor's beginning work on the Project until the time Contractor's and Subcontractor's obligations under the Contract Documents are fully complete.
 - 3) Contractor and Subcontractors (as indicated in Texas Labor Code §406.5096) includes all persons or entities performing all or part of the Work, regardless of whether that person or entity contracted directly with Contractor and regardless of whether that person or entity has employees. This includes, without limitation, independent contractors, Subcontractors, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on the Project. "Services" include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation, or other services related to the Project. "Services" does not include activities unrelated to the Project, such as food or beverage vendors, office supply deliveries, and delivery of portable toilets or portable sanitary facilities.
- d. Comply with the following relative to Worker's Compensation and Employer's Liability insurance:
 - 1) *Waiver of Subrogation Relative to Workers' Compensation Insurance*: The policy shall be endorsed to provide that insurer waives any right of subrogation that insurer may acquire against Owner, Engineer, Engineer's consultants, and others named in the Contract Documents as additional insured relative to Contractor's liability insurance, by reason of any payment made on account of injury, including death resulting therefrom, sustained by an employee of the insured.
 - 2) If workers employed on the Work will be employed through a leasing company, furnish evidence of leasing company's State of Texas license and a copy of leasing company's Worker's Compensation policy insuring its employees (including sole proprietors, partners, supervisors, and executive officers) who perform work in the State of Texas.
 - 3) Contractor shall furnish coverage, based on proper reporting of classification codes and payroll amounts and filing of coverage agreements, which meets the statutory requirements of Texas Labor Code §401.011(44) for all employees of

Contractor performing the Work or services on the Project, for the duration of the Project.

- 4) Contractor shall furnish to Owner a certificate of coverage prior to being awarded the Contract.
- 5) If the coverage period shown on the Contractor's current certificate of coverage ends during the Contract Times, Contractor shall, prior to the end of the coverage period, furnish to Owner a new certificate of coverage indicating that coverage has been extended; furnish updated certificate of coverage throughout the duration of the Project.
- 6) *Subcontractors and Workers' Compensation and Employee Liability Insurance:*
 - a) Contractor shall contractually require each Subcontractor to comply with the workers' compensation and employer's liability insurance requirements of the Contract Documents, to same extent such requirements are binding on Contractor.
 - b) Obtain from each Subcontractor and furnish to Owner a certificate of coverage, prior to that Subcontractor beginning work on the Project. Not later than seven days after receipt by Contractor, furnish updated, valid certificate of coverage for each Subcontractor throughout the duration of the Project.
- 7) Retain Contractor's and Subcontractors' required certificates of coverage for the duration of the Project.
- 8) Contractor shall notify Owner in writing, in accordance with Paragraph 17.01, within 10 days after Contractor knew or should have known, of a change that materially affects the provision of coverage of any entity performing work or services on the Contract.
- 9) Post at the Site a notice, in the text, form, and manner prescribed by the Texas Workers' Compensation Commission, informing persons performing work or services on the Contract that they are required to be covered, and stating how a person may verify coverage and report lack of coverage. Such posted notice does not satisfy other posting requirements imposed by the Act or other commission rules in the State of Texas. Such notice shall be printed with a title in text that is not less than 30-point bold type, with and other text in not less than 19-point non-bold type, and shall be in English, Spanish, and other languages, if any, common to the workers at the Site. Text for the notices shall be as indicated by the Commission on the sample notice without changes.
- 10) By executing the Agreement or furnishing or causing to be furnished a certificate of coverage, Contractor represents to Owner that employees of Contractor and Subcontractors who will perform work or services on the Contract will be covered by workers' compensation coverage for the duration of the Project; that such coverage will be based on proper reporting of classification codes and payroll amounts; and that coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the commission's Division of Self-Insurance Regulation. Furnishing false or misleading information may subject Contractor to administrative penalties of authorities having jurisdiction, criminal penalties, civil penalties of authorities having jurisdiction, and other civil actions.
- 11) Contractor's failure to comply with one or more workers' compensation insurance provisions is a breach of the Contract by Contractor, entitling Owner

to terminate for cause in accordance with Paragraph 15.02, unless otherwise provided by Laws and Regulations.

- 12) If any provision of the Workers' Compensation and Employee Liability insurance requirements of the Contract Documents, or its application to any person or circumstance, is held invalid, the invalidity does not affect other provisions or applications of this rule that can be given effect without the invalid provision or application, and to this end the provisions of this rule are declared to be severable.
2. Contractor's General Liability under Paragraphs 5.04.A.3 through 5.04.A.6 of the General Conditions which shall include completed operations and product liability coverages and eliminate the exclusion with respect to property under the care, custody, and control of Contractor. General Liability coverage shall be for not less than the limits indicated in Table 00800-1 of these Supplementary Conditions.
3. Automobile Liability under Paragraph 5.04.A.6 of the General Conditions: Shall be for not less than the limits indicated in Table 00800-1 of these Supplementary Conditions.
4. Umbrella Liability:
 - a. Contractor shall purchase and maintain, until final payment by Owner, Umbrella Liability Insurance. Such insurance shall insure against all claims in excess of the limits provided under workers' compensation and employer's liability, general liability insurance, and automobile liability policies. The limits of umbrella liability shall be in accordance with Table 00800-1 of these Supplementary Conditions.
5. *Table of Minimum Liability Insurance Coverage Limits*: The limits of liability insurance shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations. The limits of coverage under Paragraph 5.04 vary with the Contract Price as indicated in Table 00800-1:

TABLE 00800-1

LIMITS OF COVERAGE FOR ALL CONSTRUCTION PROJECTS	AUTOMOBILE (5.04.A.6) {Combined Single Limit} Per Accident	COMMERCIAL GENERAL LIABILITY (5.04.A.3 through 5.04.A.6) {Combined Single Limit} Per Project	WORKERS' COMPENSATION (5.04.A.1 through 5.04.A.2) {Employers' Liability} Per Accident Per Employee Per Disease	UMBRELLA (SC-5.04.C.4) {Combined Single Limit}
<p>CONTRACT PRICE LESS THAN \$100,000:</p> <p>Occurrence *General Aggregate Products/Completed Operations Aggregate</p>	\$300,000	<p>\$ 500,000 \$ 500,000 \$1,000,000</p>	<p>\$ 500,000 \$ 500,000 \$ 500,000</p>	Not applicable
<p>CONTRACT PRICE EQUAL TO \$100,000 OR GREATER AND LESS THAN \$500,000:</p> <p>Occurrence *General Aggregate Products/Completed Operations Aggregate</p>	\$500,000	<p>\$ 500,000 \$1,000,000 \$1,000,000</p>	<p>\$ 500,000 \$ 500,000 \$ 500,000</p>	Not applicable
<p>CONTRACT PRICE EQUAL TO OR GREATER THAN \$500,000 AND UP TO AND INCLUDING \$10,000,000:</p> <p>Occurrence *General Aggregate Products/Completed Operations Aggregate</p>	\$1,000,000	<p>\$1,000,000 \$2,000,000 \$2,000,000</p>	<p>\$1,000,000 \$1,000,000 \$1,000,000</p>	<p>\$2,000,000 \$2,000,000</p>
<p>CONTRACT PRICE GREATER THAN \$10,000,000:</p> <p>Occurrence *General Aggregate Products/Completed Operations Aggregate</p>	\$1,000,000	<p>\$1,000,000 \$2,000,000 \$2,000,000</p>	<p>\$1,000,000 \$1,000,000 \$1,000,000</p>	<p>\$5,000,000 \$5,000,000</p>

SC-5.05 Delete Paragraph 5.05 in its entirety and insert the following in its place:

SC-5.05 Not Used.

SC-5.06 Delete Paragraph 5.06 in its entirety and insert the following in its place:

SC-5.06. *Property Insurance*

- A. Contractor shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost of the Work. This insurance shall:
1. include the interests of Owner, Contractor, Subcontractors, Engineer, and other individuals or entities identified herein, and the officers, directors, members, partners, employees, agents and other consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured, additional insured, or loss payee as their interest may appear;
 - a. In addition to the individuals or entities specified above, include as additional insured, or loss payees as their interest may appear, the following:
 - 1) None
 2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood) and mechanical and electrical breakdown or failure, and damage to electrical apparatus from electrical currents.
 3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
 4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;
 5. allow for partial utilization of the Work by Owner;
 6. include testing and start-up; and
 7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor and Engineer with 30 days written notice to each other additional insured to whom a certificate of insurance has been issued.
- B. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with Paragraph SC-5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured or loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph SC-5.07.

- C. The risk of loss within any deductible amount applicable to the policies of insurance purchased in accordance with this Paragraph SC-5.06 will be borne by Contractor, Subcontractors, or others suffering such loss.
- D. Contractor shall purchase and maintain flood insurance upon the Work in the amount of the full replacement cost of the Work.

SC-5.07 Delete Paragraph 5.07 in its entirety and insert the following in its place:

SC-5.07. *Waiver of Rights*

- A. Owner and Contractor intend that all policies purchased in accordance with Paragraph SC-5.06 will protect Owner, Contractor, Subcontractors, Engineer, and all other individuals or entities identified in Paragraph SC-5.06 to be listed as insureds or additional insured or loss payees (and the officers, directors, members, partners, employees, agents, and other consultants and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of loss or damage the insurers will have no rights of recovery against any of the insureds or additional insured or loss payees thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents and other consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors, Engineer, and all other individuals or entities identified in Paragraph SC-5.06 to be listed as insureds or additional insureds or loss payees (and the officers, directors, members, partners, employees, agents and other consultants and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, Engineer, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them for:
 - 1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire and other perils whether or not insured by Owner, and;
 - 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04 or after final payment pursuant to Paragraph 14.07.
- C. Any insurance policy maintained by Owner covering any loss, damage, or consequential loss referred to in Paragraph SC-5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, Engineer, and the officers, directors, members, partners, employees, agents and other consultants and subcontractors of each and any of them.

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

SC-6.02.C Add the following new paragraph immediately after Paragraph 6.02.B:

SC-6.02.C For Work financed in whole or in part by loans or grants from, or loans insured or guaranteed by, the United States or any agency or instrumentality thereof under any statute of the United States providing wage standards for such work, the provisions of the Contract Documents are subject to the applicable provisions of the Contract Work Hours and Safety Standards Act, 40 U.S.C.A. §327 et seq. Contractor and Subcontractor shall not require or allow any laborer or mechanic to be employed on the Work in excess of forty hours in any work week unless such laborer or mechanic receives compensation at a rate not less than one-and-one-half times his or her basis rate of pay for hours worked in excess of forty hours in such work week. Except as may be otherwise required by law, all claims pertaining to the classification of labor employed on the Project shall be decided by Owner's governing body or other duly designated official.

SC 6.06.H Add the following new paragraphs immediately after Paragraph 6.06.G:

SC-6.06.H Contractor shall perform, with his organization and with the assistance of workers under Contractor's immediate superintendence, not less than 40 percent of the Contract Price, exclusive of Work not commonly found in contracts for similar construction which require specialized knowledge, craftsmanship, or equipment not ordinarily available in the organizations of contractors performing construction similar in nature to the Work. The value of the Work, exclusive of said items, will be interpreted as the value of labor, equipment, superintendence, and only those portions of materials and equipment incorporated into the Work that are related to the Contract's direct labor requirements.

SC-6.08.A Amend the first sentence of Paragraph 6.08.A to read as follows:

Contractor shall obtain, pay for, and be responsible for complying with all construction permits and licenses necessary to perform the Work and operate at the Site.

SC-6.08.B Add the following new paragraph immediately after Paragraph 6.08.A:

SC-6.08.B *TPDES Permit and Related Permits and Requirements*

1. The Work is subject to the Texas Pollution Discharge Elimination System (TPDES) permitting requirements for the installation and maintenance of temporary and permanent erosion and sediment controls and stormwater pollution prevention measures throughout the construction period.
2. Contractor's responsibilities are as follows:
 - a. Prepare a Stormwater Pollution Prevention Plan (SWPPP) in compliance with Laws and Regulations.
 - b. Obtain a signed certification statement from all Subcontractors responsible for implementing erosion and sedimentation controls and other best management practices for the Site that are part of the SWPPP. Such statement shall indicate that the Subcontractor understands the permit requirements. The certified statement forms shall be attached to and become part of the SWPPP.
 - c. Fill out the TCEQ's "Construction Site Notice" form, which is Attachment 2 to the TPDES General Permit TXR150000 (form available from Owner or on the Internet at <http://www.tceq.state.tx.us/assets/public/permitting/waterquality/attachments/stormwater/txr152d2.pdf> and post it near the main entrance of the Site, or at mu

Multiple postings if the Work is linear. Submit a copy of the completed Construction Site Notice form to Owner and Engineer.

- d. Maintain erosion/sedimentation controls and other protective measures identified in the SWPPP in effective operating conditions.
- e. Perform inspections every 14 days and after every half-inch of rainfall, noting the following observations on an inspection form provided by Owner:
 - 1) Locations of discharges of sediment or other pollutants from the Site.
 - 2) Locations of stormwater, erosion, sedimentation controls that are in need of maintenance or repair.
 - 3) Locations of stormwater, erosion, sedimentation controls that are not performing, failing to operate, or are inadequate.
 - 4) Locations where additional stormwater, erosion, sedimentation controls are needed.
- f. Continuously maintain at the Site a copy of the SWPPP (with updates, as described below) and inspection reports.
- g. Update the SWPPP as necessary to comply with TPDES permitting requirements, which includes noting changes in erosion, and sedimentation controls and other best management practices that are part of the SWPPP and which may be necessary due to the results of inspection reports.
- h. Upon Substantial Completion or establishment of permanent cover over disturbed soil areas (if such cover is established after Substantial Completion), submit TPDES records to Owner.

SC-6.09.D Add the following new paragraph immediately after Paragraph 6.09.C:

SC-6.09.D *Minimum Prevailing Wage Rates*

1. Wage rates paid to workers employed in performing the Work at the Site, including Contractor and Subcontractor employees, shall not be less than the following:
 - a. Federal Davis-Bacon minimum prevailing wage rates, comprised of ____ pages, which is part of the Contract Documents. Comply with 40 USC 31 and 29 CFR Parts 1, 3, and 5.

Contractor shall be aware of changes in the minimum prevailing wage rates applicable to the Work and shall pay the minimum prevailing wages at no additional cost to Owner. Contractor shall post the schedule of classifications and wage rates at conspicuous locations at the Site. Such schedule shall also show deductions, if any, required by law to be made from wages earned by laborers and mechanics engaged on the Work.

2. Contractor shall give preference to hiring qualified local residents for work as laborers and mechanics on the Project. Employees shall be bona-fide residents of the United States of America.
3. Contractor and Subcontractors shall pay each of their employees, engaged in the Work in full, not less often than once per week, and without deductions or subsequent rebates on any account, except for deductions mandated by law.

4. Contractor, and Subcontractors shall keep a complete payroll record indicating the name, address, and Social Security number of each employee engaged in the Work, together with the classification of work in which the employee is engaged, the hourly wage rate paid, number of deductions made from such wages and total amount paid to the employee. Submit to Owner one copy of each such payroll record, for the period for which payment is requested, with each Application for Payment. Each payroll record shall bear the affidavit of the employer certifying, under oath, that such payroll is a true, complete, and accurate report of the wages earned and paid to each employee engaged in the Work, that no deductions from any wages due each employee, except as set out on the payroll, have been directly or indirectly made, and that no rebates, either direct or indirect, have been nor will be required of an employee.
5. Certified payroll reports shall indicate for each worker whether the labor performed was performed under the Building, Heavy, Highway, or Water and Sewer Line Prevailing Wage Rate scale. Certified payroll reports shall be submitted for the complete Contract period and, for weeks where no Work was performed, negative reports shall be submitted, marked "No Work Performed". Clearly mark "FIRST PAYROLL" on the first payroll submitted, and clearly mark "FINAL PAYROLL" on the last payroll submitted for the Contract.
6. Apprentices will be work only under a bona fide apprenticeship program registered with the U.S. Department of Labor. A copy of such program shall be submitted to Owner, together with current certification or evidence of registration with the U.S. Department of Labor, Bureau of Apprenticeship and Training, for each apprentice engaged in the Work.
7. Contractor shall, when requested by Owner, submit additional certification and documentation (such as copy of cancelled check or an Employee Restitution Receipt Form) indicating that employee has received back compensation due.
8. Contractor and Subcontractors in violation of this provision are subject to a penalty of \$60 per day for each worker that is paid less than the rate specified in the Project's applicable prevailing wage rates.

SC-6.10.B Add the following new paragraph immediately after Paragraph 6.10.A:

SC-6.10.B Exemption from State of Texas sales tax may be obtained on materials and equipment incorporated into the Work and supplies required to perform the Work. Owner is an organization which qualifies for such exemption pursuant to provisions of Article 20.04(F) of the Texas Limited Sales, Excise and Use Tax Act. In accordance with Texas House Bill 11, Contractor may purchase, materials, equipment, and supplies consumed in the performance of the Work by issuing to Suppliers an exemption certificate in lieu of the tax, said exemption certificate complying with State of Texas Comptroller's ruling no. 95-0.07. Such exemption certificate(s) issued by Contractor in lieu of the sales will be subject to the provisions of the State of Texas Comptroller's ruling no. 95-0.09 as amended to be effective October 2, 1968. Exemption certificate may be obtained from Owner's Purchasing Agent.

SC-6.11.E Add the following new paragraph immediately after Paragraph 6.11.D:

SC-6.11.E *Dust Control*

1. Contractor shall not cause or allow dust-generating operations, earthmoving operation, use of property, or other operation that results in fugitive dust emissions that exceed the limits prescribed by the authority having jurisdiction, in accordance with Texas Administrative Code Title 30, Part 1, Chapter 111, Subchapter A, Division 4, Rule 111.145.

2. Provide necessary equipment and materials to apply sufficient dust suppressants, properly clean all vehicle “track-out” areas on and adjacent to the Site, and provide adequate physical stabilizations of soils to comply with requirements of earthmoving permits and approved dust control plan or activities, if any.
3. Contractor shall pay fines and civil penalties imposed by authorities having jurisdiction and incurred by Owner because of Contractor’s violation of earthmoving permits and dust control plans or activities.
4. Implement measures to control fugitive dust emissions from the Site in compliance with earthmoving permit and Laws and Regulations.

SC-6.13.D Replace the word “safety program” with “Health and Safety Plan.”

SC-6.13.G Add the following new paragraphs immediately after Paragraph 6.13.F:

SC-6.13.G Within twenty-four hours of receiving a request from Owner, Contractor shall furnish to Owner documentation substantiating representations made in the Health and Safety Plan including, but not limited to, that each of the Contractor’s employees has received training on the Health and Safety Plan as well as any other training necessary to competently effectuate the Health and Safety Plan.

SC-6.13.H Owner maintains a drug- and alcohol-free workplace in accordance with the Drug-free Workplace Act of 1983. Contractor shall publicize a statement notifying employees on the Work that the unlawful manufacture, distribution, dispensation, possession, or use of a controlled substance is prohibited in the workplace, including at the Site.

SC-6.14.I Owner maintains specific rules regarding smoking on Owner's properties. Contractor shall adhere to such rules at the Site.

SC-6.14.J Owner maintains specific rules regarding firearms and Contractor shall adhere to such rules at the Site.

SC-6.14.A.1 Add following new subparagraph immediately after Paragraph 6.14.A:

SC-6.14.A.1 Contractor’s safety representative shall be identified in submittal to Owner and Engineer for acceptance prior to commencement of Work at the Site. Name and qualifications of proposed substitute, if any, shall be submitted to Owner for acceptance.

SC-6.16.A Amend Paragraph 6.16.A by removing “Work Change Directive or” from the last sentence.

SC-6.17.E.2 Add the following new paragraphs immediately after Paragraph 6.17.E.1:

SC-6.17.E.2 For each Contractor submittal required under the Contract Documents, Engineer will review one initial submittal and one resubmittal at no cost to Contractor. Engineer will record Engineer’s time for reviewing subsequent submittals of Shop Drawings, Samples, or other submittals requiring approval or acceptance, and Contractor shall reimburse Owner for Engineer’s charges for labor and expenses for such time.

SC-6.17.F In the event that Contractor requests a change of a previously approved or previously accepted submittal, Contractor shall reimburse Owner for Engineer’s charges for Engineer’s review time unless the need for such change is beyond Contractor’s control.

ARTICLE 8 - OWNER'S RESPONSIBILITIES

SC-8.11 Delete Paragraph 8.11 in its entirety and insert the following in its place:

SC-8.11 Not used.

ARTICLE 9 – ENGINEER’S RESPONSIBILITIES

SC-9.03 Add a new paragraph immediately after Paragraph 9.03.A that is to read as follows:

SC-9.03.B Resident Project Representative (RPR) will be Engineer’s employee or agent at the Site, will act as directed by and under the supervision of Engineer, and will confer with Engineer regarding RPR’s actions. RPR’s dealings in matters pertaining to the Work in general shall be with Engineer and Contractor keeping Owner advised as necessary. RPR’s dealings with Subcontractors shall only be through or with the full knowledge and approval of Contractor. RPR shall generally communicate with Owner with the knowledge of and under the direction of Engineer.

1. Duties and Responsibilities to RPR:
 - a. Schedules: Review the Progress Schedule, Schedule of Submittals, and Schedule of Values prepared by Contractor and consult with Engineer concerning acceptability.
 - b. Conferences and Meetings: Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings, and prepare and circulate copies of minutes thereof.
 - c. Liaison:
 - 1) Serve as Engineer’s liaison with Contractor, working principally through Contractor’s superintendent, and assist in providing understanding of the intent of the Contract Documents; and assist Engineer in serving as Owner’s liaison with Contractor when Contractor’s operations affect Owner’s operations on the Site.
 - 2) Assist in obtaining from Owner additional details or information, when required for proper execution of the Work.
 - d. Shop Drawings and Samples:
 - 1) Record date of receipt of Shop Drawings and Samples that are received at the Site.
 - 2) Receive Samples that are furnished at the Site by Contractor, and notify Engineer of availability of Samples for examination.
 - 3) Advise Engineer and Contractor of the commencement of any Work requiring a Shop Drawing or Sample if the submittal has not been approved by Engineer.
 - e. Review of Work, Rejection of Defective Work, Inspections, and Tests:

- 1) Conduct observations of the Work in progress on the Site to assist Engineer in determining if the Work is, in general, proceeding in accordance with the Contract Documents.
 - 2) Report to Engineer when RPR believes that any Work is unsatisfactory, faulty, or defective or does not conform generally to the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test, or approval required to be made; and advise Engineer of Work that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection, or approval.
 - 3) Verify that tests, equipment, and systems startups, and operating and maintenance training are conducted in the presence of appropriate Owner's personnel, and that Contractor maintains adequate records thereof; and observe, record, and report to Engineer appropriate details relative to the test procedures and startups.
 - 4) Accompany visiting inspectors representing public or other agencies having jurisdiction over the Project, record the results of these inspections and report to Engineer.
- f. Interpretation of Contract Documents: Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.
- g. Modifications: Consider and evaluate Contractor's suggestions for modifications to Drawings or Specifications and report with RPR's recommendations to Engineer. Transmit to Contractor decisions issued by Engineer.
- h. Records:
- 1) Maintain at the Site orderly files for correspondence, reports of job conferences, Shop Drawings and Samples, and reproductions of original Contract Documents including all Addenda, Change Orders, Field Orders, additional Drawings issued subsequent to the execution of the Agreement, Engineer's clarifications and interpretations of the Contract Documents, progress reports, and other Project-related documents.
 - 2) Keep a record recording Contractor's hours on the Site, weather conditions, data relative to questions on Change Orders or changed conditions, list of visitors to the Site, daily activities, decisions, observations in general, and specific observations in more detail as in the case of observing test procedures; and send copies to Engineer.
 - 3) Record names, addresses, and telephone numbers of all Contractors, Subcontractors, and major Suppliers of materials and equipment. Reports:
 - 4) Furnish Engineer periodic reports as required of progress of the Work and of Contractor's compliance with the Progress Schedule and Schedule of Submittals.

- 5) Consult with Engineer in advance of scheduled major tests, inspections, or start of important phases of the Work.
 - 6) Prepare draft of proposed Change Orders, obtaining backup documents from Contractor, and provide recommendations to Engineer regarding Change Orders and Field Orders.
 - 7) Report immediately to Engineer and Owner upon the occurrence of any Site accident, any Hazardous Environmental Condition, emergencies or acts of God endangering the Work, or property damage by fire or other cause.
- j. Payment Requests: Review Applications for Payment with Contractor for compliance with the established procedure for their submission, and submit recommendations to Engineer, noting particularly the relationship of the payment requested to the Schedule of Values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.
 - k. Certificates, Maintenance and Operation Manuals: During the course of the Work, verify that certificates, maintenance and operation manuals, and other data required by the Specifications to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have this material delivered to Engineer for review and forwarding to Owner prior to final payment for the Work.
 - l. Completion:
 - 1) Before Engineer issues a certificate of Substantial Completion, submit to Contractor a list of observed items requiring completion or correction.
 - 2) Observe whether Contractor has arranged for inspections required by Laws and Regulations, including but not limited to those to be performed by public authorities having jurisdiction over the Work.
 - 3) Conduct final inspection in the company of Engineer, Owner, and Contractor, and prepare a final list of items to be completed or corrected.
 - 4) Observe that all items on final list have been completed or corrected and make recommendations to Engineer concerning acceptance of the Work.
2. The RPR shall not:
 - a. Authorize any deviation from the Contract Documents or substitution of materials or equipment, including “or equal” items.
 - b. Exceed limitations of Engineer’s authority as set forth in the Contract Documents.
 - c. Undertake any of the responsibilities of Contractor, Subcontractors, or Contractor’s superintendent.
 - d. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences, or procedures of construction, unless such advice or directions are specifically required by the Contract Documents.

- e. Advise on, issue directions regarding, or assume control over safety precautions and programs in connection with the Work.
- f. Accept Shop Drawing or Sample submittals from anyone other than Contractor.
- g. Authorize Owner to occupy the Project in whole or in part.
- h. Participate in specialized field or laboratory tests or inspections conducted by others except as specifically authorized by Engineer.

ARTICLE 10 - CHANGES IN THE WORK; CLAIMS

SC-10.01.A Amend Paragraph 10.01.A by removing from the first sentence “, or a Work Change Directive”.

SC-10.01.B Remove Paragraph 10.01.B in its entirety.

SC-10.03.A.2 Remove Paragraph 10.03.A.2 in its entirety and replace with the following: “Not used.”

SC-10.03.B Add the following new paragraph immediately after Paragraph 10.03.A:

SC-10.03.B Change Order requests shall be accompanied by Contractor’s time impact analysis for the Change Order request to be reviewed.

ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

SC-11.01.A.5.c Delete Paragraph 11.01.A.5.c in its entirety and insert the following in its place:

- c. Construction Equipment and Machinery
 - 1) Rentals of all construction equipment and machinery, and the parts thereof in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
 - 2) Costs for equipment and machinery owned by Contractor will be paid at a rate shown for such equipment in the Rental Rate Blue Book. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs. Costs will include the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, shall cease to accrue when the use thereof is no longer necessary for the changed Work. Equipment or machinery with a value of less than \$1,000 will be considered small tools.

SC-11.03.D.1 Delete Paragraph 11.03.D.1 in its entirety and insert the following in its place:

SC-11.03.D.1 The total cost of a particular item of Unit Price Work amounts to 10 percent or more of the Contract Price and the variation in the quantity of that particular item of Unit Price Work

performed by Contractor differs by more than 25 percent from the estimated quantity of such item indicated in the Agreement; and

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

SC-12.01.C.2.c Delete the semicolon at the end of GC 12.01.C.2.c, and add the following:

, provided, however, that on any subcontracted work the total maximum fee to be paid by Owner under this subparagraph shall be no greater than 25 percent of the costs incurred by the Subcontractor who actually performs the work;

SC-12.04 Add the following new paragraph immediately after Paragraph 12.03:

SC-12.04 *Liquidated Damages:*

- A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

- B. *Liquidated Damages Relative to Substantial Completion and Readiness for Final Payment:* Owner and Contractor recognize that time is of the essence as stated in Paragraph SC-12.04.A above and that Owner will suffer financial loss if the Work is not completed within the Contract Times for Substantial Completion, completion and readiness for final payment, and Milestones (if any) specified in the Contract Documents, plus any changes thereof allowed in accordance with Article 12 of the General Conditions. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty), Contractor shall pay Owner **\$1,370.00** for each day that expires after the time specified in the Contract Documents for Substantial Completion until the Work is substantially complete. After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by Owner, Contractor shall pay Owner **\$970.00** for each day that expires after the time specified in the Contract Documents for completion and readiness for final payment until the Work is completed and ready for final payment.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

SC-14.02.A.1 Add the following new subparagraph immediately after Paragraph 14.02.A.1:

SC-14.02.A.1 Contractor's and Subcontractor's certified payroll record for the period covered by the Application for Payment shall accompany the Application for Payment. Contractor's Application for Payment shall be on Owner's standard Application for Payment form.

SC-14.02.C.1 Delete Paragraph 14.02.C.1 in its entirety and insert the following in its place:

SC-14.02.C.1 Thirty days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

SC-14.07.B.1 Amend the first sentence of Paragraph 14.07.B.1 to read as follows:

If, on the basis of Engineer's final inspection and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within 20 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment.

SC 14.07.C.1 Add the following at the end of Paragraph 14.07.C.1:

An approvable application for final payment shall include Contractor and Subcontractor payrolls for the period covered in the final Application for Payment; an update of progress against the accepted Progress Schedule; and such other items as the Engineer may reasonably require.

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

SC-15.02.A.5 Add the following new paragraphs immediately after Paragraph 15.02.A.4:

SC-15.02.A.5 If the Contract or any part thereof is sublet or assigned to another party by Contractor, without the written consent of Owner and surety that issued the performance bond and payment bond;

ARTICLE 17 - MISCELLANEOUS

SC-17.07 Add the following new paragraph immediately after Paragraph 17.06:

SC-17.07 *Working Near Utilities*

A. *Construction Adjacent to High Voltage Electric Lines:*

1. Contractor shall comply with Laws and Regulations, including U.S. Occupational Safety and Health Administration (OSHA) safety standards regarding construction adjacent to high-voltage electric lines and facilities, including trenching, crane operations, final grading, and other associated work which may result in impaired clearance to an existing electrical line or facility.
2. It is a violation of OSHA regulations to operate equipment in a manner that results in persons or equipment coming within ten feet of an energized electric line. Such Laws and Regulations are enforced by OSHA, and violators are subject to penalties imposed under federal Law.
3. Texas Law prohibits function or activity where it is possible for the person performing such activity to come within six feet of an overhead power line.
4. Contractor shall notify the El Paso Electric Company in writing of Contractor's anticipated dates and times when such work is scheduled. Written notification of El Paso Electric Company shall be at least six working days prior to each scheduled activity near El Paso Electric Company power lines and facilities, so that El Paso

Electric Company personnel can coordinate with Contractor to provide proper clearance of energized electric lines. No other type of notice will be acceptable and work shall not be initiated until proper clearance and arrangements are confirmed by Contractor with the El Paso Electric Company.

5. Submit written notification to:

Raul Guel, Distribution Engineering Design
El Paso Electric Company
P. O. Box 982
El Paso, Texas 79960
(915) 543-4015

6. Simultaneously submit one copy of the notification letter to Owner's Contracts Development Manager and retain copy in Contractor's file.

7. Below are selected El Paso Electric Company phone numbers:

Claims Director	(915) 543-4158
Trouble & Emergencies	(915) 543-5720
Field Services/Power Consultants	(915) 543-2255
Cable Locator	(915) 543-4051

- B. *Construction Adjacent to Gas Lines:* Contractor shall comply with the One-Call Notification and System Protection Program developed by Southern Union Gas Company, and with State Damage Prevention Law, HB 2295:

- Contact Texas Gas Co. not less than two working days before commencing excavation activities
- Determine exact location of all underground utilities by safe and acceptable means
- Employ the two foot safety rule
- Utilize "Professional Excavator's Manual" as revised

SC-17.08 Add the following new paragraph immediately after Paragraph 17.07:

17.08 *EPCWID #1 Dewatering Permit Requirements*

- A. A license agreement for "Discharge of Foreign Waters into District Drain Ditches" is required between Owner and the El Paso County Water Improvement District (EPCWID) #1 before Contractor may begin dewatering operations. Contractor shall be a co-licensee with Owner. Terms and conditions of the license agreement are applicable to Contractor, who will function, relative to the license EPCWID #1 agreement only, as an agent of Owner, by preparing an approvable plan and carrying out the terms of the plan and the EPCWID #1 license agreement. Contractor shall, to the extent permitted by law, defend and hold harmless Owner, its employees, insurers and agents; and the Engineer and Engineer's consultants, and their employees, officers, insurers, and agents from claims arising out of damages caused by actions, or inactions, of Contractor or as a result of EPCWID's exercise of any or all options given it under the license agreement.
- B. Contractor shall prepare and submit to Engineer a "Dewatering Plan", a "Final Schedule for Dewatering", and an estimate of fees due EPCWID #1. Submit "Dewatering Plan" within 15 days of the date that the Contract Times commence running. "Dewatering Plan" shall include the estimated quantities of dewatering for each month of the Contract,

the design capacity and number of pumps to be used by Contractor, and the point(s) of dewatering pump discharge. Engineer will review for acceptability the "Dewatering Plan" and, when the submittal is acceptable to Engineer, Engineer will forward it, through Owner, to EPCWID #1. Prepare and submit the submittal and schedule the Work so that Owner receives the "Dewatering Plan" submittal not less than 14 days before the start of dewatering operations at the Site. Owner will pay the fees as estimated in the "Dewatering Plan".

C. Estimate the dewatering fees on the following basis:

1. Dewatering fee at the rate of \$150 per acre-foot of water discharged. For a month in which the discharge exceeds the amount estimated under the "Dewatering Plan", Contractor shall advise Owner and Engineer in writing, that such excess fees may be due so that the Owner may consider its liability for, and take action to make payment of, such excess fees to EPCWID #1. Owner will pay such excess fees only to the extent that such fees are incurred through no fault of Contractor.

D. Samples of the discharge water shall be tested by a qualified testing laboratory hired by Contractor. Submit to Engineer results of total dissolved solids (TDS) tests, which Engineer will transmit to EPCWID #1. Submit to Engineer and Owner monthly reports of discharge quantities and quality (TDS and sulfates), which specific requirements may be more particularly indicated in the Specifications and in the associated discharge permit; Engineer will transmit monthly reports to EPCWID #1.

E. Contractor will not be eligible for final payment by Owner until final dewatering fees based upon actual quantities and damages (if any) due EPCWID # 1 have been paid and payment due from Contractor has been made. A "Final Release" from EPCWID # 1 shall be received by Owner as a condition precedent to Contractor applies for final payment.

SC-17.09 Add the following new paragraph(s) immediately after Paragraph 17.08:

SC-17.09 *Railroads*

A. *Union Pacific Railroad Company Contractor's Right of Entry*: Contractor shall acquire, and pay all associated expenses (including railroad company inspection fees), Contractor's right-of-entry from, the Union Pacific Railroad Company. Refer to Union Pacific Railroad's "Contractor's Right of Entry" form and its exhibits, included in the Project Manual following these Supplementary Conditions. Right-of-entry requirements are interrelated with the railroad liability insurance requirements and both are Contractor's cost responsibility. Contractor shall acquire railroad company's authorization prior to commencing work in the railroad right-of-way. Submit to Owner and Engineer executed copies of Contractor's "Right of Entry" form prior to commencing work on railroad property.

B. *Railroad Liability Insurance*: Contractor shall obtain Railroad Liability Insurance in the form and amount required by the Union Pacific Railroad Company. Such insurance shall be in effect and cover all necessary work and operations required of Contractor within the railroad right-of-way. Refer to the railroad's "Contractor's Right of Entry" form and its exhibits. Insurance requirements of this paragraph are interrelated with the right-of-entry requirements in Paragraph SC-17.09.A and is Contractor's responsibility.

C. For clarification of the requirements and costs of railroad permits and insurance, contact:

Kathy Nesser, Contracts Senior Manager
Union Pacific Railroad Company

Contracts and Real Estate Department
1400 Douglas Street STOP 1690
Omaha, Nebraska 68179-1690
Phone: (402) 544-8549
Fax: (402) 501-1519

SC-17.10 Add the following new paragraph immediately after Paragraph 17.09:

SC-17.10 Texas Water Development Board (TWDB) contracts require that all Contractors and subcontractors maintain project costs in a manner consistent with generally accepted accounting principles. All records are to be maintained for a minimum period of three years and beyond that minimum period if litigation, a claim, or an audit is in process, or if audit findings are not resolved. The three year period will begin upon completion of final payment.

***** END OF SUPPLEMENTARY CONDITIONS *****

REQUIRED WORKERS' COMPENSATION COVERAGE

(Title must be 30 point font & bold lettering)

(19 point font from here on)

The law requires that each person working on this site or providing services related to this construction project must be covered by workers' compensation insurance. This includes persons providing, hauling, or delivering equipment or materials, or providing labor or transportation or other service related to the project, regardless of the identity of their employer or status as an employee."

"Call the Texas Workers' Compensation Commission at 512-440-3789 to receive information on the legal requirements for coverage, to verify whether your employer has provided the required coverage, or to report an employer's failure to provide coverage."

* The above sign to be provided in both English and Spanish without any additional words or changes and shall be posted at the Project Site. Refer to Paragraph SC-5.04.C.1 of the Supplementary Conditions (Document 00800 in the Contract Documents).

SECTION 00840

GENERAL WAGE REQUIREMENTS

PART 1: GENERAL

1.01 REQUIREMENTS

- A. Each employee shall be paid not less than the minimum rate of wages for the classification of work in which he is employed, as set out in the most current Davis-Bacon wage rates and set out in this section of the Specifications.
- B. Sewer and Water Lines Wage Rates shall be used for the entire project except on the pavement replacement, where the Highway Construction Wage Rates shall be used.

END OF SECTION

SECTION 01010

GENERAL

PART 1 GENERAL

1.01 SCOPE

- A. The work under this contract shall be for furnishing all labor, materials, transportation, and services for the construction and installation of the following work:
1. Mobilization/Demobilization, General Requirements, Bonds, and Insurance.
 2. Traffic Control Plan
 3. Project-wide Video Recording
 4. Wastewater Collection System
 - a. 6-Inch diameter forcemain pipe, inclusive of all pipe fittings.
 - b. 8-Inch diameter gravity sanitary sewer pipe, inclusive of all pipe fittings
 - c. Trench Safety System
 - d. 48-inch Polymer Sanitary Sewer Manholes
 - e. Vertical feet of extra depth for manholes
 - f. Lift Station
 5. HMAC Removal and Replacement
 6. Cement stabilized Backfill

1.02 CONSTRUCTION SEQUENCING

- A. The sequence of construction on this project is critical to the successful completion of this project. Construction shall be sequenced by the Contractor in such a manner so as to provide tie-ins (service) to the Owner and customers at the earliest possible time during construction. All construction shall be sequenced to allow for a minimum of vehicular and pedestrian traffic interruption.
- B. The Contractor shall develop a construction schedule and submit 15 calendar days after award for Engineer and Owner review and approval prior to beginning construction. The schedule shall be closely followed throughout the duration of the project. No partial payments will be made until the Engineer and Owner have approved the schedule. The Contractor shall submit updates to the Schedule of Work monthly, or more frequently when required, that is acceptable to the Engineer.

1.03 COMPLETE FACILITY

- A. It is the intent of these specifications that the project be a complete workable facility, functioning in accordance with the specified purpose. Therefore, it is the direct responsibility of the Contractor to furnish, install, and construct the complete facilities required by the plans and specifications for the prices stated in the contract, and to take account of all subsidiary requirements in accordance with the specified requirements.

1.04 RIGHTS-OF-WAY AND/OR EASEMENTS

- A. Sewer infrastrue facilities are to be installed within the following rights-of-way:
 - 1. El Paso County Right-of-Way
 - 2. EPCWID #1 Right-of-Way
 - 3. Owner Property or Easement
 - 4. TxDOT Right-of-way

The Contractor shall use the minimum area practicable for construction of the facilities regardless of the type of right-of-way, and shall be governed by the specific requirements for each type of right-of-way, as set forth herein.

Excess excavated material and “hummocks” shall be removed from the rights-of-way as necessary for completing the specified work and disposed of by the Contractor as required by the Specifications and by local, state and federal law.

- B. Types of Right-of-Way

- 1. El Paso County Right-of-Way:

Construction within the El Paso County right-of-way shall be performed in a manner causing a minimum of inconvenience to pedestrian and vehicular traffic and adjacent property. Contractor shall notify all residents and business owners that may be affected by the construction. Safe passage shall be provided at all times for the public in those areas where the construction is occurring. Provisions shall be made by the Contractor for notification of the El Paso County El Paso Public Works Department, whenever work is to be carried out in any street in the El Paso County Right of Way, and care shall be taken for the control of traffic. The Contractor is responsible for all traffic control and safety. Contractor is responsible for acquiring all permits required by the El Paso County.

Contractor shall preserve during construction, all traffic signs, underground signal conduits, and all other traffic regulatory signs. Coordinate for location of traffic signal conduits. Coordination shall be with the El Paso County Public Works Department.

No equipment, material, or debris is to be stored in County Right-of-Way.

Contractor shall replace any damaged curb, gutter, or sidewalk, from expansion joint to expansion joint. Contractor shall replace, in its entirety, any driveways or concrete pads that are damaged during construction, to equal or better conditions.

2. EPCWID #1 Right-of-Way

The Owner has secured a permit for this project for construction within EPCWID #1 ROW, and Owner shall notify the EPCWID #1 prior to beginning work on this property. The Contractor shall coordinate with the Engineer and the EPCWID #1 prior to crossing and working in any EPWID #1 area:

Mr. Jay Ornelas, P.E.
Asst. to District Engineer
13247 Alameda Ave.
Clint, Texas 79836
Ph: (915) 872-4000

3. Owner Property or Easement Right-of-Way

The Contractor shall confine his/her operations to the limits of the property, as specified, of easements owned by the Owner and as indicated on the drawings.

4. TxDOT Right-of-Way

The Owner has secured permission from TxDOT to construct portions of the work which lie within or adjacent to TxDOT right-of-way. The Contractor shall notify TxDOT and the Engineer of all periods of work on and/or adjacent to their right-of-way no less than 48 hours prior to the work and shall comply with all highway safety rules, and conditions set forth in the permits.

Mr. Jorge Barragan
13301 Gateway West Blvd.
El Paso, TX 79936
Ph: (915) 790-4369

1.05 CONTRACTOR'S SUPERINTENDENCE

- A. Contractor shall keep at all times a qualified competent Project Superintendent, satisfactory to the Engineer. The Project Superintendent shall have the responsibility to coordinate all subcontractors and be capable of communicating with the Public, the Engineer, and the Owner. The Project Superintendent shall be responsible for and shall coordinate all activities of the various crews, subcontractors and suppliers.
- B. The Resident Superintendent shall be cooperative and authorized to receive orders and to act for the Contractor. In the event a competent Superintendent is not available the Owner may suspend work until one is available. Changes of Superintendent require prior written approval by the Engineer and the Owner.
- C. All workers employed by the Contractor shall have such skill and experience as will enable them to properly perform the duties assigned. Any person employed by the Contractor or a subcontractor who, in the opinion of the Engineer, does not perform his work in a proper and

skillful manner, or is disrespectful, intemperate, disorderly or otherwise objectionable, shall at the written request of the Engineer be forthwith reassigned or discharged and shall not be deployed again on any portion of the work without written consent of the Engineer.

- D. Persons assigned to this project and identified by the Contractor during the Pre-Award requirements as Key Personnel shall not be replaced without prior consent and approval of a substitute by the Owner. Prior to replacing any Key Personnel after initial acceptance by the Owner, a resume and work history shall be submitted to the Engineer for review and recommendation for approval.”

1.06 EMERGENCY COMMUNICATION

- A. The Contractor shall maintain at all times during construction, a local telephone number where responsible supervisory personnel may be contacted twenty-four hours a day of every day the project is under construction and not yet accepted by the Owner. The telephone number shall be given to the dispatcher, the Project Manager, OWNER’s Safety/Loss Control Representative and to the Engineer so that contact can be made in the event of any emergency.
- B. Accidents shall be reported immediately to the ENGINEER and to OWNER’s Safety/loss Control Representative by messenger or phone.
- C. All accidents shall be documented and a fully detailed written report submitted to the ENGINEER and to OWNER’s Safety/loss Control Representative as soon as possible after each accident.

1.07 EXISTING UTILITIES AND FACILITIES

- A. The Contractor shall be fully responsible for all underground facilities which are shown on the drawings, or which can be located by the Contractor with reasonable effort, or which are brought to the attention of the Contractor in any manner. The Contractor shall be responsible for notifying the Engineer if any unknown facilities are uncovered and for protecting those facilities after they are uncovered.
- B. The drawings only indicate the approximate location of existing utilities that could be located or approximated during design. Therefore, the Contractor shall be responsible for determining the exact location of all buried utilities along the pipeline routes prior to starting any excavation activities. The Contractor shall be responsible for locating and protecting all utilities and service connections along the route of construction.
- C. The Contractor shall be responsible for the protection of all electric power poles, overhead lines, light poles, etc. which occur along the various pipeline routes. The Contractor shall provide whatever temporary shoring is necessary to ensure that all poles are adequately supported, braced, etc. so that the pole does not sink, shift, tilt, or otherwise move from its original position. Any removal of guy wires or anchors and setting of any guy wires or anchors shall be done at the Contractors expense. Any measures the Contractor takes to support any type of pole shall be based upon approval of the Owner of the pole and the Engineer. The Owner of the pole and the Engineer shall be notified of probable work on the pole no later than within the first week of Contractor’s work, and again 5 business days prior to the work being done. Removal of temporary supports of guy wires shall be with the approval of the Owner of the pole and the Engineer. Said removals of temporary facilities

shall only be accomplished upon five (5) business day's notification to the Owner of the pole and the Engineer.

- D. The Contractor shall coordinate the work with all utility companies having facilities within the area of work, including but not limited to El Paso Electric, Texas Gas Service Company, El Paso Water Utilities, Time Warner Communications, AT&T, NuStar Energy, Holly Energy Partners, and any utilities located in the project area. Any work associated with the protection, relocation or by-passing of existing utility lines shall be reflected in the Contractor's project schedule so that the work may be completed without delay to the project. All the requirements of the contract documents will apply to any subcontractor who performs any relocation, by-passing, or protection of existing utility lines. All work associated with the relocating, by-passing, or protection of existing utility lines shall be at the expense of the Contractor. Prior to the commencement of any protection, relocation, or by-pass work the Contractor shall submit a work plan to the utility line Owner and the Engineer for approval. No relocation or by-pass work shall be performed without prior written approval of the work by the Owner of the utility line and the Engineer. Emergency protection of existing utility lines to protect the line from immediate damage may be performed by the Contractor without prior approval; however, the Contractor shall take every action available to notify the Owner and the Engineer of the situation as quickly as possible.

1.08 DAMAGE TO PRIVATE PROPERTY

- A. The Contractor shall be responsible for any damage to private property caused by the construction project. The Contractor upon receipt of a complaint of damage shall within 30 days respond in writing with a proposal to repair said damage or a letter with reasons explaining why the damage was not caused by the construction. The damage shall be repaired completely within 60 days of the complaint.

1.09 STAKING OUT THE WORK

- A. Horizontal / vertical control is established as shown on the Drawings. The Contractor is responsible for installing all pipelines to the lines and grades indicated on the Drawings. Should the Contractor desire copies of control information, he shall request in writing within 15 days of Notice of Award that the Engineer provide the same.
- B. The Contractor must be fully satisfied as to the meaning or correctness of all horizontal control points and benchmarks before commencing with the work. No claim will be entertained by the Owner for, or on account of any alleged inaccuracies unless the Contractor notifies the Engineer thereof in writing, before commencing with the work thereon. The Contractor will be held responsible for the preservation of all such control points and benchmarks in their positions. In case any of them are lost or destroyed and require replacement, all expenses incurred by the Engineer in replacing them shall be charged against the Contractor and paid for by him before the completion and final acceptance of the work. Payment for the staking out of the work shall be included in the per unit price of pipelines installed, as shown on the proposal. The determination of whether control points or benchmarks may require replacement is at the sole discretion of the Engineer.
- C. The Contractor must provide field property staking for all easement areas. Property corner staking for properties that do not have existing perimeter fencing shall be left with two (2) property corner stakes (18-inch rebar) installed by a licensed Texas Registered Professional Land Surveyor (RPLS).

1.10 APPROVAL OF EQUIPMENT AND MATERIALS

- A. All materials shall be new and shall be designed and manufactured for the function and service specified herein. No materials shall be used in the project except those that have been approved by the Engineer. Approval for installation or incorporation in the project will be made only after submittal and examination of shop and installation drawings, manufacturer's specifications, test results or other data required in the paragraph SHOP AND INSTALLATION DRAWINGS or in connection with the Technical Specifications. Final approval and acceptance of equipment will be made only after such equipment is in operation and has met all specified tests.

1.11 SHOP AND INSTALLATION DRAWINGS

- A. Shop and Installation Drawings, Installation Instructions, Manufacturer's Specifications, and all other pertinent data required by the Engineer to determine approval for installation of the materials and equipment, shall be submitted to the Engineer, as required by the General Conditions and Section 01300, of these Specifications. Such drawings and other data as required shall be submitted to the Engineer at the earliest practicable date. Delay in submission of shop drawings will not be grounds for granting an extension of time. Shop Drawings submitted to the Engineer without first having been checked by Contractor will be returned to the Contractor for such checking before being examined by the Engineer.
- B. Shop Drawings shall be complete, showing all pipelines pieces and fittings dimensions, anchor bolts or other mounting devices, openings in structures required for installation of connecting piping, and any other pertinent data necessary for determining compliance with the specifications and suitability of the installation and for the service intended.
- C. One initial shop drawing submittal consisting of the Contractor's requirement plus 5 complete sets and one re-submittal of an equal number of complete sets will be reviewed by the Engineer at no cost to the Contractor. Subsequent reviews on resubmitted shop drawings will be reviewed at a cost to the Contractor equal to the billing rate of the reviewing Engineer times the hours required to review the submittal.

1.12 DELIVERIES TO OWNER

- A. Contractor shall provide copies of paid material invoices with the monthly partial payment request to the Engineer, who will then forward the information to the Owner as a condition precedent to approval of payment of stored materials.
- B. Contractor shall keep delivery receipts with Project Record Documents.
- C. All deliveries to Owner shall be at the Owner's designated location on the job site. Location may vary according to materials delivered.
- D. Delivery of spare parts for equipment or packaged items shall be done at one time. Spare parts inventories shall not be delivered in a piece meal manner for items under one scope of supply. Spare parts deliveries shall be complete and ready for inventory and storage and without requiring additional items to be delivered.

- E. Contractor shall notify Owner and Engineer at least 24 hours in advance of all deliveries to Owner so that Owner is expecting delivery and may specify location of delivery.

1.13 NIGHTTIME, WEEKEND AND HOLIDAY WORK

- A. If the Contractor desires to perform any work between the hours of 6 p.m. and 7 a.m., or on Saturdays, Sundays or local or national holidays, he shall request in writing to do so before he starts such work. The Contractor shall acquire any necessary permits associated with such work and comply with all permit conditions and all laws and ordinances relating thereto.
- B. The Contractor shall reimburse the Owner for additional costs incurred as a result of providing additional inspection personnel when the Contractor performs the nighttime, weekend or holiday work. Additional inspection costs will be at the rate of \$70.00 per hour.

1.14 AS-BUILT DIMENSIONS & DRAWINGS

- A. The Contractor shall make appropriate daily measurements of facilities constructed and any existing utilities encountered (horizontal and vertical), and keep accurate records of all facilities.
- B. The Contractor's "As-Built" drawings will be reviewed as a condition of payment each month based on being up to date and acceptably accurate to the site conditions.
- C. Upon completion of each facility, the Contractor shall furnish the Engineer with one set of direct prints, marked with red pencil, to show as built dimensions and locations of work constructed.

1.15 TRAFFIC CONTROL

- A. Traffic control for all areas of the project shall be the responsibility of the Contractor. Seven days prior to commencing any work in specific areas of the project, the Contractor shall prepare and submit for Engineer's and right-of-way Owner's approval, Traffic Control plans for that particular work area. The traffic control plans shall conform with the specifications and principles given in the "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES: PART VI, latest edition and version issued by the Texas Department of Transportation.

1.16 VIDEO TAPING

- A. Prior to any construction, the wastewater line route and all other construction sites shall be videotaped by the Contractor accompanied by the Engineer, to show existing conditions of roadways, adjacent properties, easements, structures, utilities and other existing improvements. Two (2) copies of the videotape (DVD format) shall be given to the Engineer. Payment for videotaping shall be on a Lump Sum basis, as shown on the Proposal.

1.17 PROJECT SIGN

- A. A project sign shall be placed within the project boundary per United States Department of Agriculture - Rural Development and the County of El Paso requirements. The location of

project sign(s) shall be verified Owner and/or Owners Representative.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this contract.

END OF SECTION

SECTION 01014

TRENCH SAFETY SYSTEM

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, and equipment and perform all operations to plan, design, construct, install, maintain, monitor, modify as necessary, and remove, upon completion, a Trench Safety System as referenced in these specifications.
- B. The requirements of this section apply to all trenches that exceed five feet in depth, as measured from the ground surface at the highest side of the trench to the trench bottom.

1.02 RELATED REQUIREMENTS

- A. Section 02221: Excavating, Backfilling, and Compacting for Utilities
- B. State of Texas: HB 662, HB 665, and HB 1569
- C. United States Government: 29 CFR Part 1926, Occupational Safety and Health Standards (OSHA), Subpart P - Excavations, Trenching, and Shoring

PART 2 PRODUCTS

- 2.01 GENERAL: All materials and products incorporated into the Trench Safety System shall be suitable for their intended use; shall meet all design criteria and parameters used by the Trench Safety System designer in designing the system; and shall meet all applicable requirements of the OSHA regulations.

PART 3 EXECUTION

3.01 PROCEDURES

- A. The Contractor shall adhere to the site-specific Trench Safety System Plan for all portions of the work having trenches deeper than five feet.
- B. The plan shall be detailed to the extent that it shows the proposed limits (to the nearest foot) of the various types of trench safety systems the Contractor proposes to use.
- C. The Contractor shall be responsible for obtaining borings and detailed geotechnical analyses as required to develop the plan.
- D. After a review as to form only, without review for adequacy, by the Engineer and Owner's staff, the plan will be forwarded to the Owner and/or Project Representative for use in monitoring the Contractor's construction activities.
- E. Contractor accepts sole responsibility for compliance with all applicable safety requirements. The review by the Engineer and Owner's staff is only for general conformance with the State of Texas and OSHA safety standards. Release of the safety plan for use in monitoring

construction activities does not relieve Contractor from any or all construction means, methods, techniques and procedures; and any property damage or bodily injury (including death) that arises from use of the trench safety plan, from Contractor's negligence in performance of contract work, or from Engineer's or Owner's failure to note exceptions to the safety plan, shall remain the sole responsibility and liability of the Contractor.

- F. Changes in the Trench Safety Plan after initiation of construction, either for the Contractor's convenience or in response to unforeseen or differing conditions, are not cause for extension of time or change order, and will require the same review process as the original plan.

3.02 METHODS

- A. Contractor has three ways to meet OSHA Standards for trench safety and comply with the provisions of this section. The three methods are:

1. Use of a Trench Box
2. Shoring, Sheeting and Bracing Methods
3. Sloping and Benching Methods per Federal Register 29 CFR Part 1926

- B. Contractors electing to use a Trench Box shall include in the Trench Safety Plan:

1. Physical dimensions, type and grade of materials, positions in the trench, expected loads, strength of the box, and all associated design calculations necessary to show that the proposed trench box is adequate for the trench conditions expected to be encountered.
2. Waiver of claim for delay cost.

- C. Contractors electing to use Shoring, Sheeting and Bracing shall include in the Trench Safety Plan:

1. Dimensions, type and grade of materials of all uprights, stringers and cross braces and spacing of each required to meet OSHA Standards for trench safety and comply with the requirements of this section.
2. All associated design calculations necessary to show that the proposed system is adequate for the trench conditions expected to be encountered.
3. Waiver of claims for delay cost.

3.03 INSPECTION

- A. The Contractor shall provide a qualified person to make daily inspections of the Trench Safety Systems to ensure that the systems meet OSHA requirements. The Contractor shall maintain a permanent record of daily inspections.

- B. If evidence of possible cave-ins, or slides, is apparent, all work in the trench shall cease until the necessary precautions have been taken by the Contractor to safeguard personnel entering the trench. It is the sole duty, responsibility, and prerogative of the Contractor, not the

Owner, Engineer, or the Owner's designated representative, to determine the specific applicability of the designed trench safety systems to each field condition encountered on the project.

- 3.04 EMERGENCIES: In an emergency situation which may threaten or affect the safety or welfare of persons or property, the Contractor shall act at his discretion to prevent possible damage, injury or loss. Any additional compensation or extension of time claimed for such action shall be considered in view of the cause of the emergency and in accordance with provisions of the General Conditions.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. Measurement and payment for this bid item shall be covered under Bid Item Number 3 and included in the total Base Bid under this Contract.

END OF SECTION

SECTION 01015

CONTROL OF WORK

PART 1 GENERAL

1.01 STAGING AREA

- A. Prior to commencement of work, coordination must be completed. Coordination shall include: Contractor's Name with telephone number, name of the project, construction period, and location of work. Coordination shall be done with the following:
 - 1. All residences and business within 500 feet of the project site
 - 2. El Paso County Road & Bridge Department
 - 3. All Utility companies impacted by the project
 - 4. News Media (Upon approval of the County of El Paso)
- B. Contractor access to and around the designated site shall be proposed for approval.
- C. Contractor is to limit construction area to reduce disturbance to surroundings. Restore disturbed surrounding improvements to their pre-existing condition.
- D. A designated staging area(s) shall be established by the Contractor and shall be coordinated with the County of El Paso or their designated agent. The Contractor shall be required to maintain their work within the designated staging area(s). Contractor shall install temporary construction fencing for the staging area perimeter and along each phase of the construction.
- E. The Contractor shall make arrangements to have dedicated parking for the Contractor's Personnel and for the County of El Paso Personnel. The Contractor shall coordinate with surrounding businesses to provide adequate parking. The Owner shall be notified prior to construction of those arrangements.

1.02 SANITARY FACILITIES

- A. Provide and maintain sanitary facilities for persons on the job sites; comply with the regulations of State and local departments of health.
- B. Enforce the use of sanitary facilities by construction personnel at the job site. Such facilities shall be enclosed. Pit-type toilets will not be permitted. No discharge will be allowed from these facilities. Collect and store sewage and waste so as not to cause a nuisance or health problem; have sewer from sanitary facilities cleaned daily and waste hauled off-site and properly disposed daily.
- C. Locate toilets near the Work site. Keep toilets clean and supplied throughout the course of the work. After completion of the work, all temporary toilet facilities shall be removed from the site.

1.03 PROTECTION OF THE WORK AND PROPERTY

A. Preventive Actions:

1. Take precautions, provide programs, and take actions necessary to protect the work and public and private property from damage.
2. Take action to prevent damage, injury or loss, including, but not limited to, the following:
 - a. Store apparatus, materials, supplies, and equipment in an orderly, safe manner that will not unduly interfere with progress of the Work or the Work of any other Contractor, any utility service company, or the Owner's operations.
 - b. Provide suitable storage for materials which are subject to damage by exposure to weather, theft, breakage, or otherwise.
 - c. Place upon the Work or any part thereof only such loads as are consistent with the safety of that portion of the work.
 - d. Frequently clean up refuse, rubbish, scrap materials, and debris caused by construction operations, keeping the Project site safe and orderly.
 - e. Provide safe barricades and guard rails around openings, for scaffolding, for temporary stairs and ramps, around excavations, elevated walkways, and other hazardous areas.
 - f. Provide a security guard at the construction site for all periods that workers are not present.
3. Obtain written consent from proper parties before entering or occupying with workers, tools, materials or equipment, privately-owned land except on easements provided for construction.
4. Assume full responsibility for the preservation of public and private property on or adjacent to the site. If any direct or indirect damage is done by or on account of any act, omission, neglect, or misconduct in execution of the work by the Contractor, it shall be restored by the Contractor to a condition equal to or better than that existing before the damage was done.

1.04 CONSTRUCTION WATER

- A. It is the responsibility of the Contractor to obtain water for drilling and other project uses and pay any necessary application and/or usage fees. Potable water may be obtained through existing or new metered stand pipes. Obtainment of the water shall be coordinated with the Owner.

1.05 NOISE AND DUST CONTROL

- A. The Contractor shall so conduct his operations that they will not annoy the residents in the vicinity of the work, and shall comply with all applicable local ordinances. Compressors,

hoists, and other apparatus shall be equipped with such mechanical devices as may be necessary to minimize noise and dust. Compressors shall be equipped with silencers on intake lines. All gasoline or oil operated equipment shall be equipped with silencers or mufflers on intake and exhaust lines. Storage bins and hoppers shall be lined with material that will deaden the sounds if directed by Engineer. The operation of dumping rock and of carrying rock away in trucks shall be so conducted as to cause a minimum of noise and dust. Vehicles carrying rock, concrete, or other material shall be routed over such streets as will cause the least annoyance to the public and shall not be operated on public streets between the hours of 6 p.m. and 7 a.m. or on Saturdays, Sundays or legal holidays unless approved by the Owner.

- B. All unpaved streets, roads, detours, or haul roads used in the construction area shall be given an approved dust-preventive treatment or periodically watered to prevent dust as directed by the Engineer. Applicable environmental regulations for dust prevention shall be strictly enforced.

1.06 DRAINAGE CONTROL

- A. The Contractor shall have the responsibility to comply with all the necessary requirements for the Federal Register dated, September 9, 1992, Volume 57, No. 175 – FINAL NPDES GENERAL PERMITS FOR STORM DISCHARGES FROM CONSTRUCTION SITES (or latest revision thereof). The Contractor shall file the Notice of Intent (NOI) as required, a minimum of 2 days prior to commencement of any construction. The STORM WATER POLLUTION PREVENTION PLAN (SWPPP) shall be followed by the Contractor and adjusted as necessary following TCEQ requirements. The SWPPP shall be kept at the work site and updated as work progresses.
- B. The Contractor shall maintain adequate drainage within and through work areas. Earth dam drainage will not be permitted in paved areas. Temporary dams of sandbags, asphaltic concrete or other acceptable materials will be permitted when necessary to protect the work and/or the public, provided such use does not create a hazard or nuisance to the public. Such dams shall be removed from the site as soon as their use is no longer necessary.
- C. It will be the responsibility of the Contractor to schedule and perform his/her work so as to provide proper passage of any storm water during the course of his/her operations. All labor, tools, equipment and supervision required to assure such proper passage of runoff water and any removal or handling of water in order to maintain dry conditions shall be considered as incidental to the remainder of the work and shall be at the expense of the Contractor. Contractor shall perform his work in phases but is ultimately responsible for the entire project area.
- D. The Contractor shall submit a drainage plan that shows the provisions for providing proper passage of any storm water during the course of his/her operations. After a review as to form only, without review for adequacy, by the Engineer and Owner's staff, the plan will be forwarded to the Owner and/or Project Representative for use in monitoring the Contractor's construction activities
- E. Contractor is responsible for the full project site once the notice to proceed is issued. Contractor is responsible for the proper passage of runoff for the full project site.

1.07 SAFETY AND HEALTH REGULATIONS

- A. The Contractor shall comply with Safety and Health Regulations for Construction, promulgated by the Secretary of Labor under Section 107 of the Contract Work Hours and Safety Standards Act, as set forth in Title 29, C.F.R. Copies of these regulations may be obtained from Labor Building, 14th and Constitution Avenue, N.W., Washington, DC 20013.
- B. The Contractor shall also comply with the provisions of the Federal Occupational Safety and Health Act, as amended.
- C. All materials and chemicals delivered to the site shall be accompanied by a complete Material Safety Data Sheet. Hazardous chemicals will be specifically disallowed.
- D. The Contractor shall submit a comprehensive Project Safety Plan that details the safety measures that will be incorporated into every phase of the construction.

1.08 OPEN EXCAVATIONS

- A. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons and damage to property. The Contractor shall, at his own expense, provide suitable and safe bridges and other crossings for accommodating travel by pedestrians and workmen. Bridges provided for access during construction shall be removed when no longer required. The length or size of excavation will be controlled by the particular surrounding conditions, but shall always be confined to the limits prescribed by the Engineer. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the Engineer may require special construction procedures such as limiting the length of open trench, prohibiting stacking of excavated material in the street, and requiring that the trench shall not remain open overnight.

1.09 TEST PITS/ POTHOLING

- A. Test pits for the purpose of locating underground utilities or structures in advance of the construction (minimum 1,000 linear feet in advance or greater as determined by Engineer) shall be excavated and backfilled by the Contractor. Test pits shall be backfilled immediately after their purpose has been satisfied and the surface restored and maintained in a manner satisfactory to the Engineer.

1.10 DISTRIBUTION SYSTEMS AND SERVICES

- A. The Contractor shall not interrupt water, sewer, gas, telephone, cable TV, or other utility services without the written permission of the utility Owner.
- B. If it appears that utility service will be interrupted for an extended period, the Engineer may order the Contractor to provide temporary service lines. Inconvenience to the users shall be minimized, consistent with existing conditions. The safety and integrity of the system is of prime importance in scheduling work.
- C. The contractor shall not move, cut, or relocate private utilities (gas, electric, telephone, cable, TV, etc.) without the written permission of the appropriate utility company.

1.11 MAINTENANCE OF TRAFFIC

- A. Unless permission to close a street is received in writing from the proper authority, all excavated material shall be placed so that vehicular and pedestrian traffic may be maintained at all times. If the Contractor's operations cause traffic hazards, he shall repair the road surface, provide temporary ways, erect wheel guards or fences, or take other measures of safety satisfactory to the proper authority. Approval of a Traffic Control Plan may be required by the City of El Paso Engineering Department and/or Traffic Division, the Texas Department of Transportation, and/or the County of El Paso.
- B. Detours around construction will be subject to the approval of the Owner and the Engineer. Where detours are permitted, the Contractor shall provide all necessary barricades and signs as required to divert the flow of traffic. While traffic is detoured the Contractor shall provide all necessary barricades and signs as required to divert the flow of traffic. While traffic is detoured, the Contractor shall expedite construction operations and periods when traffic is being detoured will be strictly controlled by the Owner.
- C. The Contractor shall take precautions to prevent injury to the public due to open trenches and boring pits. Night watchmen may be required where special hazards exist, or police protection provided for traffic while work is in progress. The contractor shall be fully responsible for damage or injuries whether or not police protection has been provided.

1.12 CLEANUP

- A. During the course of work, the Contractor shall keep the site of his operations in as clean and neat a condition as is possible. He shall dispose of all residues resulting from the construction work and, at the conclusion of the work; he shall remove and haul away any surplus excavation, broken pavement, lumber, equipment, temporary structures, vegetation and any other refuse remaining from the construction operations and shall leave the entire site of the work in a neat and orderly condition.

1.13 CONTRACTORS QUALITY CONTROL

- A. All material shall be new and of the specified quality and equal to the accepted samples, if samples have been submitted. All work shall be done and completed in a thorough, work manlike manner, notwithstanding any omission from these Contract Documents; and it shall be the duty of the Contractor to call the Engineer's attention to apparent errors or omissions and request instructions before proceeding with the work. The Engineer may, by appropriate instructions, correct errors and supply omissions, which instructions shall be as binding upon the Contractor as though contained in the original Contract Documents.
- B. At the option of the Engineer, materials to be supplied under this Contract will be tested and/or inspected either at their place of origin or at their place of origin or at the site of the work. The Contractor shall give the Engineer written notification well in advance of actual readiness of materials to be tested and/or inspected at point of origin. Satisfactory tests and inspections at the point of origin shall not be construed as a final acceptance of the material nor shall it preclude retesting or reinspection at the site of the work.
- C. Material which will require testing and inspection at the place of origin shall not be shipped prior to such testing and inspection.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this contract.

END OF SECTION

SECTION 01016

CONTROL OF MATERIALS

PART 1 GENERAL

1.01 APPROVAL OF MATERIALS

- A. Unless otherwise specified, only new materials and equipment shall be incorporated into the Work. All materials and equipment furnished by the Contractor shall be subject to the inspection and approval of the Engineer. No material shall be delivered to the work without prior approval of the Engineer.
- B. As specified in Section 01300, the Contractor shall submit to the Engineer, data relating to materials and equipment he proposes to furnish for the Work. Such data shall be in sufficient detail to enable the Engineer to identify the particular product and to form an opinion as to its conformity to the Specifications.
- C. Facilities and labor for handling and inspection of all materials and equipment shall be furnished by the Contractor. If the Engineer requires, either prior to beginning or during the progress of the Work, the Contractor shall submit additional samples or materials for such special tests as may be necessary to demonstrate that they conform to the Specifications. Such samples shall be furnished, stored, packed, and shipped as directed at the Contractor's expense. Except as otherwise noted, the Owner will make arrangements for and pay for the tests.
- D. Any delay of approval resulting from the Contractor's failure to submit samples or data promptly shall not be used as the basis for a claim against the Owner or the Engineer.
- E. In order to demonstrate the proficiency of workmen or to facilitate the choice among several textures, types, finishes, and surfaces, the Contractor shall provide such samples of workmanship or finish as may be required.
- F. The materials and equipment used on the work shall correspond to the approved samples or other data.

1.02 HANDLING AND STORAGE OF MATERIALS

- A. All materials and equipment to be incorporated into the Work shall be handled and stored by the Contractor in a manner to prevent warping, twisting, bending, breaking, chipping, rusting, and any injury, theft or damage of any kind whatsoever to the material or equipment.
- B. All mechanical equipment subject to corrosive damage from exposure shall be stored in a building. The building may be a temporary structure on the site or elsewhere, but it must be satisfactory to the Engineer.
- C. All materials which, in the opinion of the Engineer, have become so damaged as to be unfit for the use intended or specified shall be promptly removed from the site of the Work, and the Contractor shall receive no compensation for the damaged material or its removal.
- D. All pipe and other materials delivered to the job shall be unloaded and placed in a manner

which will not hamper the normal operation of the Work or interfere with the flow of traffic.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this Contract.

END OF SECTION

SECTION 01020

TPDES REQUIREMENTS

PART 1 GENERAL

1.01 GENERAL

- A. The Texas Pollutant Discharge Elimination System (TPDES) Construction General Permit No. TXR 150000 was issued on March 5, 2013 (Construction General Permit). The Construction General Permit allows operators to obtain permit coverage for stormwater conveyance from Small and Large Construction Activities. The TPDES program implements the federal National Pollutant Discharge Elimination System (NPDES) program in the state of Texas, which requires that operators of Small or Large Construction Activities obtain permit coverage prior to the commencement of construction activities.
- B. The Engineer has estimated that the project will disturb approximately 2.45 acres of land. The Contractor is responsible to prepare a Storm Water Pollution Prevention Plan (SWPPP or SW3P) at no additional cost to the Owner if construction occurs outside of periods of low erosion potential for El Paso.

1.02 SECTION INCLUDES

- A. Documentation to be prepared and signed by Contractor before conducting construction operations, in accordance with the Texas Pollutant Discharge Elimination System (TPDES) Construction General Permit Number TXR 150000, issued on March 5, 2013 (Construction General Permit).
- B. Implementation, maintenance inspection, and termination of stormwater pollution prevention control measures including, but not limited to, erosion and sediment controls, stormwater management plans, waste collection and disposal, and other applicable practices as shown in Contractor prepared SWPPP.

1.03 DEFINITIONS

- A. Commencement of Construction Activities: The exposure of soil resulting from activities such as clearing, grading, and excavating.
- B. Large Construction Activity is defined as a project that:
 - 1. Disturbs five acres or more, or
 - 2. Disturbs less than five acres but is part of a large common plan of development that will disturb five acres or more of land.
- C. Small Construction Activity is a project that:
 - 1. Disturbs one or more acres but less than five acres, or

2. Disturbs less than one acre but is part of a larger common plan of development that will ultimately disturb one or more acres but less than five acres.
- D. Operator is a person or persons who have day-to-day operation control of the construction activities, which are necessary to ensure compliance with the SWPPP for the site.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 STORM WATER POLLUTION PREVENTION PLAN (SWPPP)

- A. The Contractor shall have an SWPPP prepared in accordance with Part III of the Construction General Permit for Small or Large Construction Activities if applicable. A professional engineer licensed in the state of Texas shall prepare the SWPPP, in accordance with County of El Paso ordinance.
- B. Support Activities within 1-mile distance of project boundary of the permitted construction site, which directly supports the project, should be included in the Storm Water Pollution Prevention Plan prepared for the Contractor. These activities include but are not limited to:
1. Equipment Staging Areas
 2. Material Storage yards
 3. Material Borrow areas
 4. Excavated material disposal areas
 5. Concrete batch plants
 6. Asphalt batch plants
- Refer to Part II, Section A of the Construction General Permit for a description of Discharges Eligible for Authorization under the Construction General Permit.
- C. The SWPPP will be updated as needed during construction following Part III, Section E of the Construction General Permit.
- D. The SWPPP shall be submitted to the Engineer 15 days after award of the contract. Any comments provided shall be addressed prior to commencing construction activities.
- E. The SWPPP shall be submitted to the County of El Paso Municipal Services for Review and Approval seven (7) days prior to commencement of construction activities. Refer to Part 3.01, Section E and Part 3.02, Section B for additional submittal requirements for Large and Small Construction Activities, respectively.
- F. The SW3P shall be implemented prior to commencement of construction activities and maintained through the duration of construction.

3.02 LARGE CONSTRUCTION ACTIVITY

A. NOTICE OF INTENT (NOI)

1. Prepare and submit NOI with required documentation and fees as required by the County of El Paso and TCEQ.
2. Provide copies of the approved SWP3 to the Engineer and El Paso County.

3.03 SMALL CONSTRUCTION ACTIVITY

A. CONSTRUCTION SITE NOTICE

1. Fill out, sign, and date the Construction Site Notice, included at the end of this Section. Submit the signed copy of the Construction Site Notice to the Engineer at least two days before commencement of construction activities.
2. Post a signed copy of the Construction Site Notice near the main entrance of a construction site in a prominent place for viewing by the general public and local, state, and federal authorities prior to commencing construction activities, and maintain it in that location until completion of the construction. Post name and telephone number of Contractor's local contact person, brief project description and location of SWPPP.

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. The Contractor shall submit a signed copy of the Construction Site Notice to the City of El Paso Municipal Services Department.

3.04 CERTIFICATION REQUIREMENTS

- A. Fill out Pollution Prevention Plan Certification Form to include the Operator's signature, name, title and organization.
- B. Contractor and Subcontractors shall sign and date Contractor's / Subcontractor's Certification for TPDES Permitting included at the end of this Section including Contractor's name, address, and telephone number, and the 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. Include this certification with other Project certification forms.
- C. Submit properly completed certification forms to the Engineer for review before commencing construction.
- D. Conduct inspections in accordance with TCEQ requirements. Ensure persons or firms responsible for maintenance and inspection of erosion and sediment control measure read, fill out, sign, and date the Erosion Control Contractor's Certification for Inspection and Maintenance. Use EPA's NPDES Construction Inspection Form included at the end of this Section. Controls must be inspected once every fourteen (14) calendar days and

within twenty four (24) hours of the end of a storm event of 0.5 inches or greater, in accordance with Part III, Section F, of the Construction General Permit.

3.05 RETENTION OF RECORDS

- A. Keep a copy of this document and the SWPPP in a readily accessible location at the construction site from Commencement of Construction Activity, and maintain it in that location until completion of the construction. Contractors with day-to-day operational control over SWPPP implementation shall have a copy of the SWPPP available at a central location, on-site, for the use of all operators and those identified as having responsibilities under the SWPPP.

3.06 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 the updated list with the SWPPP.
- C. 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 the description with the SWPPP.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this Contract.

END OF SECTION

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 GENERAL

- A. The unit price or lump sum price bid on each item as stated in the Proposal shall include furnishing all labor, superintendence, incidentals, machinery, supplies, equipment and materials necessary to complete the various items of work in accordance with the Design drawings and Specifications. Cost of work or materials shown on the Design drawings, called for in the Specifications and on which no separate payment is made shall be included in the bid price on the various pay items for which they are associated.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

PART 4 MEASUREMENT AND PAYMENT

4.01 INSURANCE, BONDS, AND MOVE-IN RELATED EXPENSES (BID ITEM NO.1)

- A. Shall include all costs for Contractor's mobilization and demobilization, insurance and bond, construction permits and fees, job trailers, site administration expenses, and utilities to the job trailers including power, telephone, etc. Shall include all costs for contract closeout, site cleanup, and all costs associated with Contractor's demobilization from the site. Payment for mobilization and demobilization shall be on a Lump Sum basis as noted in the Bid Schedule. 15% of this item shall be retained until the Project is complete and the Contractor has completed his demobilization. Mobilization Bid Item shall be limited to five (5) percent of the total bid price.

4.02 PRECONSTRUCTION VIDEO (BID ITEM NO. 2)

- A. Prior to any construction and then following completion of construction, the Contractor shall video tape the project limits, in the presence of the Engineer or his representative. Two copies in DVD format shall be furnished to the Engineer prior to construction and shall include labels including project title, Bid No. and date recorded.
- B. This item shall be paid on a lump sum price.

4.03 TRENCH SAFETY SYSTEM (BID ITEM NO. 3)

- A. Compliance with all Trench Safety requirements in accordance with all applicable federal, state, and local rules and regulations and as specified herein. This item shall include design by a Professional Engineer in the state of Texas, furnishing and installation of all trench excavation safety protection system to be utilized on this project.
- B. Measurement of Trench Safety Systems shall be determined by the length along the center line of the installed pipe using horizontal stationing.

- C. Payment for Trench Safety Systems, measured as described above, shall be made at the unit price bid per linear foot of Trench Safety Systems. Payment of all work under this item shall be full compensation for the Trench Safety Systems including any design, testing, inspection, or additional excavation and backfill required, for furnishing, placing, maintaining and removing all shoring, sheeting, caissons, or bracing, for required compaction, and for all other labor, materials, tools, equipment, and incidentals necessary to complete the Trench Safety System work.
- D. Shall be paid for on a Lump Sum basis and shall include preparation of a formal TCP by a Texas licensed professional engineer; submitting and obtaining approval of the formal TCP from the required governing agencies; furnishing, installing, and maintaining the approved TCP Plan complete for the duration of the project; implementing and maintaining the TCP in conformance to the specifications and principles given in the “Texas Manual on Uniform Traffic Control Devices” over the entire project area; and all other incidentals required for Contractor to complete, implement, and maintain the TCP requirements. All costs for this work shall be included in the Contractor’s lump sum price and shall be complete compensation for complete performance of this work.

4.04 TRAFFIC CONTROL PLAN (BID ITEM NO. 4)

- A. Measurement shall be paid for on a Lump Sum basis.
- B. This item shall include preparation of a formal TCP by a Texas licensed professional engineer; submitting and obtaining approval of the formal TCP from the required governing agencies; furnishing, installing, and maintaining the approved TCP Plan complete for the duration of the project; implementing and maintaining the TCP in conformance to the specifications and principles given in the “Texas Manual on Uniform Traffic Control Devices” over the entire project area; and all other incidentals required for Contractor to complete, implement, and maintain the TCP requirements. All costs for this work shall be included in the Contractor’s lump sum price and shall be complete compensation for complete performance of this work.

4.05 6-INCH PVC FORCEMAIN DR-18 (BID ITEM NO. 5)

- A. Measurement shall be the actual linear feet of pipe installed by open cut methods.
- B. Work under this item includes furnishing all labor, new materials and equipment and performing all operations necessary to construct the sanitary sewer force main in conformance with plans and specs.
- C. Payment for force main shall be made at the unit.

4.06 8-INCH PVC SEWER PIPE SDR-35 (BID ITEMS NO. 6)

- A. Work under this item shall include all costs associated with coordination; excavation; disposal of excess material; backfilling and embedment; compaction and compaction testing for utilities; furnishing and laying the pipe joint assembly and accessories; testing; and all appurtenances defined herein to include, but not limited to the following items: locating, protecting, supporting, relocating (i.e. waterlines), if required, and repairing damage to any utilities or structures encountered in the process of the work (including, but not limited to: all fences, signs, foundations, utility service vaults, fire hydrants, walls, driveways, gravel

surfacing, chip seal, pavement, vegetation, resident gas tanks, stairways, steps, decks, removal and replacement of concrete slab at 12801 Montana Avenue, etc.); temporary bypass where required; clearing and grubbing along sewer line alignment; leakage testing of the sewer line, connections to existing sewer system infrastructure, and all other items of the project not indicated as being covered under the other specific bid items shown on the Proposal. Such payment shall be complete compensation for the complete performance of the work in accordance with the drawings and the provisions of these specifications.

B. This item will be measured for payment by the linear foot.

4.07 48-INCH POLYMER SANITARY SEWER MANHOLES (BID ITEM NO. 7)

A. This item will be measured for payment by each.

B. Work under this item includes furnishing all labor, new materials and equipment and performing all operations necessary to construct the sanitary sewer manholes 6-feet or less in depth. Depth is defined as the distance from the top of the cast iron frame to the invert of the sewer. This includes any extra excavation, backfill, concrete base, concrete or brick walls, conical section, frame and cover, providing an external protective bituminous coating such as coal tar epoxy, interior epoxy coating, and any other facility or work necessary for the complete manhole. Testing and any stub-outs shown on the plans shall be paid under this item.

4.08 48-INCH POLYMER SANITARY SEWER MANHOLES ADDITIONAL VERTICAL DEPTH (BID ITEM NO. 8)

A. The additional depth of manhole risers shall be measured by the vertical foot as determined by measuring the total depth of a manhole from its base to the top of its frame and subtracting 6 feet from the total measured depth.

B. This item will be measured by vertical foot.

4.09 4-INCH SANITARY SEWER SERVICE (MAIN TO ROW) (BID ITEM NO. 9)

A. Measurement shall be per each service.

B. Stub-out to ROW line inclusive of appurtenances, complete in place.

4.10 4-INCH PRIVATE SERVICE CONNECTION (ROW TO HOUSE) (BID ITEM NO. 10)

A. Measurement shall be for each service connection furnished and completely installed and accepted by the Engineer.

B. Payment for service connections, service taps and related appurtenances shall be made at the unit price bid as stated in the Proposal and will be compensation in full for furnishing and installing the necessary materials and work as follows:

1. Base course, removals and replacements, excavation, service tee to the main, riser pipe as required, connection to existing resident sewer service lines, fittings as required, service lateral from the riser to the property line, slope leveling, horizontal and vertical location As-built records, plugs and/or caps, stakes, metallic marking

tape, accepted HMAC paving patch work, line marker, and any other work or appurtenance as required for the successful installation as indicated on the Drawings and specified in these Specifications.

2. Service stub-outs shall be installed in accordance with the specifications and drawings.

4.11 DE-SEPTIC, PUMP HAUL, SAND, PERMITS (BID ITEM NO. 11)

- A. Work shall include complete removal of existing septic tanks and its contact, including waste hauling, waste disposal, waste permitting process, fees, and approvals, septic tank excavation, backfill and compaction to original grade.
- B. Any and all decommissioning and hauling shall be approved by and meet all County of El Paso On-site Sewage/Environmental Department requirements. The County of El Paso approval fee of \$50 per septic tank decommission. Applications may be obtained from the County of El Paso On-site Sewage/Environmental Department located at 14612 Greg "C" in El Paso, Texas 79938.
- C. Payment of this item shall be based on a per each existing septic tank decommissioning. Work shall include furnishing all materials, labor, tools and incidentals and for performing all operations required to furnish to the Owner the project, complete in place, as specified in the drawings and specifications.

4.12 REMOVE AND REPLACE PAVEMENT AND INSTALL 2-IN (TYPE D) HMAC (BID ITEM NO. 16)

- A. Measurement shall be made on a square yard basis where the centerline of the pipeline is located within the pavement. Paving is to be removed and replaced with Cement Stabilized Backfill and HMAC per the Plans and Specifications and will be paid to the limits described therein.
- B. No extra payment for excess pavement cut and/or replacement shall be made without prior written approval by the Engineer. Payment will be made at the unit price bid and will be compensation in full for all removals and for furnishing and placing all material, labor, compaction, equipment, and incidentals necessary to complete the work in accordance with the Plans and these Specifications. Pavement replacement cost shall include saw cutting and re-stripping. Pavements damaged as a result of Contractor operations or as a result of the movement of Contractor equipment or vehicles shall be replaced to pre-existing conditions at Contractor expense.

4.13 LIFT STATION – (BID ITEM NO. 13 & 14)

- A. Measurement shall be paid for on a Lump Sum Basis.
- B. All work shall be per Contract Plan Sheets, including Structural, Electrical, and any other corresponding details as needed for the completion of a fully operational lift station. Included but not limited for providing excavation installation, pre-fabricated fiberglass wet well and valve vault, new piping, fittings, pumps, pump bases & anchors, header, valves, guide rails, safety grates, supports, grading, and paving, landscaping gravel, bollards, pavement, header curb, rock walls, foundations as shown on the plans, chain link fence,

swing gate, odor control unit, access ladder, installing pumps, ponding area, control room, all electrical and structural improvements, excluding items noted elsewhere on the bid form. Water for testing of the lift station shall be the responsibility of the contractor. All training for all lift station appurtenances shall be included under this item.

- C. Payment for this item shall be made at the stated lump sum price. Payment shall include all labor, equipment, fees, and any incidentals necessary for the completion of the work. Such payment shall be complete compensation for the complete performance of the work in accordance with the drawings and the provisions of the specifications.

END OF SECTION

SECTION 01040
COORDINATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project coordination.
- B. Construction mobilization.
- C. Schedules.
- D. Submittals.
- E. Closeout procedures.
- F. Permits

1.02 RELATED SECTIONS

- A. General Conditions.
- B. Section 01700 - Contract Closeout: Contract Closeout Procedures.

1.03 PROJECT COORDINATION

- A. The Contractor shall be responsible for ascertaining the nature and extent of any collateral work done by others or work by other trades. The Contractor shall include in his bid all costs associated with coordinating with others or work by other trades. The Contractor shall not be entitled to additional compensation from the Owner resulting from such simultaneous or collateral work, nor shall concurrent work be the reason extension to the contract time. Contractor shall be aware of any and all concurrent work in the area that will require coordination for tie-ins of his work. If necessary to avoid or minimize damage or delay, the Contractor shall re-deploy his work force to other areas of the work, at no cost to the Owner. The Contractor shall be responsible for the coordination with the County of El Paso and for all coordination with utility companies as necessary for the timely completion of the project.

The Contractor shall be required to notify all adjacent commercial and residential property owners of the proposed work prior to commencing construction. The notification shall include the anticipated construction schedule and brief scope of work. As stated on the design drawings, Contractor sequencing will need to consider business owner operations along Montana Avenue.

1.04 CONSTRUCTION MOBILIZATION

- A. It is the Contractor's responsibility to locate a mobilization area that suits the execution of this project. The Owner and Engineer shall be notified of this location and shall have full access throughout the duration of the contract
- B. Cooperate with the Owner and Engineer in allocation of mobilization areas of site; access, traffic, and parking facilities.
- C. During construction, coordinate use of site and facilities with the County of El Paso, local

residents, and local businesses.

- D. Comply with the Owner's procedures for project communications; submittals, reports and records, schedules, coordination of drawings, and recommendations; and resolution of ambiguities and conflicts.
- E. Comply with instructions of the Owner and Engineer for use of temporary utilities and facilities and construction facilities.

1.05 SCHEDULES

- A. Submit preliminary progress schedule.
- B. After review and approval, revise and resubmit schedule to comply with revised Project Schedule.
- C. During progress of work, revise and resubmit Project Schedule with Applications for Payment.
- D. Contractor shall update the Project Schedule at least monthly.

1.06 SUBMITTALS

- A. Submit shop drawings, product data and samples in accordance with Section 01300 for review and compliance with Contract Documents, for field dimensions and clearances, for relation to available space, and for relation to work of separate contracts. Revise and resubmit as required.
- B. Submit requests for interpretation of Contract Documents, and obtain instructions through the Owner.
- C. Process requests for substitutions, and change orders, through the Owner or his designated agent.
- D. Deliver closeout submittals for review and preliminary inspection reports.

1.07 PERMITS

- A. Permits are currently being obtained for certain crossings (TxDOT and El Paso County Water Improvement). The contractor will be required to work on areas that do not require permitting until these permits are obtained. Areas requiring permits from TxDOT and EPCWID#1 are highlighted in red in the attachment.
- B. El Paso Electric service to the lift station property is not expected to be complete until after 40 weeks approximately. The schedule provided by the contractor shall keep in mind the need for this electrical service to be done towards the end of the Project.

1.07 CLOSEOUT PROCEDURES

- A. Notify Owner and Engineer when Work is considered ready for Substantial Completion. Accompany the Owner and Engineer on preliminary inspection to determine items to be listed for completion or correction in Contractor's Notice of Substantial Completion.
- B. Comply with the Owner's instructions to correct items of work listed in executed Certificates of Substantial Completion.

- C. Notify the Owner and Engineer when Work is considered finally complete.
- D. Comply with the Owner's and Engineer's instructions for completion of items of work determined by the Owner's and Engineer's final inspection.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this contract.

END OF SECTION

SECTION 01090

REFERENCE STANDARDS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Abbreviations and acronyms used in Contract Documents to identify reference standards.

1.02 QUALITY ASSURANCE

- A. Application: When a standard is specified by reference, comply with requirements and recommendations stated in that standard, except when requirements are modified by the Contract Documents or applicable codes establish stricter standards.
- B. Publication Date: The publication in effect on the date of issue of Contract Documents, except when a specific publication date is specified.

1.03 ABBREVIATIONS, NAMES, AND ADDRESSES OF ORGANIZATIONS

- A. Obtain copies of referenced standards direct from publication source when needed for performance of Work, or when required for submittal by Contract Documents.

AA	Aluminum Association 818 Connecticut Avenue, N.W. Washington, DC 20006
AABC	Associated Air Balance Council 1000 Vermont Avenue, N.W. Washington, DC 20005
AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol Street, N.W. Washington, DC 20001
ACI	American Concrete Institute Box 19150 Reford Station Detroit, MI 48219
ADC	Air Diffusion Council Box 19150 Reford Station Detroit, MI 48219
AI	Asphalt Institute Asphalt Institute Building College Park, MD 20740
AISC	American Institute of Steel Construction 1221 Avenue of the Americas New York, NY 10020
AISI	American Iron and Steel Institute 1000 16 th Street, N.W. Washington, DC 20036

AMCA	Air Movement and Control Association 30 West University Drive Arlington Heights, IL 60004
ANSI	American National Standards Institute 1430 Broadway New York, NY 10018
ARI	Air-Conditioning and Refrigeration Institute 1815 North Fort Meyer Drive Arlington, VA 22209
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers 1791 Tullie Circle, N.E. Atlanta GA 30329
ASME	American Society of Mechanical Engineers 345 East 47 th Street New York, NY 10017
ASTM	American Society for Testing and Materials 1916 Race Street Philadelphia, PA 19103
AWWA	American Water Works Association 6666 W. Quincy Avenue Denver, CO 80235
AWPA	American Wood-Preservers' Association 7735 Old Georgetown Road Bethesda, MD 33125
AWS	American Welding Society 2501 NW 7 th Street Miami, FL 33125
CRSI	Concrete Reinforcing Steel Institute 180 North LaSalle Street, Suite 2110 Chicago, IL 60601
FM	Factory Mutual System 1151 Boston-Providence Turnpike Norwood, MA 02062
FS	Federal Specification General Services Administration Specifications and Consumer Information Distribution Section (WFSIS) Washington Navy Yard, Bldg. 197 Washington, DC 20407
GA	Gypsum Association 1603 Orrington Avenue Evanston, IL 60201
MIL	Military Specification Naval Publications and Forms Center 5801 Tabor Avenue Philadelphia, PA 19120
MLSFA	Metal Lath/Steel Framing Association 221 North LaSalle Street Chicago, IL 60601

NAAMM	National Association of Architectural Metal Manufacturers 221 North LaSalle Street Chicago, IL 60601
NEBB	National Environmental Balancing Bureau 8224 Old Courthouse Road Vienna, VA 22180
NEMA	National Electrical Manufacturers' Association 2101 L. Street, N.W. Washington, DC 20037
NFPA	National Forest Products Association 1619 Massachusetts Avenue, N.W. Washington, DC 20036
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 20076
PCI	Prestressed Concrete Institute 20 North Wacker Drive Chicago, IL 60606
PS	Product Standard U.S. Department of Commerce Washington, DC 20203
SDI	Steel Deck Institute Box 3812 St. Louis, MO 63122
SIGMA	Sealed Insulation Glass Manufacturers Association 111 East Wacker Drive Chicago, IL 60601
SJI	Steel Joist Institute 1703 Parham Road Suite 204 Richmond, VA 23229
SMACNA	Sheet Metal and Air Conditioning Contractor's National Association 8224 Old Court House Road Vienna, VA 22180
TCA	Tile Council of America, Inc. Box 326 Princeton, NJ 08540
UL	Underwriters' Laboratories, Inc. 333 Pfingston Road Northbrook, IL 60062

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this contract.

END OF SECTION

SECTION 01110

ENVIRONMENTAL PROTECTION PROCEDURES

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The work covered by this Section consists of furnishing all labor, materials, and equipment and performing all work required for the prevention of environmental pollution in conformance with applicable laws and regulations, during and as the result of construction operations under this Contract. For the purpose of this Specification, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and/or recreational purposes.
- B. The control of environmental pollution requires consideration of air, water, and land, and involves management of noise and solid waste, as well as other pollutants.
- C. Schedule and conduct all work in a manner that will minimize the erosion of soils in the area of the work. Provide erosion control measures such as diversion channels, sedimentation or filtration systems, berms, staked hay bales, seeding, mulching, or other special surface treatments as are required to prevent silting and muddying of streams, rivers, impoundments, lakes, etc. All erosion control measures shall be in place in an area prior to any construction activity in that area.
- D. These Specifications are intended to ensure that construction is achieved with a minimum of disturbance to the existing ecological balance between a water resource and its surroundings. These are general guidelines. It is the Contractor's responsibility to determine the specific construction techniques to meet these guidelines.

1.02 APPLICABLE REGULATIONS

- A. Comply with all applicable federal, state, and local laws and regulations concerning environmental pollution control and abatement.

1.03 NOTIFICATIONS

- A. The Engineer may notify the Contractor in writing of any noncompliance with the foregoing provisions or of any environmentally objectional acts and corrective action to be taken. State or local agencies responsible for verification of certain aspects of the environmental protection requirements shall notify the Contractor in writing, of any noncompliance with state or local requirements. The Contractor shall, after receipt of such notice from the Engineer or from the regulatory agency immediately take corrective action. Such notice, when delivered to the Contractor or his/her authorized representative at the site of the work, shall be deemed sufficient for the purpose.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EROSION CONTROL

- A. Provide positive means of erosion control such as shallow ditches around construction to carry off surface water. Erosion control measures, such as siltation basins, hay check dams, mulching, jute netting and other equivalent techniques, shall be used as appropriate. Flow of surface water into excavated areas shall be prevented. At the completion of the work, ditches shall be backfilled and the ground surface restored to original condition. See Section 01500.

3.02 PROTECTION OF STREAMS

- A. Care shall be taken to prevent any damage to any stream drain or canal from pollution by debris, sediment, or other material, or from the manipulation of equipment and/or materials in or near such stream drains or canals. Water that has been used for washing or processing, or that contains oils or sediments that will reduce the quality of the water in the stream drain or canal, shall not be directly returned to the stream drain or canal. Such waters will be diverted through a settling basin or filter before being directed into the stream drains or canals.
- B. All preventive measures shall be taken to avoid spillage of petroleum products and other pollutants. In the event of any spillage, prompt remedial action shall be taken.
- C. Water being flushed from structures or pipelines after disinfection, with Chlorine residual greater than 0.099 mg/L, shall be collected and removed from the site. Contractor shall obtain Engineer's approval for method of disposal. Hypo chlorinated water may be disposed of on site if it is dechlorinated to potable levels prior to discharges in natural drainages or MS4. Energy dissipaters or controlled rates of release must be used if potential downstream erosion exists.

3.03 PROTECTION OF LAND RESOURCES

- A. Land resources within the project boundaries and outside the limits of permanent work shall be restored to a condition, after completion of construction that will appear to be natural and not detract from the appearance of the project. Confine all construction activities to existing permanent, temporary easements or areas designated by the Engineer.
- B. Outside of areas requiring earthwork and/or facilities for drainage for the construction of the new facilities, the Contractor shall not deface, injure, or destroy trees or shrubs, nor remove or cut them without prior approval.
- C. Monuments and permanent markers shall be protected similarly before beginning operations near them.
- D. The locations of the Contractor's staging area, storage, and other construction buildings, required temporarily in the performance of the work, shall be cleared portions of the job site. The preservation of landscape shall be an imperative consideration in the Contractor's use of these sites and in the construction of temporary facilities.
- E. For temporary roads or embankments and excavations for work areas, the Contractor shall submit the following for approval at least 10 days prior to start of such temporary work.

1. A layout of all temporary roads, excavations and embankments to be constructed within the work area.
 2. Details of temporary road construction.
 3. Drawings and cross sections of proposed embankments and their foundations, including a description of proposed materials.
- F. Remove all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess of waste materials, or any other vestiges of construction, in an environmentally sound manner.

3.04 PROTECTION OF AIR QUALITY

- A. Burning - The use of burning for the disposal of refuse and debris will not be permitted.
- B. Dust Control - The Contractor will be required to maintain all excavations, embankment, stockpiles, access roads, plant sites, waste areas, borrow areas, and all other work areas within or without the project boundaries free from dust which could cause the standards for air pollution to be exceeded and which would cause a hazard or nuisance to others. See Section 01500. The need to control dust (fugitive) from open-bed trucks hauling earth, debris, rubble, refuse or other material into and out of the project area requires the open-bed trucks be covered with a tarp, cover or be sufficiently wetted to prevent fugitive dust emissions.

Texas Administrative Code (TAC) 111.143 "Materials Handling" requires further that materials hauled in an open-bed truck be covered with a tarp when transporting materials (earth, debris, gravel, and like material that can contribute to dust emissions) outside of the construction site. The use of suitable water and chemical suppressant is allowable.

In addition, under Texas Administrative Code 101.4, no person shall create a discharge that adversely affects the use of property, human health, vegetation, animal life. Furthermore TAC 101.5 prohibits that no person shall create a discharge that adversely affects traffic safety or creates obstruction of traffic.

- C. Sprinkling or other similar methods will be permitted to control dust. The use of water and or an approved dust suppressant is allowable. The use of petroleum products, chloride based suppressants or asphalt is not permitted.
- D. Sprinkling must be repeated at such interval as to satisfactorily prevent dust and the Contractor must have sufficient competent equipment on the job to accomplish this at all times. The Contractor shall inhibit the creation of dust to the complete satisfaction of the Engineer.

3.05 MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION

- A. During the life of this Contract, maintain all facilities constructed for pollution control as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created.

3.06 NOISE CONTROL

- A. The Contractor shall make every effort to minimize noises caused by his/her operations. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise in compliance with local, state and federal regulations.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this Contract.

END OF SECTION

SECTION 01200

PROJECT MEETINGS

PART 1 GENERAL

1.01 PRECONSTRUCTION MEETING

- A. A Preconstruction meeting shall be held in accordance with the General and Supplemental Conditions.

1.02 PROGRESS AND SPECIAL MEETINGS

- A. Owner may request meetings with Contractor and its Subcontractors at any time during progress of Contract. It will be Contractor's responsibility to provide to Owner whatever information is requested by Engineer.
- B. Contractor shall attend bi-weekly meetings called by Engineer. Owner's representatives will be invited to attend meetings.
 - 1. It is generally intended that meetings will be complete within 2 hours; however, Contractor shall attend meeting until completion of all pertinent discussions.
 - 2. Engineer will chair all project meetings.
 - 3. Agenda of project meetings:
 - a. Varies to include, but is not limited to, general progress discussions of work to be performed and maintenance of overall progress schedule.
 - b. Engineer will provide project meeting minutes to all meeting participants.
 - 4. Construction work requiring shutdowns or major utility tie-ins shall be discussed by the Contractor at the meeting preceding such construction.
 - 5. The Contractor shall provide a written 2-week look-ahead schedule showing planned activities and locations of planned work.
- C. The CONTRACTOR shall conduct its safety meetings in accordance to the provisions of Part 1.03, Contractor Safety Meetings.

1.03 CONTRACTOR SAFETY MEETINGS

- A. Location of the meetings: Project field office of CONTRACTOR or other suitable location.
- B. Attendance:
 - 1. CONTRACTOR'S Safety Manager
 - 2. OWNER or his Safety/loss Control Representative.

3. Subcontractors as appropriate to the agenda.
 4. Suppliers as appropriate to the agenda.
 5. Others as appropriate.
- C. The CONTRACTOR is to conduct safety meetings and is to study previous meeting minutes and current agenda items, in order to be prepared to discuss pertinent topics.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this Contract.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittal procedures.
- B. Construction progress schedules.
- C. Proposed Products list.
- D. Product Data.
- E. Shop Drawings.
- F. Samples.
- G. Design data.
- H. Test reports.
- I. Certificates.
- J. Manufacturer's instructions.

1.02 RELATED SECTIONS

- A. General Conditions.

1.03 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Owner accepted form.
- B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- C. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate.
- D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
- E. Schedule submittals to expedite the project, and deliver to Owner. Coordinate submission of related items.
- F. For each submittal for review, allow five (15) days excluding delivery time to and from the Contractor.

- G. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed work.
- H. Provide space for Contractor and Engineer review stamps.
- I. When revised for resubmission, identify all changes made since previous submission.
- J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- K. Submittals not requested will not be recognized or processed.

1.04 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit initial schedule in accordance with the General Conditions.
- B. Revise and resubmit as required.
- C. Submit revised schedules with each Application for Payment, identifying changes since previous version.
- D. Submit a computer generated horizontal bar chart with separate line for each major portion of work or operation, identifying first work day of each week.
- E. Show complete sequence of construction by activity, identifying work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.
- F. Indicate estimated percentage of completion for each item of work at each submission.
- G. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner and required by Allowances.

1.05 PROPOSED PRODUCTS LIST

- A. Within 15 days after date of Notice to Proceed, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.06 PRODUCT DATA

- A. Submit the number of copies which the Contractor requires, plus two copies which will be retained by the Owner and Engineer.
- B. Mark each copy to identify applicable products, models, options and other data. Supplement manufacturer's standard data to provide information unique to this project.
- C. After review distribute in accordance with the Submittal Procedures article above and

provide copies for record documents described in Section 01700 - Contract Closeout.

1.07 SHOP DRAWINGS

- A. Submit a minimum of six (6) copies of each submittal to the Owner to be reviewed by the Engineer. Review of shop drawings by the Engineer shall not relieve the Contractor of the responsibility for complying with all requirements of the Contract Documents.
- B. After review, Contractor shall produce copies and distribute in accordance with Submittal Procedures article above and for record documents purposes described in Section 01700 - Contract Closeout.

1.08 SAMPLES

- A. Samples For Review:
 - 1. Submit to Owner for Engineer's review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
 - 2. After review, Contractor shall produce duplicates and distribute in accordance with Submittal Procedures article above and for record documents purposes described in Section 01700 - Contract Closeout.
- B. Samples For Selection:
 - 1. Submit to Owner for aesthetic, color, or finish selection.
 - 2. Submit samples of finishes from the full range of manufacturers' standard colors, textures, and patterns for Owner selection.
 - 3. After review, Contractor shall produce duplicates and distribute in accordance with Submittal Procedures article above and for record documents purposes described in Section 01700 - Contract Closeout.
- C. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- D. Include identification on each sample, with full Project information.
- E. Submit the number of samples specified in individual specification sections; one of which will be retained by the Owner and the Engineer.
- F. Reviewed samples that may be used in the Work are indicated in individual specification sections.
- G. Samples will not be used for testing purposes unless specifically stated in the specification section.

1.09 TEST REPORTS

- A. Submit test reports to the Owner and Engineer, for information for the limited purpose of

assessing conformance with information given and the design concept expressed in the contract documents.

1.10 CERTIFICATES

- A. When specified in individual specification sections, submit certification by the manufacturer, installation/application subcontractor, or the Contractor to Owner and Engineer, in quantities specified for Product Data.
- B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Owner.

1.11 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, adjusting, and finishing, to Engineer for delivery to Owner in quantities specified for Product Data.
- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this contract.

END OF SECTION

SECTION 01410

TESTING LABORATORY SERVICES

PART 1 GENERAL

1.01 TESTS

- A. Where tests of materials or any portions of the Work are required by Law/Ordinance or public authority, the Contractor shall bear all costs of such tests, shall give timely notice of readiness therefore and shall furnish to the Engineer the required certification of testing or approval.
- B. Tests specified in the Technical Specifications shall fall into four categories:
 - 1. Those required for approval of materials prior to use, which serve the same purpose as shop drawings or samples;
 - 2. Those required by law;
 - 3. Those necessary for acceptance of equipment, or facilities; and,
 - 4. Those made during the progress of the Work to check compliance with the requirements of the Contract Documents.

The Contractor shall bear all the costs of the tests in the first three categories.

- C. Tests conducted in the fourth category shall be carried out at the discretion of the Engineer. The cost for testing materials in this category shall be paid for by the Owner, with the following exceptions:
 - 1. The Contractor shall furnish the materials for any samples and shall fully cooperate with the Engineer or Testing Laboratory in securing such samples.
 - 2. Employment of the laboratory shall in no way relieve Contractor's obligations to perform the Work of the Contract.
 - 3. At the option of the Engineer the source of supply of each of the materials shall be accepted by him before the delivery is started and before such material is used in the work. Representative preliminary samples of the character and quality prescribed shall be submitted by the Contractor or producer of all materials to be used in the work for testing or examination as desired by the Engineer.
 - 4. The Owner will pay all testing invoices which have met the specifications. The Contractor will pay for all test failures and erroneous job site visits. No time extension for delays will be considered by the Owner.

1.02 RELATED REQUIREMENTS

- A. Conditions of the Contract: Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities.

- B. Respective Sections of Specifications: Certification of products.
- C. Testing Laboratory inspection, sampling and testing is required for:
 - 1. Section 02221: Excavating, Backfilling, and Compacting for Utilities
 - 2. Section 03300: Cast-In-Place Concrete

1.03 LABORATORY DUTIES

- A. Cooperate with Engineer and Contractor; provide qualified personnel after due notice.
- B. Perform specified inspections, sampling and testing of materials and methods of construction:
 - 1. Comply with specified standards.
 - 2. Ascertain compliance of materials with requirements of Contract Documents.
- C. Promptly notify Engineer and Contractor of observed irregularities or deficiencies of work or products.
- D. Promptly submit five copies of written report of each test and inspection to Engineer. Each report shall include:
 - 1. Date report issued.
 - 2. Project title and number.
 - 3. Testing laboratory name, address and telephone number.
 - 4. Name and signature of laboratory inspector.
 - 5. Date and time of sampling or inspection.
 - 6. Record of temperature and weather conditions.
 - 7. Date of laboratory test.
 - 8. Identification of product and specification section.
 - 9. Location of sample or test in the Project.
 - 10. Type of inspection or test.
 - 11. Results of tests and compliance with Contract Documents.
 - 12. Interpretation of test results, when requested by Engineer.
- E. Perform additional tests as required by Engineer or the Owner.

1.04 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

- A. Laboratory is not authorized to:
 - 1. Release, revoke, alter or enlarge on requirements of Contract Documents.
 - 2. Approve or accept any portion of the Work.
 - 3. Perform any duties of the Contractor.

1.05 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with laboratory personnel; provide access to Work, and to Manufacturer's operations.
- B. Secure and deliver to the laboratory adequate quantities of representative samples of materials proposed to be used and which require testing.
- C. Provide to the Engineer the preliminary design mix proposed to be used for concrete, and other materials and mixes which require control by the testing laboratory.
- D. Furnish copies of Products test reports.
- E. Furnish incidental labor and facilities:
 - 1. To provide access to Work to be tested.
 - 2. To obtain and handle samples at the Project site or at the source of the product to be tested.
 - 3. To facilitate inspections and tests.
 - 4. For storage and curing of test samples.
- F. Notify Engineer sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.
 - 1. When tests or inspections cannot be performed after such notice, reimburse Owner for laboratory personnel and travel expenses incurred due to Contractor's negligence.
- G. Make arrangements with Engineer and pay for additional inspections, sampling and testing required:
 - 1. For the Contractor's convenience.
 - 2. When initial tests indicate Work does not comply with Contract Documents.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this Contract.

END OF SECTION

SECTION 01560

TEMPORARY CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary Controls: Barriers and fencing, protection of the work, water control, dust control, erosion and sediment control, noise control, and pollution control.

1.02 RELATED SECTIONS

- A. General Conditions.
- B. Section 01040 – Project Coordination.

1.03 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way.
- C. Provide protection for plant life designated to remain. Replace damaged plant life.
- D. Provide vehicular traffic controls pre-approved by TxDOT and the County of El Paso..
- E. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.04 WATER CONTROL

- A. Grade site to drain. Maintain excavations free of water.
- B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- C. It will be the responsibility of the Contractor to schedule and perform his/her work so as to provide proper passage of any storm water during the course of his/her operations. All labor, tools, equipment and supervision required to assure such proper passage of runoff water and any removal or handling of water in order to maintain dry conditions shall be considered as incidental to the remainder of the work and shall be at the expense of the Contractor. Contractor shall perform his work in phases but is ultimately responsible for the entire project area.

1.05 SECURITY

- A. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons and damage to property. The Contractor shall, at his own expense, provide suitable and safe bridges and other

crossings for accommodating travel by pedestrians and workmen. Bridges provided for access during construction shall be removed when no longer required. The length or size of excavation will be controlled by the particular surrounding conditions but shall always be confined to the limits prescribed by the Engineer. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the Engineer may require special construction procedures such as limiting the length of open trench, prohibiting stacking of excavated material in the street, and requiring that the trench shall not remain open overnight.

- B. The Contractor shall take precautions to prevent injury to the public due to open trenches. All trenches, excavated material, equipment, or other obstacles which could be dangerous to the public shall be protected with barricades having flashing warning lights at all times when appropriate to insure safety and when construction is not in progress.

1.06 DUST CONTROL

- A. The 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 the limits of construction. Reasonable measures may include paving, frequent road cleaning, planting vegetative groundcover, application of water or application of chemical dust suppressants.
- B. Utilize methods and practices of construction to eliminate dust in full observance of agency regulations.
- C. The Owner will determine the effectiveness of the dust control program and may request the Contractor to provide additional measures, at no additional cost to Owner.
- D. Water used for control of dust shall be provided by the Contractor.

1.07 EROSION AND SEDIMENT CONTROL

- A. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
- B. Minimize amount of bare soil exposed at one time.
- C. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
- D. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
- E. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

1.08 PROTECTION OF STREAMS, LATERALS AND CANALS

- A. Care shall be taken to prevent any damage to any stream, lateral or canal from pollution by debris, sediment, or other material, or from the manipulation of equipment and/or materials in or near such streams. Water that has been used for washing or processing, or that contains oil that may reduce the quality of the water in the stream, lateral or canal shall not be returned to the stream, lateral or canal. Such waters will be removed from the site.

- B. The Contractor shall not discharge water from dewatering operations directly into any live or intermittent stream, channel, wetlands, surface water, or any lateral without the approval of the appropriate regulating agency.
- C. All preventative measures shall be taken to avoid spillage of petroleum products and other pollutants. In the event of any spillage, prompt remedial action shall be taken in accordance with local and state agency regulations.

1.09 NOISE CONTROL

- A. Provide methods, means, and facilities to minimize noise produced by construction operations.

1.10 POLLUTION CONTROL

- A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.
- B. The control of environmental pollution requires consideration of air, water, land, and involves management of noise and solid waste, as well as other pollutants.
- C. During the life of this Contract, maintain all facilities constructed for pollution control as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this contract.

END OF SECTION

SECTION 01600

PROGRESS SCHEDULES

PART 1 GENERAL

1.01 REQUIREMENTS

- A. The schedule of Work shall be based on the period of time within which this Contract is to be completed (Contract Completion Time).
- B. If required by the Engineer, within 10 calendar days following Notice of Award the Contractor shall provide a statement to the Engineer describing his computerized schedule for review and approval. This statement shall include the following as a minimum:
 - 1. Identification, qualifications, and experience of the member(s) of the Contractor's scheduling staff or any other consultant's scheduling staff.
 - 2. The name and description of the project management software and computer hardware to be utilized on this Contract.
 - 3. See General Conditions.
- C. Within 15 calendar days following Notice of Award, Contractor shall prepare and submit to Engineer his proposed Schedule of Work, as described in this Section, with sub schedules of related activities which are essential to its progress. These include, but are not limited to: Submittals, fabrication, delivery, installation, testing and start-up schedules.
- D. If required, included with the Schedule of Work, Contractor shall submit a written Traffic Control Plan, which shall identify how heavy equipment shall be routed through the construction areas throughout the construction period, as required in these Specifications. The Traffic Control Plan shall specify timing of road and street closures as required to perform the Work under this Contract. In addition, the Contractor shall submit at this time an "S-curve" type of schedule noting early start and late finish dates, being weighted based on the value of the scheduled completion of the various tasks.
- E. Contractor shall submit updated Schedule of Work and "S-curve" schedule monthly, or more frequently when required and acceptable to the Engineer.
- F. The Contractor shall also prepare a 2-week look-ahead schedule showing planned activities and locations of planned work. This schedule shall be updated and distributed at the specified bi-weekly progress meetings.
- G. All schedules shall be submitted to Engineer for acceptance and shall be subject to coordination with requirements of work performed under other projects which may be in progress.
- H. Contractor's Schedule is to be considered and used as a working tool.

1.02 FORM OF SCHEDULES

- A. The Schedule of Work shall utilize the Gantt Chart: Contractor shall prepare, maintain, and furnish current detailed progress and schedule charts using the Gantt Chart supporting Contract performance dates. Schedule shall identify Work in Contract in sufficient detail to ensure compliance with Contract dates, schedules, and sequences of construction.
- B. The Gantt Chart shall be maintained throughout life of Contract. Contractor shall designate an authorized representative within its firm who will be responsible for preparation of the Gantt Chart network plan and schedule and for monitoring progress of project.
- C. Contractor shall develop a network plan and schedule demonstrating fulfillment of all Contract requirements, keep network up-to-date in accordance with requirements of this Section and shall utilize network plan for scheduling, coordinating, and performing Work under this Contract (including all activities of Subcontractors, equipment vendors, and suppliers). The Gantt Chart techniques will be utilized to satisfy both time and cost applications. Principles and definitions of terms used herein shall be as set forth in Associated General Contractors of America (AGC) publications.
- D. Contractor is deemed to have included in the Total Bid Price a sum of money sufficient to pay for all costs attendant to the scheduling requirements of this Section, throughout the Contract completion time. Owner shall have right to withhold progress payments due to Contractor in the event that schedules are not maintained current or submitted as specified. Preparation, content, submittal, review and use of the network plan and schedule are as set forth below.
 - 1. Schedule submittal: Within 25 calendar days following Award of Contract, Contractor shall submit to the Engineer complete Gantt Chart network plan. Size of network plan sheet or sheets shall be limited to 24-inch x 36-inch. A schedule of estimated monthly progress payments shall be developed by Contractor and submitted with the Gantt Chart network plan. A schedule of Shop Drawing submittals and reviews shall also be included.
 - 2. Within 7 calendar days after receipt of Schedule, Engineer will meet with Contractor for joint review, and any necessary correction or adjustment of proposed network plan. Within five calendar days after joint review, Contractor shall submit three copies of revised schedule to Engineer. Resubmittal will be reviewed by Engineer and if found to be as previously agreed upon, will be accepted. Accepted schedule shall constitute Project Schedule of Work until subsequently updated in accordance with requirements of this Section. The submission of schedules by Contractor, as required herein are not only required for the verification of progress payments, but also informing Owner and Engineer of the status of the Project in order that Owner and Engineer may evaluate project progress, Contractor change order requests, or other proposed changes to the Project.
 - 3. Acceptance of Contractor's Schedule by Engineer will not relieve Contractor from compliance with all conditions of the Contract. Errors and omissions in accepted Contractor's Schedule will not be cause for future claims by Contractor for extra costs or increased Contract Time. Comments made by the Engineer on the Contractor's Construction Schedule during review will not relieve the Contractor from compliance with requirements of the Contract Documents. This review is only for general conformance with the schedule concept of the project and general

compliance with the information given in the Contract Documents.

4. Network plan shall show sequence and interdependence of activities required for complete performance of all items of Work under this Contract. Contractor shall exercise sufficient care to produce a clear, legible, and accurate network plan. Network plan shall show the following for each work activity:
 - a. Concise description of work represented by activity.
 - b. Duration (in work days).
 - c. Early and late start dates, and early and late finish dates.
 - d. Percent complete.
5. Work activities in network plan shall be sufficiently detailed to identify all major items of Work included in this Contract, including procurement and delivery of materials, and including shutdowns and restarts.
6. Contractor shall also submit with network plan:
 - a. Proposed number of working days per week.
 - b. Holidays to be observed during duration of Contract (by day and month).
 - c. Planned number of shifts per day.
 - d. Number of hours per shift.
 - e. Average manpower usage planned monthly by major trades. Trades shall include as a minimum: carpenters, laborers, operators, ironworkers, electricians, pipe fitters, masons, and painters.
7. All schedules are Contractor's schedules, prepared by him and he remains solely responsible for adherence thereto.
8. Project control: Once a month or more frequently if warranted, Contractor shall review progress of Work to that date. He shall collect information, with aid of field superintendents for all Subcontractors, on all jobs scheduled to be worked on during previous monthly period including Shop Drawings, material procurement, and Change Orders that may have been issued in this period. Information shall be evaluated and compared with original plan and schedule. Project problems will be reviewed and Contractor shall take necessary measures to keep Project on schedule. Any changes shall be incorporated into the schedule.
9. If latest completion time for any significant job does not come within time allowed by Contract, including all extensions, sequence of jobs, and performance of jobs shall be revised by Contractor through either concurrent operations, additional manpower, additional shifts, and significant Contract completion and occupancy times will be met. No additional cost will be allowed by Owner to Contractor or to any Subcontractor for overtime, additional manpower, equipment, or additional

shifts if such expediting procedures are necessary.

10. Each month, Contractor shall update the Project Schedule of Work and “S-curve” schedule and shall submit to Engineer three copies for review and acceptance. Updates shall include all revisions required under item 9 above, percentage completion by work activity, as well as any revisions to Shop Drawing schedule and information included under item 6 above.
11. Changes to Schedule: Contractor may at any time make changes to his current plan and schedule upon notification to Engineer. Contractor shall submit changes to network plan and schedule for any of the following reasons:
 - a. When delay in completion of any activity or group of activities indicates an extension of scheduled Project completion including delays which may be involved with change orders, unusual weather, etc.
 - b. Delays in submittals or deliveries or work stoppages are encountered which make replanning or rescheduling of Work necessary.
 - c. Schedule does not represent actual prosecution and progress of Project.
12. Engineer’s acceptance of changes to Schedule and all relevant data is contingent upon compliance with all other paragraphs of this Section and any other previous agreements or requirements by Engineer.
13. Contractor’s cost of revisions to Schedule due to any cause shall be responsibility of Contractor.
14. Adjustment of Contract completion: Contract Time will be adjusted only by Change Order for causes specified in this Contract. In the event Contractor requests an extension of Contract Time, he shall furnish such justification, the Gantt Chart data, and supporting evidence as follows for a determination as to whether or not Contractor is entitled to an extension of Time under provisions of Contract: all Gantt Chart logic revisions, durations changes, and cost changes for Work in question and its relationship to other activities on accepted, current network plan. Submission of proof based on network activity logic and durations is obligatory with any Contractor request for extension of time. Schedule must clearly display that Contractor has used, in full, all float time available for Work involved in this request. For other than critical path work, Contractor shall use available float times for Owner requested changes. Contractor shall not reserve float time for subsequent contracted requested changes. Engineer’s determination as to total number of days of Contract extension shall be based upon current Schedule at time of alleged delay and all other relevant information and provisions of Contract. Schedule data shall be included in next monthly updating of Schedule. Actual delays in activities which according to network plan and schedule do not affect Contract Completion Date will not be basis for a change of Contract Completion Date. Engineer shall review facts within a reasonable time after receipt of Contractor request for extension of Time and supporting evidence, and shall advise Contractor in writing thereof.
15. Contractor shall submit a brief narrative report as part of monthly update. Narrative report shall include a description of problem areas; current and anticipated delaying

factors and their estimated impact on performance of other activities and completion dates; and an explanation of corrective action taken or proposed.

- E. The initial Contractor's payment request will be evaluated by the Engineer if the initial schedule submittal has been made. Subsequent payment requests made by the Contractor will not be evaluated by the Engineer until the revised Contractor's schedule (as defined in paragraph 1.02.D.2) has been accepted by the Engineer.
- F. All "float time" i.e. the time indicated on the Contractor's Progress schedule between the early start time and late start time, and early finish time and late finish time is owned by the Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this Contract.

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Closeout procedures
- B. Final cleaning
- C. Adjusting
- D. Project record documents
- E. Warranties and bonds
- F. Maintenance service

1.02 RELATED SECTIONS

- A. General Conditions

1.03 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's review.
- B. Provide submittals to Engineer and Owner.
- C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- D. Follow Lower Valley Water District's close out procedures as required.

1.04 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
- B. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- C. Clean debris from gutters, downspouts, and drainage systems.
- D. Clean site; sweep paved areas, rake clean landscaped surfaces.
- E. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.05 ADJUSTING

- A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

1.06 PROJECT RECORD DOCUMENTS

- A. Maintain on-site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings
 - 2. Specifications
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract
 - 5. Reviewed Shop Drawings, Product Data, and Samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:
 - 1. Manufacturer's name and product model and number
 - 2. Product substitutions or alternates utilized
 - 3. Changes made by Addenda and modifications
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured elevations of pavement foundations in relation to the site benchmark.
 - 2. Field changes of dimension and detail
 - 3. Details not on original Contract drawings
- G. Submit documents to Owner and Engineer with claim for final Application for Payment.

1.07 WARRANTIES AND BONDS

- A. Provide duplicate notarized copies.
- B. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and

manufacturers.

- C. Provide Table of Contents and assemble in ring binder(s) with durable plastic cover.
- D. Submit prior to final Application for Payment.
- E. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this contract.

END OF SECTION

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Contractor shall maintain at Site for the Engineer and Owner:
 - 1. One record copy of:
 - a. Specifications
 - b. Addenda
 - c. Change Orders and other Modifications to Agreement
 - d. Reviewed Shop Drawings and Samples
 - e. Field test records
 - 2. Two copies of Record Drawings, marked and updated each working day.

1.02 RELATED REQUIREMENTS

- A. Section 01300: Submittals.

1.03 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Contractor shall store documents in Contractor's field office apart from documents used for construction.
 - 1. Provide files and racks for storage of Documents and Samples.
- B. Contractor shall file Documents and Samples in accordance with Construction Specifications Institute (CSI) format.
- C. Contractor shall maintain Documents in clean, dry, legible condition, and in good order. Do not use Record documents for construction purposes.
- D. Contractor shall make Documents available at all times for reference by Engineer or Owner.

1.04 MARKING PENS

- A. Contractor shall provide felt tip marking pens for recording information in color code designated by Engineer.

1.05 RECORD DRAWINGS AND SPECIFICATIONS

- A. Contractor shall label each of the two sets of Record Drawings with "PROJECT RECORD"

in neat large printed letters.

- B. Contractor shall record information concurrently with construction progress. Do not cover any Work until required information is recorded.
- C. Drawings shall be legibly marked by Contractor to record actual construction (As-Built). Use symbols acceptable to the Engineer.
- D. During progress of Project, Contractor shall keep careful record at Site of all changes and corrections from layouts shown, on two separate sets of drawings. Contractor shall enter such changes and corrections on prints of Contract Drawings (marked "PROJECT RECORD") within a day of the times the changes are made. Record Drawings shall also indicate in addition to changes and corrections, actual location, diameter and pipe materials of all subsurface utility lines encountered. In order that location of these lines and appurtenances may be determined in the event of surface openings or indicators become covered over or obscured, Record Drawings shall show, by installation elevation and offset dimension to two permanently fixed surface features, end of each run including each change in direction. Manholes shall be located by stationing along utility run from reference point. At time of Substantial Completion of each facility involved under Contract, Contractor shall submit to Engineer, Record Drawings, Specifications and Addenda showing aforementioned data. Engineer will not recommend interim payment or final payments for Project until above requirements have been fulfilled by Contractor.
- E. Specifications and Addenda shall be legibly marked by Contractor to record:
 - 1. Manufacturer, trade name, catalog number, and supplier of each product and item or equipment actually installed.
 - 2. Changes made by field order or by Change Order.
 - 3. Changes made to the text of the specifications due to change orders, selection of options, substitutions and information on concealed construction.
 - 4. Follow procedures similar to those noted above for Record Drawings.

1.06 SUBMITTAL

- A. At Substantial Completion, Contractor shall deliver Record Drawings and Specifications to Engineer for Owner.
- B. Accompany submittal with transmittal letter in duplicate, containing:
 - 1. Date
 - 2. Project title and number
 - 3. Contractor's name and address
 - 4. Title and number of each Record Document
 - 5. Signature of Contractor or his/her authorized representative

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this Contract.

END OF SECTION

SECTION 01740

GUARANTEES AND WARRANTIES

PART 1 GENERAL

1.01 RELATED REQUIREMENT

A. General – Section 01010: Warranty ; tests.

1.02 PROJECT MAINTENANCE AND GUARANTEE

A. The Contractor shall maintain and keep in good repair, the work covered by these Contract Documents during the life of this Contract.

1. The Contractor shall indemnify the Owner against any repairs which may become necessary to any part of the work performed and to items of equipment, and systems procured for or furnished under this Contract, arising from defective workmanship or materials used therein, for a period as described in the General Conditions of the Specifications.
2. All equipment, spare parts, supplies, materials, special tools, and any other items installed or supplied by the Contractor shall be warrantied by the Contractor for a period of 1 year from the date of Final Completion.
3. The Contractor shall, at his own expense, furnish all labor, materials, tools, and equipment required and shall make such repairs and removals or shall perform such work of reconstruction, as may be made necessary by any structural or functional defect or failure resulting from neglect, faulty workmanship, or faulty materials, in any part of the work performed by him. Such repair shall also include refilling of trenches, roadways, excavations, or embankments which show undue settlement or erosion after backfilling or placement.
4. Except as noted on the Drawings or as specified, all structures such as embankments, levees, fences, etc., shall be returned to their original condition prior to the completion of the Contract. Any and all damage to any facility, not designated for removal, resulting from the Contractor's operations shall be promptly repaired by the Contractor at no cost to the Owner.
5. The Contractor shall be responsible for all new and reconstructed/repaired work, including the reconstruction or repair of any road, street, and/or entrance damaged as a consequence of his operations, and/or repairs and maintenance of same for a period of one year from the date of Final Completion. In the event the repairs and maintenance are not made immediately to the satisfaction of the Engineer, and it becomes necessary for the Owner of the road or street to make such repairs, the Contractor shall reimburse the Owner of the road or street for the cost of such repairs.
6. In the event the Contractor fails to proceed to remedy the defects of which he has been notified within 7 days of the date of such notice, The Owner reserves the right to cause the required materials to be procured and the work to be done, as described

in the General Conditions and to hold the Contractor and his sureties liable for the cost and expense thereof.

7. All equipment warranties for periods of longer than one year shall be assigned to the Owner after the one-year warranty period specified herein and in the General Conditions.

1.02 PROCESS WARRANTIES

- A. Certain items of construction are specified as to performance. Should these items fail to perform as specified, the Contractor shall make all required modifications or replacement necessary to achieve the specified results at no additional cost to the Owner.

1.03 SUBMITTAL REQUIREMENTS

- A. Assemble warranties and certificates of executed by each of respective manufacturers, suppliers and subcontractors.
- B. Number of original signed copies required: 2 each.
- C. Table of Contents: Neatly typed, using Table of Contents of Project Manual as format.
- D. Provide complete information for each item.
 1. Name and location of project.
 2. Name and address of Contractor.
 3. Product, equipment or system.
 4. Firm, with name and principal, address and telephone number.
 5. Scope.
 6. Date of beginning and duration of warranty.
 7. Provide information for Owner's personnel:
 - a. Proper procedure in case of failure.
 - b. Instances which might affect validity of warranty.

1.04 FORM OF SUBMITTALS

- A. Assemble warranties and certificates in two separate 3-ring binders.
- B. Format:
 1. Size: 8-1/2 in. x 11 in., fold larger sheets to fit into binders.
 2. Indexing: Tabbed fly-leaf for each separate product or system.

3. Identification: Each binder cover and spine printed with title “WARRANTIES” and project title and bid number.
- C. Binders: Commercial quality, 3-ring, with durable and cleanable plastic covers, custom printed.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this Contract.

END OF SECTION

SECTION 02010

SUBSURFACE INVESTIGATION

PART 1 GENERAL

- 1.01 The Contractor is solely responsible for the success of any trench system or any other subsurface operation as shown on the drawings. The Contractor is encouraged to obtain any and all information necessary to enable the efficient and successful completion of this work without damage to existing facilities. The cost of any additional information shall be the sole responsibility of the Contractor.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this contract.

END OF SECTION

SECTION 02100

SITE PREPARATION AND DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Demolition of roadway pavement structure, curb and gutter, sidewalks, concrete and all items related to the project and disposal of materials from site.
- B. Removal of vegetation, loose aggregate and waste from project site.

1.02 RELATED SECTIONS

- A. Section 01040 – Project Coordination
- B. Section 01700 – Contract Closeout.

1.03 REGULATORY REQUIREMENTS

- A. Conform to applicable code for demolition work, dust control, products requiring electrical disconnection and re-connection.
- B. Obtain required permits from authorities.
- C. Do not close or obstruct ingress/egress width to any site entrance or exit.
- D. Conform to procedures applicable when hazardous or contaminated materials are discovered.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Shop Drawings: Indicate demolition and removal sequence and location of salvageable items; location and construction of barricades, fences and temporary work.

1.05 SCHEDULING

- A. Schedule work under the provisions of Section 01300.
- B. Schedule work to coincide with new construction.
- C. Describe demolition removal procedures and schedule.
- D. Coordinate schedule with Owner for performance of noisy, malodorous, or dust producing work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PREPARATION

- A. Provide, erect, and maintain temporary barriers and security devices at the perimeter of the construction site areas.
- B. Protect existing landscaping materials, appurtenances, and structures which are not to be demolished.
- C. Mark location of utilities.

3.02 DEMOLITION REQUIREMENTS

- A. Conduct demolition to minimize interference with adjacent structures and building occupancies.
- B. Cease operations immediately if adjacent structures appear to be in danger. Notify Engineer. Do not resume operations until directed.
- C. Conduct operations with minimum interference to public or private accesses. Maintain protected egress and access at all times.
- D. Obtain written permission from adjacent property owners when demolition equipment will traverse, infringe upon or limit access to their property.
- E. Sprinkle work with water to minimize dust. Provide hoses and water connections for this purpose.

3.03 DEMOLITION

- A. Identify utilities within demolition areas.
- B. Remove HMAC pavement related roadway elements per project drawings and specifications
- C. Rough grade and compact areas affected by demolition to match proposed grades and contours.
- D. Remove demolished materials from site.
- E. Do not burn or bury materials on site. Leave site in clean condition.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. Measurement and payment shall be in accordance with Section 01025 of these specifications.

END OF SECTION

SECTION 02221

EXCAVATING, BACKFILLING, AND COMPACTING FOR UTILITIES

PART 1 GENERAL

1.01 STATUTORY REQUIREMENTS

- A. All excavation, trenching and related sheeting, bracing, etc. shall comply with the requirements of OSHA excavation safety standards (29 CFR part 1926.650 Subpart P) and any State or local requirements. Where conflicts between OSHA, State, and local regulations exist, the most stringent requirements shall apply.
- B. INDEMNIFICATION: The Contractor shall indemnify and hold harmless the Owner, its employees and consultants, from any and all damages, costs (including without limitation, legal fees, court costs, and the cost of investigation), judgments or claims, by anyone, including workers or the general public, for injury or death of persons resulting from the collapse or failure of trenches/excavations constructed under this contract. The Owner acknowledges and agrees that this indemnity provision provides indemnity for the Owner in case that claims are made that the Owner is negligent either by act or omission in providing for trench safety, including, but not limited to inspections, failure to issue stop work orders, and the hiring of the Contractor.

1.02 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, superintendence, tools and incidentals necessary to perform trenching for pipelines and appurtenances, including drainage, filling, backfilling, disposal of surplus material, and restoration of trench surfaces and easements.
- B. Excavation shall extend to the width and depth shown on the drawings or as specified and shall provide suitable room for placing shoring, pipe embedment and installing pipe, structures, and appurtenances.
- C. Furnish and place all sheeting, bracing, and supports and remove from the excavation all materials which the Engineer may deem unsuitable for backfilling.
- D. Whatever the requirement for any percentage of compaction is referred to herein shall mean "at least that percentage of maximum density as determined by ASTM D1557."

1.03 RELATED WORK

- A. Environmental Protection Procedures is included in Section 01110.
- B. Trench Safety System is included in Section 01014.
- C. Pipelines are included in Sections 02610 and 02622.

1.04 SUBMITTALS

- A. Trench excavation support system designs shall be prepared by a licensed Professional Engineer, registered in the State of Texas, having a minimum of five years of

professional experience in the design and construction of excavation support systems. Submit an original and a minimum of three (3) copies of the licensed Professional Engineer's certification, on the P.E. form included in Section 01300, stating that the excavation support systems designs have been prepared by the Professional Engineer and that the Professional Engineer will be responsible for their execution. See also Section 01010.

PART 2 PRODUCTS

2.01 GENERAL

- A. Materials designated for use in this section are specified in Section 02235.
- B. Timber used for excavation support systems shall be pressure treated with wood preservative for ground contact.
- B. Filter fabric shall be Mirafi 140N, Supac equivalent, or approved equal.

PART 3 EXECUTION

3.01 TRENCH EXCAVATION SUPPORT

- A. This item covers the requirements for the Contractor to provide the design and construction of trench safety for all trenches excavated. Refer to SUPPLEMENTARY CONDITIONS and Section 01010 - General, of these specifications for additional information regarding TRENCH EXCAVATION SAFETY SYSTEM.
- B. The Contractor shall furnish, put in place, and maintain a trench safety system to support the sides of the excavations where required, to prevent movement which could in any way diminish the width of the excavation below that necessary for proper construction, and to protect structures, pipelines, streets, drains, canals and utilities from damage due to lateral movement or settlement of ground.
- C. The trench safety system shall be suitable for construction of pipelines, utilities, etc. that are installed below grade and shall be sufficient to fully protect public or private property including other existing utilities and structures below, or above grade. Trench safety systems include, but are not limited to, sheeting, trench boxes or trench shields, sheet piling, cribbing, bracing, shoring, or diversion of water to provide adequate drainage.
- D. The Contractor shall be responsible for the design of systems, and procedures such as the use of sheet piling, shoring, or other means of temporary support to protect existing buildings, streets, highways, water conveying structures, and any other structures. In the case of existing utilities, the Contractor may elect to remove the utilities under the stipulated condition that the removal and subsequent replacement of these utilities shall meet with the approval of the Engineer, the Owner, the utility owner, and all agencies having jurisdiction of the structure or property. In all cases, the Contractor shall be fully responsible for the protection of public or private property and for protection of any person or people who, as a result of the Contractor's work, may be injured.

No Trenching in excess of five (5) feet below existing grade will be allowed until the trench excavation plan is reviewed and returned to the Contractor. The review is only for

general conformance with OSHA safety standards; and review of the trench excavation plan does not relieve the Contractor of any or all construction means, methods, techniques, and procedures. Any changes in the trench excavation plan after initiation of construction will not cause an Extension of Time or Change Order but such changes will require the same review process as the original excavation plan.

- E. CONSTRUCTION METHODS: Trench safety systems shall be accomplished in accordance with the detailed specifications set out in the provisions of Excavations, Trenching, and Shoring, 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. 54, No. 209), on October 31, 1989. The sections that are incorporated into these specifications by reference include Sections 1926-650 through 1926-652. Legislation that has been enacted by the Texas Legislature (H.B. No. 662 and H.B. 665) with regard to trench safety systems, is hereby also incorporated, by reference, into these specifications.
- F. SAFETY PROGRAM: The Contractor shall submit a safety program specifically for the construction of trench excavations together with the trench excavation plans for trench safety systems. The trench safety program shall be in accordance with OSHA Standards governing the presence and activities of individuals working in and around trench excavation.
1. Contractors have the following accepted methods, or combinations thereof, to meet OSHA Standards for Trench Excavation:
 - a. Utilization of Trench Box.
 - b. Shoring, Sheeting, and Bracing Methods.
 - c. Sloping and Benching Methods per Federal register 29 CFR Part 1926
 2. A Contractor electing to utilize a trench box must submit physical dimensions, materials, position in the trench, expected loads, and the strength of the box. The trench box shall be designed by a Professional Engineer. No claims for delay will be permitted.
 3. A Contractor electing to utilize shoring, sheeting, and bracing must submit dimensions and materials of all uprights, stringers, cross bracing, and spacing required to meet OSHA requirements, all designed by a Professional Engineer. No claims for delay will be permitted.
- G. Sheeting and Bracing
1. The Contractor shall furnish, put in place, and maintain such sheeting and bracing as may be required to protect personnel, to support the sides of excavations, to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction, and to protect adjacent structures from undermining or other damage. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed and the cause of such voids investigated. Where soil cannot be properly compacted to fill void, and where acceptable to

the Engineer, lean concrete shall be used to fill the void at no additional cost to the Owner.

2. The Contractor shall leave in place to be embedded in the backfill all sheeting the Engineer may direct him in writing to leave in place at any time during the progress of the work for the purpose of preventing injury to structures, utilities, or property. The Engineer may direct that timber used for sheeting and bracing be cut off at any specified elevation. See Section 02200, Paragraph 3.02 for further description regarding support left in place.
 3. All sheeting and bracing not left in place shall be carefully removed in such manner as not to cause excessive loading on the installed piping, and to not endanger the construction or other structures, utilities, or property. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted for that purpose, or otherwise as may be directed.
 4. The right of the Engineer to order sheeting and bracing left in place shall not be construed as creating any obligation on his part to issue such orders, and his failure to exercise his right to do so shall not relieve the Contractor from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of failure on the part of Contractor to leave in place sufficient sheeting and bracing to prevent any caving in or moving of the ground.
 5. No wood sheeting is to be completely withdrawn if driven below mid-diameter of any pipe, and under no circumstances shall any wood sheeting be cut off at a level lower than 1 foot above the top of any pipe.
 6. When movable trench bracing such as trench boxes, moveable sheeting, shoring, or plates are used to support the sides of the trench, care shall be taken in placing and moving the boxes or supporting bracing to prevent movement of the pipe, or disturbance of the pipe bedding or backfill.
 - a. When installing rigid pipe, any portion of the box extending below mid-diameter shall be raised above this point prior to moving the box ahead to install the next pipe. This is to prevent the separation of installed pipe joints due to movement of the box.
 - b. When installing flexible pipe, trench boxes, moveable sheeting, shoring, or plates shall not be allowed to extend below mid-diameter of the pipe. As trench boxes, moveable sheeting, shoring or plates are moved, screened gravel shall be placed to fill any voids created and the screened gravel and backfill shall be re-compacted to provide uniform side support for the pipe.
- H. The Contractor shall provide a qualified person to make daily inspections of the trench safety systems to ensure that the systems meet OSHA requirements. The contractor shall maintain a permanent record of these daily inspections.

If the evidence of possible cave-ins, or slides, is apparent, all work in the trench

shall cease until the necessary precautions have been taken by the Contractor to safeguard personnel entering the trench. It is the sole duty, responsibility, and prerogative of the Contractor, not the Owner, the Owner's designated representative, or the Engineer to determine the specific applicability of the designed trench safety systems to each field condition encountered on the project.

- I. In any emergency situation which may threaten or affect the safety or welfare of persons or property, the Contractor shall act at his discretion to prevent possible damage, injury, or loss. Any additional compensation or extension of time claimed for such action shall be considered in view of the cause of the emergency and in accordance with the general conditions.
- J. OSHA Safety and Health Regulation Part 1926: (See pages at the end of the section)

3.02 TRENCH EXCAVATION PROCEDURES

- A. Existing concrete and asphaltic pavement, sidewalk, curb, or driveway removed in connection with construction shall be replaced to neatly sawed edges. Saw cuts shall be made to a minimum depth of 1½-inches or ¼ the thickness of the concrete, whichever is greater. Cuts shall be neat and to true straight lines with no shatter outside the removal area. If a saw cut would fall within 30-inches of a construction joint, cold joint, expansion joint, or edge, the concrete shall be removed and replaced to the joint or edge. Concrete sidewalk and/or driveway may be removed so that a minimum 30-inch square is replaced. If the saw cut would fall within 12 inches of score mark, the concrete shall be removed and replaced to the score mark. Existing bituminous pavement removed in connection with construction shall be cut with a saw, cutting wheel, or other similar and suitable tool. Care shall be taken to assure that the edge of the removed pavement does not vary from a straight line more than 2 inches from the mean. The Contractor shall furnish all material, labor, equipment, and supplies necessary to do the work required in removal of pavement and disposal of same where required. Saw cutting is required on all paving. Saw cutting shall be 1½ -inches minimum depth of cut. The cutting shall be carried in a vertical plane through the pavement along a straight line marking the limits of the cut. Any unnecessarily irregular breakage or cracking caused by the Contractor shall be removed and replaced by the Contractor without added expense to the Owner. Additional pavement replacement that results from excavation beyond the maximum trench widths as shown in the drawings and specified elsewhere in these specifications will be replaced at no cost the Owner. Paving cuts for manholes and valve boxes shall be SQUARE and at adequate distances from outside diameter to manholes and valve boxes to allow installation.
- B. Trench digging machinery may be used to make trench excavation except in places where operation of same would cause damage to existing structures either above or below ground. In such instances, hand methods shall be employed. The Contractor shall locate all existing underground lines, whether or not they are shown on the drawings, sufficiently in advance of trenching operations to prevent any damage thereto. Extreme care shall be taken to prevent such damage and the Contractor shall be fully responsible for damage to any such lines. The Contractor shall locate the elevation of all major damage to any such lines. The Contractor shall locate the elevation of all major utility lines at least **200** feet ahead of pipeline placement operations and notify the Engineer in writing of any conflicts that are found or expected.

- C. There will be no classification of excavated materials and all materials encountered shall be excavated as required. Adjacent structures shall be protected from damage by construction equipment. All excavated material shall be piled along the trench in a manner which will not endanger the work.
- D. Excavation for manholes and other appurtenances shall be made as required to provide space for constructing the structure and trench safety system.
- E. Trenches shall be excavated to the depth indicated on the drawings and in widths sufficient for laying and bedding the pipe, constructing concrete easement, bracing and for pumping and drainage facilities. If the existing subgrade soils are determined to be unsuitable, direction will be provided by the Engineer regarding removal and replacement with suitable materials. The bottom of the excavations shall be firm and dry and in all respects acceptable to the Engineer.
- F. Excavation shall be performed in-the-dry by methods which preserve the undisturbed state of subgrade soils. The trench may be excavated by machinery to, or just below the designated subgrade, provided that material remaining in the bottom of the trench is no more than slightly disturbed. Subgrade soils which become soft, loose, "quick," or otherwise unsatisfactory as a result of inadequate excavation, dewatering or other construction methods shall be removed and replaced by crushed stone fill as required by the Engineer at the Contractor's expense.
- G. The Contractor shall not open up more trench in advance of pipe laying than is necessary to expedite the work, and in no event shall the length of a continuous open trench at the job site exceed 300 feet; however, trenching shall be done far enough in advance of pipe laying to allow the Engineer to make necessary grade changes without the use of extra fittings.
- H. Any excavated areas shall be considered as "open trench" until all pavement replacements have been made or until all trenches outside of pavement replacement areas have been backfilled and compacted in accordance with these Contract Documents. Trenches across streets shall be completely backfilled with temporary or permanent pavement in place within 24 hours after laying the pipe.
- I. The Contractor shall provide substantial steel plates with adequate trench bracing to support a minimum load of AASHTO H-20 which shall be used to bridge across trenches at street and alley crossings and at commercial driveways, where trench backfill and temporary patches have not been completed before the end of the Contractor's regular working hours. Safe and convenient passage for pedestrians shall be provided at all times. The Engineer may designate an enclosed or railed passage for the safe access of pedestrian traffic at any location adjacent to construction activities as he deems necessary. Access to fire stations, fire hydrants, schools, and hospitals shall be maintained at all times.
- J. Trench widths from the bottom of the trench to a point 12 inches above the top of the pipe shall be kept to the practical minimum required for properly bedding, laying, aligning, grading, and jointing of the pipe. Trench widths from the bottom of the pipe to a point 12 inches above the top of pipe shall be as shown on the Drawings.

If the maximum recommended trench width must be exceeded or if the pipe is installed in

a compacted embankment, then pipe embedment shall be compacted to a point of at least 2½ pipe diameters from the pipe on both sides of the pipe or to the trench walls.

Whenever the prescribed maximum trench width is exceeded, the Contractor shall use an embedment or encasement as required by the Engineer for the trench width as actually cut. For trench widths in excess of the prescribed maximum, excavated by the Contractor for his own convenience, the additional cost incurred will be borne by the Contractor.

- K. In all cases, any accumulated water in the trench shall be removed before laying pipe, placing concrete, or backfilling.
- L. If the Contractor excavates below grade through error or for the Contractor's own convenience, or through failure to properly dewater the trench, or disturbs the subgrade before dewatering is sufficiently complete, he may be directed by the Engineer to excavate below grade as set forth in the following paragraph, in which case the work of excavating below grade and furnishing and placing the refill shall be performed at the Contractor's expense.
- M. If the material at the level of trench bottom consists of fine sand, sand and silt, or soft earth which may work into the pipe embedment material notwithstanding effective drainage, the subgrade material shall be removed to the extent acceptable to the Engineer and the excavation refilled with a 6-inch layer of coarse sand, as approved by the Engineer, to form a filter layer preserving the voids in the pipe embedment material. The composition and gradation of the filter layer shall be approved by the Engineer prior to placement. Pipe embedment material shall then be placed in 6-inch layers thoroughly compacted up to the normal grade of the pipe. If approved by the Engineer, bank-run gravel shall be used for refill of excavation below grade. Geotextile filter fabric may be substituted for filter layer if approved by the Engineer. Filter fabric shall be Mirafi 140N, Supac equivalent. In any case, the bottom of the excavated trench shall be compacted by mechanical means to a density of not less than 90% per ASTM D1557.

3.03 PIPE EMBEDMENT AND TRENCH BACKFILL PROCEDURES

- A. After completion of the trench excavation in accordance with article 3.02 above, bedding material shall be placed on the trench bottom for support under the pipe. Bell holes and similar excavations for appurtenances shall be hand excavated. All pipe shall be installed in such manner as to insure full support of the pipe barrel over its entire length and under appurtenances. Bedding material to be placed under the pipe shall be 6-inches in thickness after 90% compaction has been reached by mechanical means per ASTM D1557.
- B. Bedding, laying and joining of pipe shall be as specified for the individual type of pipe. After joining pipe it shall be adjusted to the line and grade indicated on the drawings.
- C. As soon as practicable after pipe has been installed and joined, bedding material shall be placed and compacted to the top of the pipe. Additional bedding material shall be placed and compacted to at least 12-inches over the top of the pipe. The bedding material and initial backfill shall be hand packed under the haunches and tamped in 6-inch lifts compacted to 90% per ASTM D1557 paying particular attention to bell holes, sling holes, elimination of voids and to insure uniform support for the pipe.

- D. Backfilling over pipes shall begin as soon as practicable after the pipe has been laid, jointed and inspected and the bedding material placed as specified.
- E. Allow three days before placing backfill over concrete encasement.
- F. All backfilling shall occur expeditiously and as specified.
- G. The remainder of the trench from a point 12 inches above the pipe, or above the concrete encasement, shall be backfilled and thoroughly compacted as herein specified. To prevent longitudinal movement of the pipe, dumping backfill material into the trench and then spreading will not be permitted until the bedding or select fill has been placed and compacted to a level 1 foot over the pipe.
- H. If the soil conditions do not require bedding zone material to the top of the pipe, the first lift of backfill material shall be placed carefully under the haunches and around the pipe and thoroughly compacted in 8-inch lifts by means of mechanical tamps to the top of the pipe. When the first lift above the top of the pipe has been compacted as specified, the backfilling of the remainder of the trench shall be done in the following manner: The backfill material shall be placed in the trench in layers not to exceed 8 inches and compacted with approved mechanical compaction equipment until the required density is obtained. Vibratory rollers may not be used in city streets. The backfill material from the bottom of the trench to finish grade shall be moistened or aerated as necessary to obtain optimum moisture. Compaction shall occur from as close to the pipe as possible to as close to the trench shield as possible. Density requirements shall be as follows:
 - 1. For all backfill in areas to be paved, a density of not less than 95 percent per ASTM D1557 shall be obtained from bottom of subgrade to the top of the bedding in 8-inch lifts.
 - 2. For all backfill not in paved areas, density of not less than 90 percent per ASTM D1557 shall be obtained from top of pipe to ground surface in 8-inch lifts.
 - 3. The jetting method of water tamping or the water ponding method will not be allowed.
- I. Following the completion of backfilling, the Contractor will maintain the trench surface in a satisfactory manner until final completion and acceptance of the finished project. The maintenance shall include blading from time to time as necessary, digging out, refilling and re-compacting depressions caused by settlement, and other work required to keep the areas and roads in satisfactory condition. If needed, paved streets shall be restored in accordance with Sections 02222 and 02510. Any settlement of the paved surface which occurs before and during the 1 year warranty period shall be repaired by the Contractor at his expense. This may include saw cutting and removing portions of the affected pavement, removing all unconsolidated material and re-compacting with new material or filling with 2-sack cement stabilized material. The Engineer shall determine the limits of removal. Upon acceptance by the Engineer, the Contractor shall repave.
- J. Backfill around structures shall be selected common fill material, and shall be compacted, especially over pipes connected to the structures to a density of not less than 95 percent per ASTM D1557.

- K. When moveable trench bracing such as trench boxes, moveable sheeting, shoring, or plates are used to support the sides of the trench, care shall be taken in placing and moving the boxes or supporting bracing to prevent movement of the pipe, or disturbance of the pipe bedding and the backfill. Trench boxes, moveable sheeting, shoring, or plates shall not be allowed to extend below top of the pipe. As trench boxes, moveable sheeting, shoring, or plates are moved, pipe bedding shall be placed to fill any voids created and the backfill shall be re-compacted as specified to provide uniform side support for the pipe across the entire trench width.
- L. Any relocated sewer, potable water, natural gas, buried telephone, reuse water line, or other utility shall be marked by installing the appropriate marking tape in the trench. Marking tape for water and sewer pipelines shall be metallic. All other marking tape shall consist of a minimum of 4.0 mil inert polyethylene plastic. The tape shall be imprinted continuously over its entire length in permanent black ink to identify the type of line. The tape shall be 6-inches in width and colored High Visibility Safety Yellow for gas pipelines, High Visibility Blue for potable water pipelines and High Visibility Green for sanitary sewer pipelines.

The pipeline shall be marked by concurrently installing the appropriate marking tape in the trench for detecting purposes. The marking tape shall be as manufactured by Alarm-Tapes, Inc. or approved equal. Installation in the trench shall be as recommended by the manufacturer and as shown on the Drawings.

M. CONSTRUCTION TESTS

- 1. Tests of all the materials may be made during construction to determine conformity with the specifications. Such tests may include field densities on base coarse and grading analysis of material. The frequency and type of testing will be determined by the Engineer. The Contractor shall cooperate in securing samples and shall furnish materials and equipment required for sampling.
- 2. All passing construction tests requested by the Engineer will be paid for by the Owner. Should construction testing reveal that the item tested does not meet the requirements of the Construction Documents, retesting shall be required until the item does meet the requirements. All failing tests shall be at the Contractor's expense and shall not be paid for by the Owner. The Contractor may obtain any additional tests which he may require for quality control, using his testing laboratory, at his expense.

3.04 RESTORING TRENCH SURFACE

- A. Where the trench occurs adjacent to a paved street, in shoulders, or in sidewalks, thoroughly consolidate the backfill and maintain the surface as the work progresses. If settlement takes place, immediately deposit additional fill to restore the level of the ground. The Contractor shall rework the area as specified.
- B. In and adjacent to streets, the upper portion of trenches shall be backfilled with base material and pavement replaced in accordance with Section 02222 and 02510.
- C. In sections where the pipeline passes through grassed areas the Contractor shall remove and replace the sod, or loam and seed the surface to the satisfaction of the Engineer.

3.05 EXCAVATION AND BACKFILLING FOR PIPES UNDER OR ADJACENT TO STRUCTURES

- A. Excavation for all pipe lines beneath structures shall be carried out with the excavating equipment operating from the subgrade for the structure. The excavation shall be carried out "in-the-dry" and in a manner which will preserve the undisturbed state of the subgrade soils.
- B. In order to minimize any differential settlement, all pipe within the excavation limits of structures shall be adequately supported on structural fill. The Contractor shall provide a suitable transition zone of this backfill under the pipelines or ducts from the structure wall to the beginning of the normal trench as shown on the drawings and as acceptable to the Engineer.
- C. In locations where pipes pass through fill areas, the Contractor shall take the following precautions to consolidate and refill up to an elevation of at least 1 foot above the top of the pipes:
 - 1. Place and compact structural fill in such areas for a distance of not less than 3 feet either side of the centerline of the pipe in level layers not exceeding 6 inches in depth, and extending from the structure wall to the end of fill. Compaction shall be a minimum 95% per ASTM D1557.
 - 2. Excavate for pipe trench and backfill as specified above.

3.06 DISPOSAL OF SURPLUS MATERIAL

- A. Excavated material may be stacked without excessive surcharge on the trench bank. Excavated material shall be segregated for use in backfilling.
- B. Unsuitable waste and surplus excavated material shall be removed and disposed of offsite in accordance with all applicable regulations. Materials may be temporarily stockpiled in an area within the limits of construction that does not disrupt neighborhood activities, construction activities, create any nuisances or safety hazards, or otherwise restrict access to the site of the work.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this Contract.

END OF SECTION

SECTION 02222

EXCAVATING, BACKFILLING, AND COMPACTING FOR PAVEMENT REPLACEMENT

PART 1 GENERAL

1.01 SCOPE

- A. The work covered by this section of the Specifications consists of all earthwork required to prepare ground surfaces upon which the proposed HMAC roadway will be constructed, and concrete items such as curbs, gutters, sidewalks and driveways are to be replaced. The work shall include removal and disposal of any unacceptable or excess materials and any necessary rock excavation.
- B. The Contractor shall furnish all materials, equipment, tools, labor, superintendence and incidentals required to perform the work as indicated on the drawings, as required by the Engineer, and as specified herein.
- C. The work shall be performed to prepare the ground surfaces in those areas where roadway pavement or concrete curbs, gutters, sidewalks, and/or similar items are being constructed or have been removed or damaged during construction and must be reconstructed or repaired. Preparation of the ground surface shall include all necessary grading, excavating, filling, backfilling, borrowing and stockpiling of material, disposing of unacceptable or excess material, wetting, compacting, shaping and rolling.
- D. The work shall be performed to the dimensions, typical sections, and lines and grades indicated on the drawings or established by the Engineer and in accordance with these Specifications.
- E. It shall be the responsibility of the Contractor to become familiar with job site conditions, and materials to be encountered prior to submitting his Proposal. The Contractor shall include in the proposal all costs of such preliminary investigations, as well as all costs for performing the work covered by this section, including any necessary rock excavation.

1.02 SUBMITTALS

- A. Imported materials must have prior approval by the Engineer in the form of accepted certification from the material supplier that the proposed material meets all the requirements of this Section.

1.03 RELATED WORK

- A. Granular Material is included in Section 02235.
- B. Asphaltic Concrete Paving is included in Section 02510.

PART 2 GENERAL

2.01 IMPORTED MATERIAL

- A. Imported backfill and subgrade materials shall conform with Section 02235 of these

Specifications.

PART 3 EXECUTION

3.01 GRADING AND EXCAVATION

- A. This work shall consist of removing all materials to the dimensions, typical sections, lines and grades shown on the drawings or established by the Engineer. The work shall include removal of all materials encountered, regardless of their nature, removal of materials which are unsuitable for use in subgrades, fills and backfills; stockpiling of suitable soils for use in fills or backfills; and the satisfactory disposal of unsuitable soil, vegetation, debris, or any other deleterious materials encountered within areas of excavation.
- B. All areas involved in the construction shall be graded as shown on the drawings or as required by the Engineer. These areas shall be shaped to drain away from the construction area and shall be maintained free of trash and debris until final completion and acceptance of the work by the Owner.
- C. If unsuitable soils such as clay, or silty sands or trash are exposed at the depths to which excavation is required by the Contract Drawings, these unacceptable soils or trash will be removed to a depth of 1 foot below the required excavation. The full cost of excavation required to remove unacceptable materials and to fill in these areas with acceptable material shall be borne by the Contractor. The Contractor may review the available boring logs, and may perform additional soils investigations at Contractor's expense to ascertain whether removal of such undesirable soils or trash will be required in any area of the construction.
- D. Unauthorized excavation consists of removal of materials beyond indicated elevations or dimensions without specific written authorization of the Engineer. Unauthorized excavation, as well as remedial work performed outside of the contract limits, and not authorized by the Engineer, shall be corrected at the expense of the Contractor.
- E. Excavation walls should be suitably sloped at no more than 1 to 1 during construction, and protected such that the slope will be stable. The Contractor shall be responsible for maintaining, at all times, safe embankment slopes during the work.
- F. Prior to placement of fill or backfill, all excavations and potential fill materials shall be inspected and approved by the Engineer. The excavation shall be underlain by natural non-expansive soils and not be undesirable soil materials or clay soils.
- G. After excavation to the required elevation and/or prior to placement of fill, the upper 6 inches of the excavated area shall be scarified and compacted to the density required by this Section. Fill materials, if required, shall be incorporated into the scarified surface during the compaction operation.

3.02 BORROW MATERIAL

- A. If sufficient suitable material is not available from the excavated areas at the job site, the Contractor shall provide additional suitable materials as required to complete backfills and to construct all fills to the typical sections, lines and grades shown on the drawings

or established by the Engineer. The Contractor shall obtain the additional material from the owners of outside borrow areas. The Contractor shall be responsible for locating the sources of material and for obtaining the right to excavate and remove the material. All costs of providing the borrow material, including payment of royalties, developing the source of borrow, and excavating and hauling the material to the job site shall be paid by the Contractor at no cost to the Owner. Borrow material shall conform with Section 02235.

3.03 FILLING AND BACKFILLING

- A. Filling and backfilling shall be performed as necessary to complete the preparation of ground surfaces to the typical sections and the lines and grades shown on the drawings or established by the Engineer.
- B. Fill and backfill material shall be free of any organic or deleterious substances and shall not contain cobbles or lumps over four inches in greatest dimension. It shall contain no more than 20 % by weight of material passing a No. 200 sieve. The fill material shall show low shrinkage or swelling when subjected to changes in moisture content, and its plasticity index shall not exceed 12.
- C. Suitability of potential fill material shall be determined by grain size analysis and tests for liquid limit, plastic limit, and shrinkage performed in accordance with ASTM D522, D423, D424 and D427, respectively.
- D. Soils at the site will be considered suitable for use as engineered fill, provided all of the above criteria are met. Under no circumstances shall rubble material, frozen soil, or deposits of clay be used to compromise any part of the engineered fill. Undesirable materials encountered during excavation shall be removed from the job site and disposed of at the Contractors expense. All excess excavation which cannot be reused as backfill shall be disposed of at the Contractors expense.
- E. No frozen material shall be placed in fills or backfills, and no material shall be placed and compacted during periods when freshly placed material would become frozen.

3.04 INSTALLATION OF FILL AND BASE MATERIALS

- A. No base will be used for this project. A 12-inch layer of soil cement backfill will be utilized as shown in the drawings and as specified in Section 02400.
- B. The base of excavations shall be moistened and shall be compacted to a dry density, which is not less than 95 % of maximum as determined by ASTM D1556 or D2167. Fill material shall be placed in lifts not to exceed eight inches (loose measure) in depth and then compacted. The moisture content of the material shall be uniform and within, plus or minus, 3 % of optimum, as determined by ASTM D1557. Water shall not be pooled or jetted onto the in-place fill, but shall be distributed uniformly over its surface.
- C. Compaction of fill material shall be with approved types of pneumatic or tamping equipment. Self-propelled or heavy-duty vibratory compaction equipment should not be used adjacent to previously completed buildings or structures. Each lift of fill material shall be compacted to a dry density, which is not less than 90 % of maximum or as shown on the Drawings as determined by ASTM D1557 or D2167.

- D. Control of filling operations shall consist of field inspection and testing to determine that each lift of fill has been compacted to the required density. Should any lift or portion of a lift not conform to density requirements, it shall be scarified, wetted, if necessary, then re-compacted until the required density is attained. If the Contractor is unable to attain the required compaction with the material in place, the material shall be removed, replaced with new material, and the site re-compacted until the required density is attained.
- E. Where fill or backfill is required to be compacted to a specified density, tests for compliance will be made by the Owner's testing laboratory as directed by the Engineer. The frequency of testing will be approximately one test for every 1,000 square feet and 2 feet of depth, unless otherwise directed by the Engineer. The costs for this testing (passing tests only) shall be paid for by the Owner. The Contractor shall pay for all failing tests.
- F. It is understood and agreed that the performance of tests shall not constitute acceptance of any portion of the work, or relieve the Contractor from compliance with the terms of the Contract Documents.

3.05 SUBGRADE

- A. After completion of excavation or filling and backfilling, the surfaces of the excavated or filled areas shall be prepared as subgrade for pavement base course, for the construction of concrete items or for the placement of the pavement. The subgrade shall be the thicknesses shown on the drawings. Any clay encountered within two feet of the wearing course shall be removed and replaced with engineered fill.
- B. The subgrade shall be scarified, plowed or otherwise loosened; shall be wetted, shaped and rolled with approved rollers. The rolling shall be continued until a density of not less than 95 % is attained. The testing will be as outlined in ASTM D1557; method to be selected by the testing laboratory and approved by the Engineer.
- C. When the required compaction is achieved the subgrade shall be finished to the lines and grades as shown on the plans or as required by the Engineer. The subgrade shall be kept in good condition as required and shall be safe for traffic until such time as the remaining courses are constructed. Periodic wetting of the subgrade may be required to maintain density and to control dust. Upon commencement of the base course, the Contractor will ensure that the subgrade continues to maintain the same density as the day it passed, and remains finished to the lines and grades as shown on the plans and as required by the Engineer, and if not, all requirements will be re-established at no cost to the Owner. The above mentioned requirements pertaining to the maintenance of the subgrade, shall also apply to the base course upon commencement of the Paving (HMAC) replacement.
- D. Where subgrade is required to be compacted to a specified density, tests for compliance will be made by the Owner's testing laboratory as directed by the Engineer. The frequency of testing will be approximately one test for every 1,000 square feet and 2 feet of depth, unless otherwise directed by the Engineer. The costs for this testing (passing tests only) shall be paid for by the Owner. The Contractor shall pay for all failing tests.
- E. It is understood and agreed that the performance of tests shall not constitute acceptance of any portion of the work, or relieve the Contractor from compliance with the terms of the Contract Documents.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment shall be made for the work under this section, but it shall be included in the unit price bid for removal and replacement of HMAC, as described in Section 01025.

END OF SECTION

SECTION 02235

GRANULAR FILL MATERIAL

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals necessary to obtain materials for filling and backfilling, grading and miscellaneous site work, for the uses shown on the drawings and as specified herein.

1.02 RELATED WORK

- A. Site Preparation & Demolition is included in Section 02100.
- B. Excavating, Backfilling, and Compacting for Utilities is included in section 02221.
- C. Schedule of Pipe is included in Section 02610.

1.03 SUBMITTALS

- A. Submit in accordance with Section 01300, complete product data, for materials specified in this Section.
- B. Laboratory Test Reports for each proposed material as follows:
 - 1. Grain size analyses, and plasticity index and liquid limit where applicable, to determine suitability for use as backfill or fill material in conformance with the requirements specified herein. Grain size analyses shall be determined in accordance with ASTM C136 and soils shall be classified in accordance with ASTM D2487.
 - 2. Moisture-density relations to determine the maximum dry densities and optimum moisture content required for compaction testing as specified elsewhere in the Contract Documents.

1.04 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM C33 Standard Specification for Concrete Aggregates
 - 2. ASTM D75 Methods for Sampling Aggregates
 - 3. ASTM C136 Method for Sieve Analyses for Fine and Course Aggregates
 - 4. ASTM D4318 Liquid Limit, Plastic Limit and Plasticity Index of Soils
 - 5. ASTM D698 Standard Test Method for Moisture-Density Relations for Soils and Soil-Aggregate Mixtures, Using 5.5-pound (2.49-kg)

Rammer and 12-inches (305 mm) Drop.

6. ASTM C131 Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
7. ASTM D2487 Classification of Soils for Engineering Purposes

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

A. Laboratory Testing

1. At least 14 days prior to the placement of any backfill and fill materials, deliver a representative sample of the proposed materials weighing at least 50 pounds to the Engineer for testing by the testing laboratory.
2. The soils testing laboratory will perform:
 - a. Grain-size analyses and soil classification of the samples to determine their suitability for use as backfill or fill material in conformance to the material requirements specified hereinafter.
 - b. The appropriate Proctor analyses to determine the moisture density relationship curve for the material submitted.
3. Test results shall be delivered to the Engineer and to the Contractor no later than three days prior to the placement of backfill or fill materials.
4. The Contractor will pay for all tests necessary to determine suitability of off-site or on-site excavation material being proposed for use as backfill or fill.

1.06 DELIVERY, STOCKPILING, AND HANDLING

- A. The Engineer shall be notified of all deliveries of granular material a minimum of 72 hours in advance of the scheduled delivery time.
- B. Stockpile granular material within areas allowed for construction and at locations acceptable to the Engineer. The Contractor shall construct a pad of the stockpile material at the stockpile location(s) and shall utilize equipment capable of properly stacking each stockpile in a neat and regular shape. Contaminated or unsatisfactory stockpile material shall be replaced at no additional cost to the Owner. The Engineer shall be the sole authority determining the acceptability of stockpiled material.
- C. Limit the handling of stockpiled material to prevent segregation and unnecessary material loss. Material to be stockpiled shall be covered with a waterproof tarp secured to the ground with weights or snaps, in the event of wet weather.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Backfill and fill materials shall be suitable on-site excavated materials, natural or processed mineral soils obtained from off-site sources, or graded crushed stone or gravel. Backfill embankment fill and common fill materials shall be free of all organic material, trash, snow, ice, frozen soil, or other objectionable materials which may be compressible or which cannot be properly compacted. Backfill and fill materials shall not contain any granite blocks, broken concrete, masonry rubble or asphalt pavement. Soft, wet, plastic soils which may be expansive clay soils, having a natural in-place water content in excess of 30 percent, soils containing more than 5 percent (by weight) fibrous organic materials, and soils having a plasticity index greater than 15 (per ASTM D4318) shall be considered unsuitable for use as backfill, fill or common fill. Backfill, embankment fill and common fill materials shall have a maximum of 1.5 percent expansion when testing is performed on a sample remolded to 95 percent of maximum dry density (per ASTM D698) at 3 percent below optimum moisture content under a 100 pounds/square foot surcharge. Onsite sands may be used as fill materials provided they meet the requirements specified for the class of fill, and test results are submitted and approved.
- B. Structural fill shall be unfrozen, sandy gravel, or gravelly sand free of organic material, loam, trash, snow, ice or other objectionable material. It shall have a plasticity index of less than 15 (per ASTM D4318) and shall be graded within the following limits when sampled and tested in accordance with ASTM D75 and ASTM D136:

Sieve No. or Size	Total Percent Passing by Weight
2 inches	100
1 inch	90 to 100
#4	70 to 100
#200	0 to 20

- C. Common fill shall consist of granular clayey, silty sands or sandy gravel mixtures, free of clay lumps, deleterious materials, vegetation, organic material, cobbles or boulders over 3 inches in nominal size. The Native (Common) Fill should have a liquid limit less than 35 and a plasticity index less than 15. Native Fill Soils should meet the gradation requirements below:

Sieve No. or Size	Total Percent Passing by Weight
3 inches	100
¾ inches	70 to 100
No. 4	45 to 100
No. 200	3 to 45

- D. Select fill shall consist of granular clayey, silty sands or sandy clayey, silty gravel mixtures, free of clay lumps, deleterious materials, organic material, vegetation, cobbles or boulders over 3 inches in nominal size. The select fill shall have a liquid limit less than 35 and a plasticity index from 3 to 12. The Select Fill shall also exhibit an optimum dry density of at least 120 pcf determined per ASTM D 1557. Select Fill soils should also meet the gradation requirements below:

Sieve No. or Size	Total Percent Passing by Weight
3 inches	100
¾ inches	85 to 100
No. 4	35 to 85
No. 200	5 to 35

- E. Crushed rock shall be sound, durable stone, angular in shape, and free of any foreign material, structural defects, and chemical decay. Crushed rock shall have a percentage of wear of no greater than 50, when tested in accordance with ASTM C131, and shall conform to the following gradation limits:

Sieve No. or Size	Total Percent Passing by Weight
1 inch	100
¾-inch	90 to 100
½-inch	30 to 60
3/8-inch	0 to 25
No. 4	0 to 5

- F. Screened pea gravel shall consist of hard, durable, rounded or subangular particles of proper size and gradation, and it shall be free from sand, loam, clay, excess fine, and deleterious material. The size of the particle shall be uniformly-graded within the following limits:

Sieve No. or Size	Total Percent Passing by Weight
5/8-inch	100
½-inch	40 to 100
3/8-inch	15 to 45
No. 10	0 to 5

- G. Pipe Embedment

1. Unless otherwise shown on the drawings, as noted or required by the Engineer or specified herein, the pipe embedment materials shall be utilized in accordance with the following tables:

TABLE 1 - STANDARD BEDDING CLASS SCHEDULE ¹

CLASS	MATERIAL CLASS	BEDDING SECTION	PIPE TYPE³	DEPTH COVER	SOIL CONDITION
A	Native < 12% Passing #200 sieve	Shaped Trench	Rigid	3' – 12'	Dry
B	Native < 12% Passing #200 sieve	6" Bed Min + (O.D./6)" but not <4"	Rigid	3' – 18'	Dry & Wet ²
C	Concrete	(O.D./6)" but not < 4" Ext to Springline	Rigid	> 18'	Dry
E1	Class I ASTM D-2321	4" to 6" Bed – Ext to Top of Pipe Zone	Rigid & Flex	> 3'	Dry
E2	Class II ASTM D-2487	4" to 6" Bed – Ext to Top of Pipe Zone	Flex	> 3'	Dry
E3	Class III ASTM D-2487	4" to 6" Bed – Ext to Top of Pipe Zone	Flex	> 3'	Dry
F	Class I	4" - 6" Bed – Geotech Fabric Bottom of Bed to Top of Pipe Zone	Flex	> 3'	Wet
G	Class II ASTM D-2487	4" Bed Ext to Top of Pipe Zone	Flex Pressure Pipe	as specified	Dry & Wet ²

1. Refer to Drawing Details for correlation to this table.
2. Under special conditions, where trench bottom is unstable, gravel may be added to embedment material.
3. All backfill, fill and native materials to be used in pipe trenches shall not exceed 1½ inch aggregate size.
4. Pipe type shall be classified according to the following, as designated by the utility:

Rigid Pipe shall denote steel, steel cylinder concrete pipe (SCCP), ductile iron pipe (DIP), reinforced concrete pipe (RCP), and vitrified clay pipe (VCP)

Flexible Pipe shall denote polyvinyl chloride (PVC) sewer pipe, high density polyethylene (HDPE) sewer pipe and fiberglass pipe.

Flexible Pressure Pipe shall denote polyvinyl chloride (PVC) water pipe and high density polyethylene (HDPE) water pipe in accordance with AWWA Standards.

TABLE 2 - DESCRIPTION OF EMBEDMENT MATERIAL CLASSIFICATIONS

SOIL CLASS	SOIL TYPE	DESCRIPTION OF MATERIAL CLASSIFICATION
CLASS I SOILS *	----	Manufactured angular, granular material, ¼ to 1 ½ inches (6 to 40 mm) size, including materials having regional significance such as crushed stone or rock, broken coral, crushed slag, cinders, or crushed shells.
CLASS II SOILS **	GW	Well-graded gravels and gravel-sand mixtures, little or no fines. 50% or more retained on No. 4 sieve. More than 95% retained on No. 200 sieve. Clean.
	GP	Poorly graded gravels and gravel-sand mixtures, little or no fines. 50% or more retained on No. 4 sieve. More than 95% retained on No. 200 sieve. Clean.
	SW	Well-graded sands and gravelly sands, little or no fines. More than 50% passes No. 4 sieve. More than 95% retained on No. 200 sieve. Clean.
	SP	Poorly graded sands and gravelly sands, little or no fines. More than 50% passes No. 4 sieve. More than 95% retained on No. 200 sieve. Clean.
CLASS III SOILS ***	GM	Silty gravels, gravel-sand-silt mixtures. 50% or more retained on No. 4 sieve. More than 50% retained on No. 200 sieve.
	GC	Clayey gravels, gravel-sand-silt mixtures. 50% or more retained on No. 4 sieve. More than 50% retained on No. 200 sieve.
	SM	Silty sands, sand-silt mixtures. More than 50% passes No. 4 sieve. More than 50% retained on No. 200 sieve.
	SC	Clayey sands, sand-clay mixtures. More than 50% passes No. 4 sieve. More than 50% retained on No. 200 sieve.
CLASS IV SOILS	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands. Liquid limit 50% or less. 50% or more passes No. 200 sieve.
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. Liquid limits 50% or less. 50% or more passes No. 200 sieve.
	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts. Liquid limit greater than 50%. 50% or more passes No. 200 sieve.
	CH	Inorganic clay of high plasticity, fat clays. Liquid limit greater than 50%. 50% or more passes No. 200 sieve.
CLASS V SOILS	OL	Organic silts and organic silty clays of low plasticity. Liquid limit 50% or less. 50% or more passes No. 200 sieve.
	OH	Organic clays of medium to high plasticity. Liquid limit greater than 50%. 50% or more passes No. 200 sieve.
	PT	Peat, muck and other highly organic soils.

- * Soils defined as Class I materials are not defined in **ASTM D2487**.
- ** In accordance with ASTM D2487, less than 5% pass No. 200 sieve.
- *** In accordance with **ASTM D2487**, more than 12% pass No. 200 sieve. Soils with 5% to 12%

pass No. 200 sieve fall in borderline classification, *e.g.*, **GP – GC**.

- H. Asphaltic pavement subgrade material shall consist of suitable native or imported material conforming to the gradation specified as follows:

Sieve No. or Size	Total Percent Passing by Weight
6 inches	100
3 inches	90 to 100
# 4	50 to 100
# 200	35 max.

- I. Sand used for fill shall have no more than 5 percent fines passing the No. 200 sieve.
- J. Lean concrete shall be cast-in-place concrete conforming to the requirements of Section 03300. Minimum compressive strength shall be 2,000 pounds per square inch (psi) after 7 days and 2,500 psi after 28 days.

PART 3 EXECUTION (NOT USED)

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this Contract.

END OF SECTION

SECTION 02400

CEMENT STABILIZED BACKFILL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. This Section includes the following:
 - 1. Flowable Fill
 - 2. "2-Sac" Cement Stabilized Backfill

1.3 SUBMITTALS

- A. Material Certificates: Provide copies of materials certificates, signed by material producer and Contractor, certifying that each material item complies with, or exceeds specified requirements.

1.4 QUALITY ASSURANCE

- A. Codes and Standards: Comply with the Texas Department of Transportation and City of El Paso Engineering Department standard specifications, latest edition, and with local governing regulations if more stringent than herein specified.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Flowable Fill:
 - 1. Shall consist of cement, graded limestone aggregate, water, and air entraining admixture.
 - 2. Must be of such consistency after it has cured, that it can be excavated with standard excavation power and/or hand equipment.
 - 3. Not more than 125 lbs. nor less than 75 lbs. of cement per cubic yard of flowable fill.
 - 4. Twenty-eight-day compressive strength of test sample made in standard 6 x 12 concrete cylinder mold to be no more than 150 psi or less than 100 psi.
 - 5. pH shall be greater than 8.

6. No fly ash will be permitted.
 7. Stable air content of 20 to 35 percent, admixture for maintaining stable air content shall be designed specifically for cement slurry.
 8. Aggregate shall be graded screenings with 3/8" maximum size aggregate.
 9. Slump shall be 8 inches.
 10. Water-cement ratio shall not exceed 4.5.
 11. Field test must be submitted and approved by Engineer showing the designed mix meets the required properties.
 12. Test excavations as directed by the Engineer shall be made to confirm that material can be excavated as described in 2 above. Material that does not comply shall be removed at no cost to the Owner.
- B. "2-Sac" Cement Stabilized Backfill:
1. Shall comply with Item 400.6 of the Texas Department of Transportation Standard Specifications for Construction of Highways, Streets and Bridges.

PART 3 EXECUTION

3.1 CONSTRUCTION

- A. Flowable fill shall be allowed to cure sufficiently to prevent displacement prior to placing fill or base course over the cement slurry. Flowable Fill must be of consistency during placement such that mix is highly flowable with no signs of segregation.
- B. "2-Sac" Cement Stabilized Backfill shall be placed in accordance with Item 400.6 of the Texas Department of Transportation Standard Specifications for Construction of Highways, Streets and Bridges.
- C. Equipment: All equipment necessary for the proper construction of this work shall be on the project, in first-class working condition, and approved by the Engineer before construction is permitted to start.

PART 4 MEASUREMENT AND PAYMENT

4.1 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment shall be made for the work under this section. Flowable fill shall be included in the unit price bid for Pipeline and "2-sac" shall be included in the unit price bid for Removal and Replacement of Pavement with HMAC and Cement Stabilized Backfill. Contractor shall include in their bid an allowance for 100 cubic yards of additional flowable fill that may be used at Owner/Engineer discretion.

END OF SECTION

SECTION 02510

ASPHALTIC CONCRETE PAVING

PART 1 GENERAL

1.01 DESCRIPTION

- A. This item shall consist of a surface course composed of mineral aggregate and bituminous material mixed in a central mixing plant and placed on a prepared course in accordance with these specifications and shall conform to the lines, grades, thicknesses, and typical cross sections shown on the plans.
- B. Each course shall be constructed to the depth, typical section, or elevation required by the plans and shall be rolled, finished and approved before the placement of the next course.
- C. Pavement replacement width shall be governed by TABLE 1 below and in no case shall the Owner pay for additional pavement due to excessively wide trenches caused by the Contractor's failure to take adequate precautions to maintain a narrow trench. The use of the angle of repose method or the benching method for the trench safety system shall not be considered an acceptable method of maintaining a narrow trench. If the Contractor elects to use these methods for the trench safety system, additional pavement replacement shall be at the Contractor's expense. Pavement replacement width shall be measured equal distance from the centerline of the pipeline. Payment shall be only for the actual pavement removed and replaced within the limits of the pavement width as shown in Table 1.

Table 1. Maximum Pavement Width For Payment Purposes

Trench Depth	Pipe Size	Pavement Width
0' through 6.9'	12" and smaller	5'
0' through 6.9'	Larger than 12"	6'
7' through 9.9'	12" and smaller	6'
7' through 9.9'	Larger than 12"	8'
10' and Deeper	12" and smaller	8'
10' and Deeper	Larger than 12"	10'

1.02 MATERIALS

- A. Aggregate. Aggregates shall consist of crushed stone or crushed gravel with or without sand or other inert finely divided mineral aggregate. The portion of materials retained on the No.8 sieve shall be known as coarse aggregate, the portion passing the No. 8 sieve and retained on the No. 200 sieve as fine aggregate, and the portion passing the No. 200 sieve as mineral filler.
 - 1. Coarse Aggregate
 - a. Coarse aggregate shall consist of sound, tough, durable particles, free from adherent films of matter that would prevent thorough coating with the bituminous material. The percentage of wear shall not be greater than 40 percent when tested in accordance with ASTM C131. The sodium sulfate soundness loss shall not exceed 9 percent, after five cycles, when tested in accordance with ASTM C88.

- b. Aggregate shall contain at least 60 percent by weight of crushed pieces having two or more fractured faces and 75 percent having at least one fractured face. The area of each face shall be equal to at least 75% of the smallest midsectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces. Fractured faces shall be obtained by artificial crushing.
- c. The aggregate shall not contain more than 8%, by weight, of flat or elongated pieces. A flat particle is one having a ratio of width to thickness greater than five; an elongated particle is one having a ratio of length to width greater than five.

2. Fine Aggregate

- a. Fine aggregate shall consist of clean, sound, durable, angular particles produced by crushing stone or gravel that meets the requirements for wear and soundness specified for coarse aggregate. The aggregate particles shall be free from coatings of clay, silt, or other objectionable matter and shall contain no clay balls. The fine aggregate, including any blended filler, shall have a plasticity index of not more than six when tested in accordance with ASTM D424 and a liquid limit of not more than 25 when tested in accordance with ASTM D423 or shall have a sand equivalent value not less than 45 in accordance with ASTM D2419.
- b. Natural sand may be used to obtain the gradation of the aggregate blend or to improve the workability of the mix. The amount of sand to be added will be adjusted to produce mixtures conforming to requirements of this specification.
- c. Sampling and Testing. ASTM D75 shall be used in sampling coarse and fine aggregate, and ASTM C183 shall be used in sampling mineral filler. The Contractor shall furnish documentation to the Engineer confirming that the aggregates meet specification requirements.
- d. Sources of Aggregates. Sources of aggregates shall be selected well in advance of the time the materials are required in the work. When the aggregates are obtained from a previously approved source or an existing source producing aggregates that has a satisfactory service record in bituminous pavement construction for at least five years, samples shall be submitted 14 days prior to start of production. An inspection of the producer's operation will be made by the Engineer. When new sources are to be developed, the Contractor shall indicate the sources and shall submit a plan for operation 30 days in advance of starting production. Samples from test pits, borings, and other excavations shall be submitted at the same time. Approval of the source of aggregate does not relieve the Contractor in any way of the responsibility for delivery at the job site of aggregates that meet the requirements specified herein.
- e. Samples of Aggregates. Samples of aggregates shall be furnished by the Contractor at the start of production or at every 500 tons with a minimum of

two per project. The sampling points will be designated by the Engineer. The samples will be the basis of approval of specific lots of aggregates from the standpoint of the quality requirements of this section.

1.03 FILLER

- A. If filler, in addition to that naturally present in the aggregate, is necessary, it shall meet the requirements of ASTM D242.

1.04 BITUMINOUS MATERIAL.

- A. Bituminous material shall conform to the following requirements: AC-10 or AC-20 In accordance with ASTM D3381.
- B. The Contractor shall furnish vendor's certified test reports for each tank load of bitumen shipped to the project. The report shall be delivered to the Engineer or his/her representative before permission is granted for use of the material. The furnishing of the vendor's certified test report for the bituminous material shall be the basis for final acceptance.

1.05 COMPOSITION

- A. Composition of Mixture. The bituminous plant mix shall be composed of a mixture of aggregate, filler if required, and bituminous material. The several aggregate fractions shall be sized, uniformly graded, and combined in such proportions that the resulting mixture meets the grading requirements of the job mix formula.
- B. Job Mix Formula. No bituminous mixture for pavement shall be produced until a job mix formula has been approved by the Engineer. The formula shall be submitted in writing by the Contractor to the Engineer at least 10 days prior to the start of paving operations and shall indicate the definite percentage of each sieve fraction of aggregate, the percentage of bitumen, and the temperature of the completed mixture when discharged from the mixer. All test data used to develop the job mix formula shall also be submitted. The job mix formula for each mixture shall be in effect until modified in writing by the Engineer or his/her representative. Should a change in sources of materials be made, a new job mix formula must be established before the new material is used.
- C. The bituminous mixture shall be designed using procedures contained in Chapter III, MARSHALL METHOD OF MIX DESIGN, of the Asphalt Institute's Manual Series No. 2 (MS-2), current edition, and shall meet the requirements of Tables 2 and 3. The temperature of the mix immediately prior to compaction shall be 250° ±5°F (121° ±3°C).

Table 2. Marshall Design Criteria

Test Property	
Number of Blows	75
Stability, minimum pounds	1500
Flow, 0.01 in. (0.25mm)	8-16
Percent air voids	3-5
Percent voids in mineral aggregate	See Table 3

Table 3. Minimum Percent Voids In Mineral Aggregate

Maximum Particle Size	Maximum Particle Size	Minimum Voids in Mineral Aggregate
in.	mm	Percent
¾	19.0	15
1	25.0	14
1 1/4	31.25	13

1. The mineral aggregate shall be of such size that the percentage composition by weight, as determined by laboratory screens, will conform to the gradation or gradations specified in Table 4 when tested in accordance with ASTM Standard C136 d (dry sieve). The percentage by weight for the bituminous material shall be within the limits specified.
2. The gradations in Table 4 represent the limits which shall determine the suitability of aggregate for use from the sources of supply. The aggregate, as finally selected, shall have a gradation within the limits designated in Table 4 and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve, or vice versa, but shall be uniformly graded from coarse to fine.

Table 4. Aggregate - Bituminous Pavement Specification Gradation Band

Sieve	Percentage by Weight Passing Sieves		
	GRADE A	GRADE B	GRADE C
Size:	1 1/4" max.	1" max.	
1¼ in. (30.0 mm)	100	---	---
1 in. (24.0 mm)	86-98	100	---
¾ in. (19.0 mm)	68-93	76-100	100
½ in. (12.5 mm)	57-81	66-86	79-99
3/8" (9.5 mm)	49-69	57-77	68-88
No.4 (4.75 mm)	34-54	40-60	48-68
No.8 (2.36 mm)	22-42	26-46	33-53
No.16 (1.18 mm)	13-33	17-37	20-40
No.30 (0.600 mm)	8-24	11-27	14-30
No.50 (0.300 mm)	6-18	7-19	9-21
No.100 (0.150 mm)	4-12	6-16	6-16
No.200 (0.075 mm)	3-6	3-6	3-6
Bitumen Percent Stone	4.5 - 7.0	4.5 - 7.0	4.8-5.5
Gravel	5.0 - 7.5	5.0-9.0	---

3. The job mix tolerances shown in Table 5 shall be applied to the job mix formula to establish a job control grading band. The full tolerances still will apply if application of the job mix tolerances results in a job control grading band outside the master grading band.

Table 5. Job Mix Formula Tolerances
(Based on a Single Test)

Material	Tolerance Plus or Minus
Aggregate Passing No.4 Sieve or Larger	7 %
Aggregate Passing Nos. 8 and 16 sieves	6 %
Aggregate Passing Nos. 30 and 50 sieves	5 %
Aggregate Passing Nos. 100 and 200 sieves	3 %
Bitumen	0.45 %
Temperature of Mix	20°F (11°C)

4. Deviation from the final approved design for bitumen content and gradation of aggregates shall not be greater than the tolerances permitted and shall be based on daily plant extraction. Extraction tests for bitumen content and aggregate gradation will be made at least twice daily. The mixture will be tested for bitumen content in accordance with AASHTO T30.
 5. The completed mixture shall be sampled at the plant to retain job control. One sample shall be taken from each subplot on a random basis, in accordance with procedures contained in ASTM D3665. The lot size shall be consistent with that specified in paragraph 4.12 (a). Testing shall be in accordance with the Marshall method procedures contained in Chapter III of the Asphalt Institute Manual Series No.2 (MS-2), current edition, except the temperature of the mix prior to compaction shall be 250°F ± 5°F (121°C ± 2°C). If any two consecutive Marshall test results of any property do not conform to the requirements shown in Tables 1 and 2, the Contractor shall take immediate corrective action. In no instance shall the percent air voids exceed 1% of the job mix formula value.
 6. The Engineer may halt production if the Marshall test criteria are not met and not allow it to resume until the problem is corrected.
 7. If the index of retained strength of the specimens of composite mixture, as determined by ASTM D1075, is less than 75, the aggregates shall be rejected or the asphalt shall be treated with an anti-stripping agent. The amount of anti-stripping agent added to the asphalt shall be sufficient to produce an index of retained strength of not less than 75.
- D. Test Section. Prior to full production, the Contractor shall prepare a quantity of bituminous mixture according to the job mix formula. The amount of mixture should be sufficient to construct a test section 50 feet long and 12 feet wide placed in two sections and shall be of the same depth specified for the construction of the course which it represents. The underlying grade or pavement structure upon which the test section is to be constructed shall be the same as the remainder of the course represented by the test section. The equipment used in construction of the test section shall be the same type and weight to be used on the remainder of the course represented by the test section.

If the test section should prove to be unsatisfactory, the necessary adjustments to the mix design, plant operation, and/or rolling procedures shall be made. Additional test sections, as required, shall be constructed and evaluated for conformance to the specifications. When test sections do not conform to specification requirements, the pavement shall be removed and replaced at the Contractor's expense. A marginal quality test section that has been placed in an area of little or no traffic may be left in place. If a second test section also does

not meet specification requirements both sections shall be removed at the Contractor's expense. Full production shall not begin without the Engineer's approval.

- E. Testing Laboratory. The testing laboratory used to develop the job mix formula and to perform the tests required by this specification shall meet the requirements of ASTM D 3666. A certification that the laboratory meets these requirements shall be submitted to the Engineer.

1.06 CONSTRUCTION METHODS

- A. Weather Limitations. The bituminous mixture shall not be placed upon a wet surface or when the surface temperature of the underlying course is less than specified in Table 6.

Table 6. Base Temperature Limitations

Mat Thickness	Base Temperature (Minimum)
3 in. (7.5 cm) or Greater	40°F 4°C
Greater than 1 in. (2.5 cm) but Less than 3 in. (7.5 cm)	45°F 7°C
1 in. (2.5 cm) or Less	50°F 10°C

- B. Bituminous Mixing Plant. Plants used for the preparation of bituminous mixtures shall conform to the requirements of ASTM D995 with the following changes:

1. Requirements for All Plants.
 - a. Truck scales. The bituminous mixture shall be weighed on approved scales furnished by the Contractor, or on public scales at the Contractor's expense. Such scales shall be inspected and sealed as often as the Engineer deems necessary to assure their accuracy.
 - b. Testing laboratory. The Contractor or producer shall provide laboratory facilities for control and acceptance testing functions during periods of mix production, sampling, and testing and whenever materials subject to the provisions of these specifications are being supplied or tested. The laboratory shall provide adequate equipment, space, and utilities as required for the performance of the specified tests.
 - c. Inspection of plant. The Engineer shall have access, at all times, to all parts of the plant for checking adequacy of equipment; inspecting operation of the plant: verifying weights, proportions, and character of materials; and checking the temperatures maintained in the preparation of the mixtures.
 - d. Storage bins and surge bins. Paragraph 3.9 of ASTM D995 is deleted. Instead, the following applies. Use of surge bins or storage bins for temporary storage of hot bituminous mixtures will be permitted as follows:
 2. The bituminous mixture may be stored in surge bins for period of time not to exceed 3 hours, provided all specifications, temperature and segregation, requirements are fully met.
 3. The bituminous mixture may be stored in insulated storage bins provided an inert

gas atmosphere or oxygen proof hot oil seal is maintained in the bin during the storage period.

- a. The bins shall be such that mix drawn from them meets the same requirements as mix loaded directly into trucks. If the Engineer determines that there is an excessive amount of heat loss, segregation or oxidation of the mixture due to temporary storage, no storage will be allowed.

C. Hauling Equipment

1. Trucks used for hauling bituminous mixtures shall have tight, clean, and smooth metal beds. To prevent the mixture from adhering to them, the truck beds shall be lightly coated with a minimum amount of paraffin oil, lime solution, or other approved material. Each truck shall have a suitable cover to protect the mixture from adverse weather. When necessary, to ensure that the mixture will be delivered to the site at the specified temperature, truck beds shall be insulated, and covers shall be securely fastened.

D. Bituminous Pavers

1. Bituminous pavers shall be self contained, power propelled units with an activated screed or strike off assembly, heated if necessary, and shall be capable of spreading and finishing courses of bituminous plant mix material which will meet the specified thickness, smoothness, and grade. Pavers used for shoulders and similar construction shall be capable of spreading and finishing courses of bituminous plant mix material in widths shown on the plans.

The paver shall have a receiving hopper of sufficient capacity to permit a uniform spreading operation. The hopper shall be equipped with a distribution system to place the mixture uniformly in front of the screed. The screed or strike off assembly shall effectively produce a finished surface of the required evenness and texture without rearing, shoving, or gouging the mixture.

2. The paver shall be capable of operating at forward speeds consistent with satisfactory laying of the mixture.
3. If an automatic grade control device is used, the paver shall be equipped with a control system capable of automatically maintaining the specified screed elevation. The control system shall be automatically actuated from either a reference line or surface through a system of mechanical sensors or sensor directed mechanisms or devices which will maintain the paver screed at a predetermined transverse slope and at the proper elevation to obtain the required surface. The transverse slope controller shall be capable of maintaining the screed at the desired slope within plus or minus 0.1 percent.
4. The controls shall be capable of working in conjunction with any of the following attachments:
 - a. Ski type device of not less than 30 feet (9.14 m) in length or as directed by the Engineer.

- b. Taut stringline (wire) set to grade.
- c. Short ski or shoe.

E. Rollers

- 1. Rollers of the steel wheel or pneumatic tired type may be used. Vibratory rollers may be used subject to approval of the Engineer. The number, type, and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition. The use of equipment which causes excessive crushing of the aggregate will not be permitted.

F. Preparation of Bituminous Material

- 1. The bituminous material shall be heated in a manner that will avoid local overheating and provide a continuous supply of the bituminous material to the mixer at a uniform temperature. The temperature of the bituminous material delivered to the mixer shall be sufficient to provide a suitable viscosity for adequate coating of the aggregate particles but shall not exceed 325°F (160°C).

G. Preparation of Mineral Aggregate

- 1. The aggregate for the mixture shall be dried and heated to the temperature designated by the job formula within the job tolerance specified. The maximum temperature and rate of heating shall be such that no permanent damage occurs to the aggregates. Particular care shall be taken that aggregates high in calcium or magnesium content are not damaged by overheating. The temperature shall not be lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide a mixture of satisfactory workability.

H. Preparation of Bituminous Mixture

- 1. The aggregates and the bituminous material shall be weighed or metered and introduced into the mixer in the amount specified by the job mix formula.
- 2. The combined materials shall be mixed until the aggregate obtains a uniform coating of bitumen and is thoroughly distributed throughout the mixture. Wet mixing time shall be the shortest time that will produce a satisfactory mixture. It shall be established by the Contractor, based on the procedure for determining the percentage of coated particles described in ASTM D2489, and approved by the Engineer for each individual plant and for each type of aggregate used. The minimum mixing time shall be 25 seconds. The mixing time will be set to achieve 95% of coated particles. For continuous mix plants, the minimum mixing time shall be determined by dividing the weight of its contents at operating level by the weight of the mixture delivered per second by the mixer. The moisture content of the mix shall not exceed 1.0 percent.

I. Transporting, Spreading, and Finishing

- 1. The mixture shall be transported from the mixing plant to the point of use in

vehicles conforming to the requirements of Section 4.3. Deliveries shall be scheduled so that spreading and rolling of all mixture prepared for one day's run can be completed during daylight, unless adequate artificial lighting is provided. Hauling over freshly placed material shall not be permitted until the material has been compacted, as specified, and allowed to cool to atmospheric temperature.

2. Immediately before placing the bituminous mixture, the underlying course shall be cleared of all debris with power blowers, power brooms, or hand brooms as directed.
3. The mix shall be placed at a temperature of not less than 250°F (107°C) when asphalt cement is used, and not less than 150°F (65°C) when tar is used.
4. Upon arrival, the mixture shall be spread to the full width by an approved bituminous paver. It shall be struck off in a uniform layer of such depth that, when the work is completed, it shall have the required thickness and conform to the grade and contour indicated. The speed of the paver shall be regulated to eliminate pulling and tearing of the bituminous mat. Unless otherwise directed, placement of the mixture shall begin along the centerline of a crowned section or on the high side of areas with a one way slope. On streets with inverted crown, no joint will be placed at invert of street. The mixture shall be placed in consecutive adjacent strips having a minimum width of 12 feet except where edge lanes require less width to complete the area.
5. In a two layer operation the longitudinal joint in one layer shall offset that in the layer immediately below by at least 1 foot (30 cm); however, the joint in the top layer shall be at the centerline of the pavement. Except on streets with inverted crowns, where the invert is at the center line of the street.
6. Transverse joints in one layer shall be offset by at least 2 feet (60 cm) from transverse joints in the previous layer. Transverse joints in adjacent lanes shall be offset a minimum of 10 feet (3 m).
7. On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the mixture may be spread, raked, and luted by hand tools.

J. Compaction of Mixture

1. After spreading, the mixture shall be thoroughly and uniformly compacted by rolling. The surface shall be rolled when the mixture has attained sufficient stability so that the rolling does not cause undue displacement, cracking or shoving. No vibratory roller or any other type of vibratory machine shall be permitted without the written authorization from the Engineer. The sequence of rolling operations and the type of rollers used shall be at the discretion of the Contractor with approval from the Engineer.
2. The speed of the roller shall, at all times, be sufficiently slow to avoid displacement of the hot mixture. Any displacement occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected at once.

3. Sufficient rollers shall be furnished to handle the output of the plant. Rolling shall continue until all roller marks are eliminated, the surface is of smooth uniform texture, free of segregation and voids and true to grade and cross section, and the required field density is obtained.
4. To prevent adhesion of the mixture to the roller, the wheels shall be kept properly moistened, but excessive water will not be permitted.
5. In areas not accessible to the roller, the mixture shall be thoroughly compacted with hot hand tampers.
6. Any mixture that becomes loose and broken, mixed with dirt or in any way defective shall be removed and replaced with fresh hot mixture and immediately compacted to conform to the surrounding area. This work shall be done at the Contractor's expense. Skin patching shall not be allowed.
7. A minimum prime coat coverage of 0.25 gallons per square yard shall be placed on all new asphaltic pavement surfaces.

K. Joints

1. The formation of all joints shall be made in such a manner as to ensure a continuous bond between old and new sections of the course. All joints shall have the same texture, density, and smoothness as other sections of the course.
2. The roller shall not pass over the end of the freshly laid mixture except when necessary to form a transverse joint. When necessary to form a transverse joint, it shall be made by means of placing a bulkhead or by tapering the course, in which case the edge shall be cut back to its full depth and width on a straight line to expose a vertical face. In both methods all contact surfaces shall be given a tack coat of bituminous material before placing any fresh mixture against the joint.
3. Longitudinal joints which are irregular, damaged, or otherwise defective shall be cut back to expose a clean, sound surface for the full depth of the course. All contact surfaces shall be given a tack coat of bituminous material prior to placing any fresh mixture against the joint.

L. Acceptance Sampling and Testing of Bituminous Mixture (Density) Pavement density will be determined by comparing the density of cores taken from the compacted pavement to the density of laboratory compacted specimens.

1. Lot sizes. The pavement will be accepted for density on a lot basis. A lot will consist of:
 - a. One day's production where it is not expected to exceed 500 tons. A minimum of one density test will be required.
 - b. A half day's production where a days production is expected to consist of between 500 and 1,000 tons. A minimum of two (2) density tests will be required per day.

- c. Similar subdivisions for quantities greater than 1,000 tons.
2. Laboratory Density. Bituminous mixture for laboratory compacted specimens shall be sampled as per this section.
 - a. The specimens shall be compacted in accordance with ASTM D1559, Section 3.5, except that the temperature immediately prior to compaction shall be 250°F " 5° (120°C " 3°). The sample of bituminous mixture can be placed in an oven for not more than 30 minutes to maintain the heat, but it shall not be reheated if it cools below 250°F (120°C) before use. The density of each specimen shall be determined in accordance with ASTM D2726 or D1188, whichever is applicable.
3. Core Density. Cores for determining the density of the compacted pavement shall be taken as indicated in this section. The cores shall be taken in accordance with the requirements of this section. The density of each core shall be determined in accordance with ASTM D 2726 or D1188, whichever is applicable.
4. Pavement Density. The target density (percent compaction) of each lot of in-place pavement shall be 98% of the average density of the laboratory prepared specimens. The pavement density shall be determined by dividing the core density of one day's production by the average density of the laboratory prepared specimens.

M. Acceptance Criteria.

1. Surface / Smoothness Tests. Tests for conformity with the specified crown and grade shall be made by the Contractor immediately after initial compaction. Any variation shall be corrected by the removal or addition of materials and by continuous rolling.

The finished surface shall not vary more than [¼ inch] for the surface course when tested with a 16 foot (4.8 m) straightedge applied parallel with, or at right angles to the centerline.

After the completion of final rolling, the smoothness of the course shall be tested by the Owner or his/her designated representative; humps or depressions exceeding the specified tolerances shall be immediately corrected by removing the defective work and replacing with new material, as directed by the Owner or his/her designated representative. This shall be done at the Contractor's expense.

The finished surfaces of bituminous courses shall not vary from the grade line, elevations, and cross sections shown on the contract drawings by more than ½ inch (12.70 mm). The Contractor shall correct pavement areas varying in excess of this amount by removing and replacing the defective work. Skin patching will not be permitted.

Segregation and/or exposed aggregate will not be accepted, failure to comply with this requirement, will result in complete removal and replacement of pavement at the contractor's expense. Patching will not be accepted.

2. Sampling Pavement. Core samples or Nuclear Density Machine for determination of the density of completed pavements shall be obtained by the Owner. The size, number, and locations of the samples will be as directed by the Deputy Director for Engineering or his/her designated representative. Samples shall be neatly cut with a saw, core drill, or other approved equipment. The Contractor shall patch core locations in accordance with these specifications, at no additional cost to the owner.
3. Thickness. Thickness shall be evaluated for compliance to the requirements shown on the plans. At the discretion of the Owner or his/her designated representative, the thickness of the pavement course shall be determined by cores taken at locations indicated by the Owner or his/her designated representative. Contractor shall patch, core locations in accordance with these specifications, at no additional cost to the Owner.
4. Material Density shall comply with this section.

All tests necessary to determine conformance with requirements specified in this item will be performed by the Owner or his/her designated representative without cost to the Contractor. All failing tests shall be at the Contractor's expense and shall not be paid for by the testing allowance. The Contractor may obtain any additional test which he may require for quality control, using his testing laboratory, at his expense.

Each lot of bituminous mix shall be accepted for density when core or nuclear density machine equals or exceeds 98%. Density requirements will be accepted at an adjusted contract price in accordance with Table 7.

Table 7. Price Adjustment Schedule

Percentage of Compaction (Core or Nuclear Machine)	Percent of Contract Price to be Paid
98-100	100
95-97.9	90
Below 95	To be Removed and Replaced*

Lot shall be removed and replaced. However, the Owner may decide to allow the rejected pavement to remain. In that case, if the Owner and Contractor agree in writing that the pavement shall not be removed, it shall be paid for at 50 percent of the contract price and the total project payment limitation will be reduced by the amount withheld for the rejected pavement.

1.07 TESTING REQUIREMENTS

- A. ASTM C29 - Unit Weight of Aggregate
- B. ASTM C88 - Soundness of Aggregates by Use of Magnesium Sulfate
- C. ASTM C131 - Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine
- D. ASTM C136 - Sieve or Screen Analysis of Fine and Coarse Aggregates

- E. ASTM C183 - Sampling Hydraulic Cement
- F. ASTM D75 - Sampling Aggregates
- G. ASTM D423 - Liquid Limit of Soils
- H. ASTM D424 - Plastic Limit and Plasticity Index of Soils
- I. ASTM D995 - Requirements for Mixing Plants for Hot Mixed, Hot Laid Bituminous Paving Mixtures
- J. ASTM D1075 - Effect of Water on Cohesion of Compacted Bituminous Mixtures
- K. ASTM D1188 - Bulk Specific Gravity of Compacted Bituminous Mixtures Using Paraffin Coated Specimens
- L. ASTM D1461 - Moisture of Volatile Distillates in Bituminous Paving Mixtures
- M. ASTM D1559 - Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
- N. ASTM D2172 - Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
- O. ASTM D2419 - Sand Equivalent Value of Soil and Fine Aggregate
- P. ASTM D2489 - Degree of Particle Coating of Bituminous Aggregate Mixtures
- Q. ASTM D2726 - Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface Dry Specimens
- R. ASTM D3665 - Random Sampling of Paving Materials
- S. ASTM D3666 - Inspection and Testing Agencies for Bituminous Paving Materials
- T. AASHTO T30 - Mechanical Analysis of Extracted Aggregate
- U. The Asphalt Inst. - Model Construction Specifications for Asphalt Concrete and Other Plant Type
- V. Series (SS-1) - Mixes
- W. The Asphalt Inst. - Mix Design Methods for Asphalt Concrete Manual No.2 (MS-2)

1.08 MATERIAL REQUIREMENTS

- A. ASTM D242 - Mineral Filler for Bituminous Paving Mixtures
- B. ASTM D490 - Tar
- C. ASTM D946 - Asphalt Cement for Use in Pavement Construction

D. ASTM D3381 - Viscosity Graded Asphalt Cement for Use in Pavement Construction

E. AASHTO M226 - Viscosity Graded Asphalt Cement

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

A. Measurement and payment for this work item shall be as specified in this Section and Section 01025 of these specifications. No separate measurement and payment will be made for pavement markings but shall be included in the unit price bid for Asphaltic Concrete Paving as specified herein.

END OF SECTION

SECTION 02521

CONCRETE CURBS, SIDEWALKS AND DRIVEWAYS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The work covered by this section of the Specifications consists of constructing new concrete curbs, sidewalks and driveways and reconstructing or repairing all concrete driveways, sidewalks, curbs, gutters, and headers removed or damaged during construction of the pipelines.
- B. The Contractor shall furnish all material, equipment, tools, labor, superintendence and incidentals necessary for the complete construction of this work in accordance with the drawings and these specifications.

1.02 RELATED WORK

- A. Division 3 – Concrete

PART 2 PRODUCTS

2.01 EXPANSION JOINTS

- A. Expansion joint material shall be an approved performed bituminous impregnated, non-extending, type jointing material with a thickness of 1/2 to 3/4 inch.
- B. Concrete shall be in accordance with Division 3 of these Specifications, minimum 28-day strength equal to 4000 psi.

PART 3 EXECUTION

3.01 DRIVEWAYS AND SIDEWALKS

- A. Damaged, existing driveway and sidewalk sections shall be reconstructed or repaired to match the width, grade and all other pre-construction conditions of the existing facility. New and replacement driveway concrete shall be reinforced with #4 steel bars at 12-inch O.C.E.W., or 6"x6" W1.4xW1.4 welded wire fabric. Reinforcing bars (#4) shall be doveled into undisturbed concrete at 12-inch centers to a depth of 4-inches.
- B. The slabs shall be screeded and floated to a uniform surface. When the concrete has set sufficiently to support knee boards, the surface shall be given a steel trowel finish then brushed lightly with a soft-bristled brush. The brush shall be moistened with water and shall be kept clean at all times. Brushing shall be limited to that necessary to remove the glaze and produce a non-slip surface. Edges shall be rounded to a c inch radius with an edging tool.

- C. New concrete driveways and sidewalks shall be constructed with an expansion joint at intervals of not more than forty (40) feet if required. A construction or contraction joint shall be at intervals equal to driveway or sidewalk width.

3.02 CURB, CURB AND GUTTER AND HEADERS

- A. Curb, curb and gutter and headers shall be constructed as indicated or to match the facility being repaired. New work shall begin and end at an existing expansion, contraction or construction joint. New work may be of the formed or the machine laid type. However, the method used must match the method used to install the existing improvement.
- B. New work shall be finished to a surface of uniform texture by floating with a wood float and troweling. The final finishing shall be done with a brush, the last stroke being one from the back of the curb or header to the lip of the curb or header. Both sides of all joints, the lip of the curb or header, and back edge of the header shall be finished with an approved edging tool before the final brushing.
- C. Concrete curbs and headers shall be constructed with an expansion joint at the tangent point of each return at intersections, at intervals of not more than forty-feet (40') between intersections (odd length sections as established by the Engineer), and at the end of each day's concrete placement. A construction or contraction joint shall be located at 10-foot intervals, or at perpendicular to the surface of the concrete and to the axis of the section. Construction or contraction joints for the items placed in metal forms shall be formed by metal templates accurately shaped to the cross-section and so constructed that they can be removed during the finishing operations. Templates shall be maintained in good condition and warped or bent templates shall not be used.

3.03 CURING

- A. All concrete shall be cured as specified in Division 3.

3.04 DEFECTIVE WORK

- A. Any defective work disclosed after the forms have been removed shall be immediately removed and replaced. If any dimensions are deficient, or if any section is not constructed to the proper grade, or if the surface of the concrete is bulged, uneven, or shows honeycomb, which in the opinion of the Engineer cannot be repaired satisfactorily, the entire section between joints shall be removed and replaced at the expense of the Contractor. Removed concrete shall be immediately removed from the job.

3.05 BACKFILL

- A. Backfilling behind and adjacent to all concrete work of this section shall be made from good quality topsoil. This material shall be free from organic material such as leaves, grass, roots and other unsuitable materials and free of rocks or stones. The Contractor shall provide a smooth, even slope between the property line and the edge of concrete headers or the top of other concrete structures.
- B. Care shall be taken during the backfill, compaction and cleanup process not to scrape, chip, crack or otherwise damage new and/or existing concrete, including tire marks from

equipment or trucks. Any damaged concrete will be removed and replaced at the expense of the Contractor.

3.06 CONSTRUCTION TESTS

- A. Tests of all the materials may be made during construction to determine conformity with the specifications. Such tests may include strength, slump, air content, temperature, cement content and grading analysis of material. The frequency and type of testing will be determined by the Engineer. The Contractor shall cooperate in securing samples and shall furnish materials required for sampling.
- B. All passing construction tests requested by the Engineer will be paid for by the Owner. Should construction testing reveal that the item tested does not meet the requirements of the Construction Documents, re-testing shall be required until the item does meet the requirements. All failing tests shall be at the Contractor's expense and shall not be paid for by Owner.
- C. The Contractor is responsible for any quality control testing, using his testing laboratory, at his expense. The Owner's test and lab are used for quality assurance only.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this Contract.

END OF SECTION

SECTION 02605

MANHOLES

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, and equipment to install standard pre-cast manholes, concrete manhole bases, frames, and covers and appurtenances as shown on the contract drawings.

1.2 RELATED WORK

- A. Section 02221 Excavating, Backfilling and Compacting for Utilities.

1.3 SUBMITTALS

- A. Shop drawings, product data, materials of construction, and details of installation shall be submitted in accordance with Section 01300. Submittals shall include the following:
 - 1. Details of base sections, riser sections, conical top sections, flat slab tops, and grade rings, with a certificate indicating compliance with ASTM C478.
 - 2. Pipe connection to manhole details.
 - 3. Manhole frame and cover details with a certificate indicating compliance with ASTM A48, Class 30.
 - 4. Manholes and Inlet Structures can be pre-cast or cast-in-place.
- B. Design Data
 - 1. Cast-in-Place concrete structures:
 - a. 4 copies plus Contractor's requirements of sections plan(s) and elevations showing dimensions, reinforcing steel placement and pipe connections to the manhole.
 - b. 4 copies plus Contractor's requirements of concrete design mix.
 - c. Manhole frame and cover.

1.4 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM A48 Specification for Gray Iron Castings
 - 2. ASTM A615 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

3. ASTM C33 Specification for Concrete Aggregates
 4. ASTM C62 Standard Specifications for Building Brick (solid masonry units made from clay or shale)
 5. ASTM C150 Standard Specification for Portland Cement
 6. ASTM C207 Specification for Hydrated Lime for Masonry Purposes
 7. ASTM C478 Standard Specification for Precast Reinforced Concrete Manhole Sections
 8. ASTM D4101 Specification for Propylene Plastic Injection and Extrusion Materials
- B. American Concrete Institute (ACI)
1. ACI 318 Building Code Requirements for Reinforced Concrete
- C. American Association of State Highway and Transportation Officials (AASHTO)
1. Standard Specifications for Highway Bridges
- D. Occupational Safety and Health Administration (OSHA)
- E. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.5 QUALITY ASSURANCE

- A. All material shall be new and unused and supplied by a single manufacturer for each product.
- B. Material quality, manufacturing process, and finished sections are subject to inspection and approval by Engineer or another Owner representative. Inspection may be made in the place of manufacture, at worksite following delivery, or both.
- C. Materials will be examined for compliance with ASTM specifications, these specifications, and approved manufacturer's drawings. Additional inspection criteria shall include appearance, dimension(s), blisters, cracks, and soundness.
- D. Materials shall be rejected for failure to meet any specification requirement. Rejection may occur at the place of manufacture, at the worksite, or following installation. Mark for identification rejected materials and remove from worksite immediately. Rejected materials shall be replaced at no cost to Owner.
- E. Repair minor damage to precast concrete sections by an approved method, if repair is authorized by Engineer.

PART 2 PRODUCTS

2.1 GENERAL

- A. Manholes shall be as shown on the plans, constructed at the locations designated, in accordance with the details on project drawings.
- B. Manholes shall be constructed pre-cast or cast-in-place concrete sections, as herein specified.

2.2 PRE-CAST OR CAST-IN-PLACE CONCRETE MANHOLE SECTIONS

- A. The manhole riser and manhole section(s) shall be designed for installations in the diameter specified or shown. All manhole sections shall have a wall thickness as shown with tongue and groove joints. Rings shall be available in various lengths from 1 foot to 4 feet. Manhole wall thickness shall not be less than 7-inch for 72-inch diameter reinforced barrel sections. The sections shall be concentric for standard 72-inch manholes and adapted to the ring at one end and to the standard cast iron frame at the other. The base ring shall have a flat bottom joint. Steps or rungs are not required. Manufacturing of manhole section(s) shall comply with ASTM C478 and any additional specifications listed here forth:
 - 1. Bottom slab thickness shall be as shown on the plans.
 - 2. Top section of manholes shall be as shown in the drawings.
 - 3. Base, riser and top sections shall have tongue and groove joints.
 - 4. Sections shall be cured by an approved method, in accordance with referenced standards.
 - 5. Concrete shall have a minimum 28-day compressive strength of 4,000 psi. Water-cement ratio shall be 0.5 or less by weight or not more than 5.5 gallons per sack.
 - 6. All aggregates fine and coarse other than lightweight aggregate shall conform to specifications outlined by ASTM C33. Aggregates shall be free of deleterious substances causing reactivity with oxidized hydrogen sulfide. Both types of aggregates shall be graded in order to produce a homogeneous concrete mix. All materials are to be accurately weighed at a central batching facility for mixing.
 - 7. All cement shall be Portland Cement conforming to ASTM C150 for sewer applications. Cement content shall be sufficient to produce a minimum strength of 4,000 psi.
 - 8. Design cast-in-place concrete base, riser, top, and grade ring for a minimum H-20 loading plus earth load.
 - 9. Mark date of manufacture, name, and trademark for manufacture on the inside of each cast-in-place section.
 - 10. Construct and install cast-in-place concrete base as shown on the drawings.
 - 11. Provide integrally cast knock-out panels in cast-in-place concrete manhole sections at locations and with sizes shown on drawings. Knock-out panels shall have no steel reinforcing.

12. All concrete shall be handled from the mixer or transport vehicle to the place of final deposit in a continuous manner, as rapidly as practicable, and without segregation or loss of ingredients, until (the approved unit operation) is completed. Concrete shall be placed in layers not over two feet deep. Each layer shall be compacted by mechanical internal or external vibrating equipment. Duration of the vibration cycle shall be limited to the time necessary to produce satisfactory consolidation without causing objectionable segregation.
13. Concrete may be heated in the mold after the initial set has taken place. The temperature shall not exceed 160 degrees and shall be raised from normal ambient temperature at a rate not to exceed 40 degrees per hour. The cured unit shall not be removed from forms until sufficient strength is obtained for the unit to withstand any structural strain that may be subjected during the form stripping operation. After the stripping of forms, further curing by means of water spraying or a membrane curing compound may be used and shall be of a clear or white type, conforming to ASTM C309.
14. Reinforcing steel shall be as outlined in ASTM C478 and any additional specifications herein. The minimum steel area of 0.12 square inches shall apply to both risers and cone sections and the maximum center to center spacing of 6 inches shall apply as well. Placing of reinforcing steel for one-line circumferential reinforcement shall be on the tension side of the wall (the inner half part of the wall with a minimum 1-inch cover) for two lines circular reinforcement, refer to ASTM C478. All reinforcing shall be sufficiently tied to withstand any displacement during the pouring operation.
15. Both tongue and groove shall contain a #4 rebar.
16. Lifters shall be designed to handle the imposed weights and shall be placed per manufacturer's requirements.
17. All joints to be sealed using Ram-Nek joint sealer. Joint sealer to be provided in sufficient quantities by the vendor as part of the manhole section(s). Size shall be per manufacturer's recommendations. Completed joint shall withstand 15 PSI internal water pressure without leakage.

2.3 MANHOLES INTERIOR COATING

- A. All manholes with a depth greater than 6 feet shall be interior coated. Concrete and mortar to be dry and clean with all oil, grease, form release agents, curing compounds, sealers, hardeners, and any other contaminants removed. Verify dryness by testing with "Tape Down Test."

Acceptable Coatings:

Triplex Coating (Contractor to submit coating to be approved by the Engineer)

2.4 MANHOLE FRAME AND COVER

- A. Manhole frames and covers shall be of good quality, strong, tough, even-grained cast iron, smooth, free from scale, lumps, blisters, sand holes, and defects of any kind which render them unfit for the service for which are intended. Manhole covers and frame seats shall be

machined to a true surface. Castings shall be thoroughly cleaned and subject to hammer inspection. Cast iron shall conform to ASTM A48, Class 30.

- B. No holes shall be in the cover, but edge notches for embedded rings shall be used for lifting. Mating surfaces shall be machined to ensure a snug fit of the cover and frame.

PART 3 EXECUTION

3.1 INSTALLATION

A. Manhole Installation

1. The manholes shall be constructed at the location shown on the plans or as directed by the Engineer and in accordance with the details shown on the plans and as specified herein. After the excavation has been completed, the concrete base or bottom shall be poured. When the concrete has sufficiently set, the riser work may proceed.
2. The subgrade under manhole/inlet bases shall be compacted in accordance with Section 02221. Compaction limits shall be one foot beyond the perimeter of the concrete base and shall be a minimum of one foot in depth.
3. Set pre-cast or cast-in-place concrete barrel sections and structures plumb with a ¼-inch maximum out of plum tolerance allowed. Seal joints of cast-in-place barrel sections as specified. Fill the outside and inside joint with a non-shrink mortar and finished flush with the adjoining surfaces. Caulk the inside of any leaking barrel section joint with non-shrink grout to the satisfaction of the Engineer.
4. Allow joints to set for 14 hours before backfilling.
5. Plug holes in the concrete barrel sections required for handling with a non-shrinking grout or non-shrinking grout in combination with concrete plugs. Finish flush on the inside.
6. Cut holes in pre-cast or cast-in-place sections to accommodate pipes prior to setting manhole sections in place to prevent jarring which may loosen the mortar joints.
7. All manholes that are in groundwater shall be externally coated with a bituminous coating such as Coal Tar Epoxy or approved equal. Interior coatings of manholes shall be in accordance with this section.
8. Backfill carefully and evenly around manhole sections.

B. Setting Manhole Frame and Cover

1. Set manhole covers and frames in a full mortar bed. Utilize grade rings, a maximum of eight-inches thick, to assure frame and cover are set to the finished grade. Set manhole frame and cover to final grade prior to placement of permanent paving.

3.2 CLEANING

- A. Thoroughly clean all new manholes of all silt, debris, and foreign matter of any kind, prior to final inspection.

PART 4 MEASUREMENT AND PAYMENT

4.1 MEASUREMENT AND PAYMENT

- A. Measurement and payment shall be in accordance with Section 01025 of these specifications.

END OF SECTION

SECTION 02606

POLYMER CONCRETE MANHOLES

1.02 REFERENCES

- A. ASTM C 478 (most current) Standard Specification for Precast Reinforced Concrete Manhole Sections
- B. ASTM C 579 (most current) Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic, Surfacing, and Polymer Concretes
- C. ASTM C 443 (most current) Standard Specification for Joints for Concrete Pipe and Manholes Using Rubber Gaskets
- D. ASTM C 580 (most current) Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
- E. ASTM C 857 (most current) Standard Practice for Minimum Structural Design Loading for Underground Utility Structures
- F. ACI 350-06 Code Requirements for Environmental Engineering Concrete Structures & Commentary
- G. ACI 440.1R-15 Guide for the Design and Construction of Structural Concrete Reinforced with Fiber-Reinforced Polymer (FRP) Bars
- H. ACI 548.6R-96 Polymer Concrete-Structural Applications State-of-the-Art Report
- I. ASTM D 648 (most current) Test Method for Deflection Temperature of Plastics Under Flexural Load in Edgewise Position
- J. ASTM D 6783 (most current) Standard Specification for Polymer Concrete Pipe
- K. ASTM D 2584 (most current) Test Method for Ignition Loss of Cured Reinforced Resins
- L. ASTM C 923 (most current) Standard Specifications for Resilient Connectors between Concrete Manholes Structures and Pipe
- M. ASTM C 990 (most current) Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections using Preformed Flexible Joint Sealants
- N. ASTM C 497 (most current) Test Methods for Concrete Pipe, Manhole Sections, or Tile

- O. California Greenbook Standard Specifications for Public Works Construction Section 211-2

1.03 SUBMITTALS

- A. Conform to bid document requirements
- B. Submit manufacturer's data and details of following items for approval:
- C. Shop drawings of manhole sections, base units and construction details, jointing methods, materials, and dimensions
- D. Summary of criteria used in manhole design including, as minimum, material properties, loading criteria, and dimensions assumed. Include certification from manufacturer that polymer concrete manhole design meets or exceeds the load and strength requirements of ASTM C 478 and ASTM C 857, reinforced in accordance with ACI 440.1R-15. Include current ISO 9001:2008 certification
- E. Frames, grates, rings, and covers
- F. Materials to be used in fabricating pipe drop connections
- G. Materials to be used for pipe connections
- H. Materials to be used for stubs and stub plugs, if required
- I. Proof of independent Chemical Resistance testing conducted in accordance with the Standard Specifications for Public Works Construction (California Greenbook) Section 211-2
- J. Submitted sealed drawings by a registered Professional Engineer

2.01 POLYMER CONCRETE MANHOLES

- A. Provide polymer concrete manhole sections, monolithic base sections and related components referencing to ASTM C 478. ASTM C 478 material and manufacturing is allowed compositional and dimensional differences required by a polymer concrete product.
- B. Provide base riser section with monolithic floors, unless shown otherwise
- C. Provide riser sections joined with bell and spigot / ship-lap design seamed with butyl mastic and or rubber gaskets (ASTM C 990) so that on assembly, manhole base, riser and top section make a continuous and uniform manhole structure
- D. Construct riser sections for polymer concrete manholes from standard polymer concrete manhole sections of the diameter indicated on drawings. Use various lengths of polymer concrete manhole sections in combination to provide correct height with the fewest joints

- E. Design wall sections for depth and loading conditions with wall thickness as designed by polymer concrete manufacturer
- F. Provide tops to support AASHTO HS-20 or HL-93 or vehicle loading or loads as required and receiving cast iron frame covers or hatches, as indicated on drawings.
- A. Polymer Concrete Manholes risers, cones, flat lids, grade rings and manhole base sections shall be designed by manufacturer to meet the intent of ASTM C 478 with allowable compositional and sizing differences as designed by the polymer concrete manufacturer.
 - 1. AASHTO HS-20 or HL-93 design or as required loading applied to manhole cover and transition and base slabs
 - 2. Polymer manholes will be designed based upon live and dead criteria in ATSM C 857 and ACI 350-06.
 - 3. Unit soil weight of 120 pcf located above portions of Manhole, including base slab projection
 - 4. Internal liquid pressure based on unit weight of 63 pcf
 - 5. Dead load of manhole sections fully supported by polymer concrete manhole base

2.03 DESIGN

- A. Polymer Concrete Manhole risers, cones, flat lids, grade rings and manhole base sections shall be designed by manufacturer to meet loading requirements of ASTM C 478, ASTM C 857 and ACI 350-06 as modified for polymer concrete manhole design as follows:
 - 1. Polymer Concrete Mix Design shall consist of thermosetting resin, sand, and aggregate. No Portland cement shall be allowed as part of the mix.
 - 2. Design matrix. All sand and aggregate shall be inert in an acidic environment.
 - 3. Reinforcement – Shall use acid resistant reinforcement (FRP Bar) in accordance with ACI 440.1R-06 as applicable for polymer concrete design.
 - 4. The wall thickness of polymer concrete structures shall not be less than that prescribed by the manufacturer's design by less than 95% of stated design thickness.
 - 5. Thermosetting Resin - The resin shall have a minimum deflection temperature of 158° F when tested at 264 psi (1.820 mPa) following Test Method D 648. The resin content shall not be less than 7% of the weight

of the sample as determined by test method D 2584. Resin selection shall be suitable for applications in the corrosive conditions to which the polymer concrete manhole structures will be exposed.

6. Each polymer concrete manhole component shall be free of all defects, including indentations, cracks, foreign inclusions and resin starved areas that, due to their nature and degree or extent, detrimentally affect the strength and serviceability of the component part. Cosmetic defect shall not be cause for rejection. The nominal internal diameter of manhole components shall not vary more than 2%. Variations in height of two opposite sides of risers and cones shall not be more the 5/8 inch. The under run in height of a riser or cone shall not be more than ¼ in/ft of height with a maximum of ½ inch in any one section.
7. Marking and Identification - Each manhole shall be marked with the following information - Manufacturer's name or trademark, Manufacturer's location and Production Date.
8. Manhole joints shall be assembled with a bell/spigot or shiplap butyl mastic and/or gasketed joint so that on assembly, manhole base, riser and top section make a continuous and uniform manhole. Joint sealing surfaces shall be free of dents, gouges and other surface irregularities that would affect joint integrity.
9. Minimum clearance between wall penetrations and joints shall be per manufacturer's design.
10. Construct invert channels to provide smooth flow transition with minimal disruption of flow at pipe-manhole connections. Invert slope through manhole is as indicated on drawings. All precast base sections to be cast monolithically. Polymer bench and channel are to be constructed with all polymer concrete material. Extended ballast slab requirements for buoyancy concerns can be addressed with cementitious concrete material.
11. Provide resilient connectors conforming to requirements of ASTM C 923 or other options as available. All connectors are to be watertight. Install approved resilient connectors at each pipe entering and exiting manholes in accordance with manufacturer's instructions.

2.04 QUALITY CONTROL

- A. Facility Quality Control should be maintained by adhering to ISO 9001:2008 for manufacturing. All fabricators will be ISO 9001:2008 Certified. All fabrication will take place in an all-polymer concrete fabrication facility. At no time will the polymer concrete fabrication facility share the facility with a cementitious precast product production facility. Fabricator is also to provide references of 5 previous projects in the last 5 years performed with both owner and contractor for reference and review by owner. Polymer concrete shall be cast in a polymer only facility and shall not be manufactured in a cementitious concrete facility.

2.05 GROUTING

- A. All materials needed for grouting and patching will be a polyester mortar compound provided by the manufacturer or an approved equal by the manufacturer.

2.06 MANUFACTURER

1. Armorock, LLC
Boulder City, NV
www.armorock.com
(702) 824-9702
2. OR Approved Equal

PART 3 EXECUTION (NOT USED)

PART 4 MEASUREMENT AND PAYMENT

- A. Measurement and payment for this bid item shall be covered under Bid Item Number 7 & 8 and included in the total Base Bid under this Contract.

END OF SECTION

SECTION 02610

SCHEDULE OF PIPE

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This section covers the materials, installation, and testing of all piping, including fittings used in the project.
- B. Furnish all labor, materials, equipment, tools, superintendence and incidentals required to install, test, and perform any other specified or drawn work required to construct and install the pipeline systems under this Contract.
- C. Only approved pipe shall be used for the construction of all pipelines and connections under this Contract. The only types of pipe that will be considered for use, and for the uses specified, are those listed in Part 2 of this Section. All pipe of like use and size shall be the same type, class and manufacturer.

1.02 PIPE SUBMITTALS

- A. Before starting fabrication, the Contractor shall furnish the Engineer with electronic submittals that shall include a laying plan and details of a standard pipe section, special fittings, restrained joints and bends. Dimensions plate size, coating and lining and other pertinent information shall be shown. Design calculations shall be included. The laying plan shall show the location of each pipe section and each special length with each piece numbered or otherwise designated in sequence. All outlets and bends shall be made up into special lengths so that, when installed, they will be located as indicated. Each pipe and fitting shall be marked on the outside to indicate the class of pipe and the location number on the laying plan. Pipe shall be furnished and installed in accordance with the reviewed laying plan. Where two or more classes or lengths of pipe of the same diameter are to be furnished, clearly mark each pipe section. All marking shall be coded to the shop drawings. The drawings shall be furnished in conformance with requirements of the General Conditions. Review of the drawings by the Engineer shall not relieve the Contractor of the responsibility for complying with all requirements of the Contract Documents.

1.03 CERTIFICATION

- A. Certifications properly executed by the manufacturer shall be furnished to the Engineer showing compliance to the required specifications. Test data on tests performed shall be provided as requested by the Engineer.

1.04 INSPECTION

- A. The Engineer and his representatives shall have access to all phases of work: the manufacturer and Contractor shall provide proper facilities for access and inspection. Material, fabricated parts, and pipe which are discovered to be defective, or which do not conform to the requirements of this Specification, will be subject to rejection at any time prior to final acceptance of the pipe.

PART 2 PRODUCTS

2.01 SCHEDULE OF PIPE

- A. 8-inch Diameter Approved Pipe:
 - 1. Polyvinyl Chloride (PVC) Pipe conforming to ASTM D-3034, PVC SDR 35 Gravity Sewer Pipe, 46 psi minimum stiffness
- B. 4-inch Diameter Approved Pipe (force main):
 - 1. Polyvinyl Chloride (PVC) Pipe conforming to AWWA C900, PVC DR 18 Gravity Sewer Pipe, 235 psi minimum stiffness
- C. 4-inch Diameter Approved Pipe (residential yard line):
 - 1. Polyvinyl Chloride (PVC) Pipe conforming to ASTM D-3034, PVC SDR 35 Gravity Sewer Pipe, 46 psi minimum stiffness
 - a. 4-inch Diameter Approved Pipe (main to ROW) Minimum yield strength of 35,000 psi, minimum thickness of 0.500-inch, equipped with grout holes as herein specified, and conforming to AWWA C200.
- E. Lift Station Piping
 - a. Refer to Division 11
- F. Pipe within casings (gravity or pressurized) shall be mechanically restrained.
- G. No galvanized pipe or fittings shall be utilized for any aspect for this project.
- H. All pipes conveying sanitary sewer shall be manufactured green.

PART 3 EXECUTION (NOT USED)

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this Contract.

END OF SECTION

SECTION 02622

POLYVINYL CHLORIDE (PVC) PIPE

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to install and test polyvinyl chloride (PVC) pipe and fittings, complete as shown on the Drawings and as specified herein.
- B. Piping shall be located substantially as shown on the drawings. The Engineer reserves the right to make such modifications as may be found desirable to avoid interference between pipes or for other reasons. Pipe fitting notation is for the Contractor's convenience and does not relieve him/her from installing and jointing different or additional items where required to achieve a complete piping system.
- C. Where the word "pipe" is used it shall refer to pipe, fittings and appurtenances unless noted otherwise.

1.02 RELATED WORK

- A. Excavating, backfilling, and compacting for utilities is included in Section 02221.
- B. Granular fill material is included in Section 02235.
- C. Manholes are included in Section 02606.
- D. Repair of Paved Surfaces is included in Sections 02222 and 02510.
- E. Schedule of Pipe is included in Section 02610.

1.03 SUBMITTALS

- A. Shop drawings, product data and all specified calculations shall be submitted in accordance with Section 01300 and this Specification.
- B. Submit copies of design calculations in accordance with this Section.
- C. Submit the anticipated pipe production and delivery schedule from the manufacturer and supplier.
- D. Prior to shipment of pipe, submit a certified affidavit of compliance from the manufacturer stating that the pipe, fittings, gaskets, interior linings, and exterior coatings for this project have been manufactured and tested in accordance with ANSI/AWWA and ASTM Standards and requirements specified herein.

Submit calculations, prepared by the manufacturer, for all required lengths of joint restraint in general conforming to the locations shown on the drawings. Approval by the Engineer is required prior to the manufacture and shipment of the pipe.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
2. ASTM D2241 – Poly(Vinyl Chloride)PVC) Pastic Pipe (SDR-PR)
3. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-flow Application.
4. ASTM D2464 – Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
5. ASTM D2729 – Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
6. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
7. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
8. ASTM D3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
9. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
10. ASTM F679 – Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
11. ASTM F758 - Standard Specification for Smooth -Wall Poly (Vinyl Chloride) (PVC) Plastic Under drain Systems for Highway, Airport and Similar Drainage.
12. ASTM F789 - Standard Specification for Type PS-46 Poly (Vinyl Chloride) (PVC) Plastic Gravity Flow Sewer Pipe and Fittings
13. ASTM F794 Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings based on Controlled Inside Diameter

B. American Water Works Association (AWWA)

1. AWWA C900-Polyvinyl Chloride (PVC)

C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. All PVC pipe and fittings of each type shall be from a single manufacturer. The supplier shall be responsible for the provisions of all test requirements specified in the referenced ASTM Standards as applicable. In addition, all PVC pipe to be installed under this Contract may be inspected at the plant for compliance with these specifications by an independent testing laboratory provided by the Owner. The Contractor shall require the manufacturer's cooperation in these inspections. The cost of plant inspection of all pipe approved for this Contract, plus the cost of inspection of a reasonable amount of disapproved pipe, will be borne by the Owner.
- B. Inspections of the pipe may also be made by the Engineer or other representatives of the Owner after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though sample pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall be removed from the job at once.
- C. All polyvinyl chloride (PVC) pipe and fittings to be installed under this Contract may be inspected at the plant for compliance with these Specifications by an independent testing laboratory selected by the Owner at the Owner's expense. The Contractor shall reimburse the Owner for excessive inspection costs, which are defined as the costs of inspection of that amount of pipe which exceeds 125 percent of the aggregate length of pipe under this Section.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Care shall be taken in shipping, handling and laying to avoid damaging the pipe and fittings. Extra care will be necessary during cold weather construction. Any pipe damaged in shipment shall be replaced as directed by the Engineer.
- B. Any pipe or fitting showing a crack or which has received a blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.
- C. While stored, pipe shall be adequately supported from below at not more than 3-ft intervals to prevent deformation. Pipe shall not be stacked higher than 6-ft. Pipe and fittings shall be stored in a manner which will keep them at ambient outdoor temperatures. Temporary shading as required to meet this requirement shall be provided. Simple covering of the pipe and fittings which allows temperature buildup when exposed to direct sunlight will not be permitted.
- D. Gaskets for mechanical and push-on joints to be stored shall be placed in a cool location out of direct sunlight. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first-in, first-out basis.

PART 2 PRODUCTS

2.01 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

- A. Gravity Sanitary Sewer:
 - 1. Pipe shall be manufactured from PVC compounds meeting ASTM D1784, Class 12454-B in accordance with ASTM D1785, PVC 1120. The pipe shall have a minimum hydrostatic design stress of 2,000 psi at 73 degrees F and shall be suitable for field cutting and solvent welding. Pipe shall be of the sizes as shown on the Drawings and shall be Schedule 80 unless otherwise shown.

2. Fittings shall be the socket type for solvent welded joints conforming to ASTM D2467 and D2466. Fittings shall be manufactured from PVC compound meeting ASTM D1784, Class 12454-B. Solvent cement shall be as specified in ASTM D2564.
 3. Joints shall be flanged where shown on the Drawings. Flanges shall be furnished with 1/8-in thick full-faced gaskets which shall be of a material suitably resistant to the fluid within the respective pipelines and shall be subject to the approval of the Engineer. Flange bolts and nuts shall be ASTM F593 and F594, Type 304 stainless steel.
- B. Each pipe length shall be marked with the manufacturer's name or trademark, size, material code, pressure class, AWWA designation number and seal of test agency that verified pipe material for pressure service. Pipe shall be fabricated green.
 - C. Encroachment near existing Public Water Distribution Lines or as Shown on Drawings: Sanitary sewer PVC pressure pipe (4" through 15" in diameter) shall conform to the requirements of AWWA C900. All pipe shall be Class 150 with a dimension ratio of 18 (DR 18). The pipe shall be PVC 1120 made from PVC compounds Class 12454-B as defined in ASTM 1784. Each pipe length shall be marked with the manufacturer's name or trademark, size, material code, pressure class, AWWA designation number and seal of test agency that verified pipe material for pressure service. All sanitary sewer pressure pipe shall be green in color.
 - D. PVC gravity sanitary sewer pipe and fittings shall be Type PSM, SDR35 with full diameter dimensions and shall conform to ASTM D3034, or Type PS-46 conforming to ASTM F3034 or ASTM F679. Straight pipe shall be furnished in lengths of not more than 13-ft and wyes shall be furnished in lengths of not more than 3-ft. Saddle wyes will not be allowed.
 - E. Fittings, specials, unions, and flanges shall be of the same schedule number and manufactured of the same materials the pipe.
 - F. All pipe shall be manufactured green.

PART 3 EXECUTION

3.01 INSTALLATION OF PVC PIPE AND FITTINGS

- A. No single piece of pipe shall be laid unless it is generally straight. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends of the pipe by more than 1/16-in per foot of length. If a piece of pipe fails to meet this requirement check for straightness, it shall be rejected and removed from the site. Laying instructions of the manufacturer shall be explicitly followed.
- B. If any defective pipe is discovered after it has been installed, it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional cost to the Owner. All pipe and fittings shall be thoroughly cleaned before installation, shall be kept clean until they are used in the work and when laid, shall conform to the lines and grades required. PVC and CPVC pipe and fittings shall be installed in accordance with requirements of the manufacturer, ASTM D2321 or as otherwise provided herein.

- C. As soon as the excavation is complete to normal grade of the bottom of the trench, bedding shall be placed, compacted and graded to provide firm, uniform and continuous support for the pipe. Bell holes shall be excavated so that only the barrel of the pipe bears upon the bedding. The pipe shall be laid accurately to the lines and grades indicated on the Drawings. Blocking under the pipe will not be permitted. Bedding shall be placed evenly on each side of the pipe to mid-diameter and hand tools shall be used to force the bedding under the haunches of the pipe and into the bell holes to give firm continuous support for the pipe. Generally the compaction shall be done evenly on each side of the pipe and compaction equipment shall not be operated directly over the pipe until sufficient backfill has been placed to ensure that such compaction equipment will not have a damaging effect on the pipe. Equipment used in compacting the initial 3-ft of backfill shall be approved by the pipe manufacturer's representative prior to use.
- D. All pipe shall be sound and clean before installation. When installation is not in progress, including lunchtime, the open ends of the pipe shall be closed by watertight plug or other approved means. Good alignment shall be preserved during installation. The deflection at joints shall not exceed that recommended by manufacturer.
- E. When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Cut ends of pipe to be used with a bell shall be beveled to conform to the manufactured spigot end.
- F. In making solvent welded connections, clean dirt and moisture from pipe and fittings, bevel pipe ends slightly with emery cloth, if necessary, and apply solvent cement of the proper grade. Solvent welded joints shall be made in accordance with ASTM D-2855.
- G. The Engineer may examine each bell and spigot end to determine whether any preformed joint has been damaged prior to installation. Any pipe having defective joint surfaces shall be rejected, marked as such, and immediately removed from the job site.
- H. Each length of the pipe shall be shoved home against the pipe previously laid and held securely until enough backfill has been placed to hold the pipe in place. Joints shall not be "pulled" or "cramped".
- I. Before any joint is made, the pipe shall be checked to assure that close joint with the next adjoining pipe has been maintained and that the inverts are matched and conform to the required grade. The pipe shall not be driven down to grade by striking it.
- J. Precautions shall be taken to prevent flotation of the pipe in the trench.
- K. When movable trench bracing such as trench boxes, moveable sheeting, shoring or plates are used to support the sides of the trench, care shall be taken in placing and moving the boxes or supporting bracing to prevent movement of the pipe, or disturbance of the pipe bedding and the backfill. Trench boxes, moveable sheeting, shoring or plates shall not be allowed to extend below top of the pipe. As trench boxes, moveable sheeting, shoring or plates are moved, pipe bedding shall be placed to fill any voids created and the backfill shall be recompacted to provide uniform side support for the pipe.
- L. Wastewater pipelines shall be installed to such a depth that they will have at least 48-inches of cover below existing natural ground at all times. The pipeline shall have no dips, sags, humps, or other irregularities in vertical alignment.

3.02 TESTING

Testing shall be performed as per Section 02635

3.03 CLEANING

- A. At the conclusion of the work, the Contractor shall thoroughly clean the entire pipe by flushing with water or other means to remove all dirt, stones, pieces of wood, or other material which may have entered during the construction period. All debris shall be removed from the pipeline. The lowest segment outlet shall be flushed last to assure debris removal.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. Measurement and payment for this bid item shall be covered under Bid Item Numbers 5, 6, 9, & 10 and included in the total Base Bid under this Contract.

END OF SECTION

SECTION 02635

TESTING OF GRAVITY PIPELINES

PART 1 GENERAL

1.01 DESCRIPTION

- A. Extent of Work. Furnish all labor, materials, tools and equipment, and perform all operations in connection with low pressure air testing and Mandrel testing on completed sanitary sewer lines.
- B. Time of Testing. After gravity sanitary sewer line has been laid and backfilled, but prior to replacement of pavement, subject line to low pressure air test. Test shall be performed using equipment denoted herein according to outlined procedures.
- C. Contractor's Responsibility. Take such precautions as required to prevent damage to lines and appurtenances being tested. Repair any damage resulting from test at Contractor's expense. All testing to be completed in the presence of the Engineer.

PART 2 PRODUCTS

2.01 PERFORMANCE AND DESIGN REQUIREMENTS

- A. Equipment. Equipment used shall meet the following minimum requirements.
 - 1. Pneumatic plugs shall have a sealing length equal to greater than diameter of pipe tested.
 - 2. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.
 - 3. One of the pneumatic plugs shall have inlet tap or other provision for connecting air supply to introduce low pressure air into the line for testing.
 - 4. All air used shall pass through a single control panel.
 - a. From control panel to pneumatic plugs for inflation.
 - b. From control panel to a sealed line for introducing low pressure air.
 - c. From sealed line to control panel for continuous monitoring air pressure in sealed line.
 - 5. Air supply system shall have necessary valves and gauges to control rate at which air enters test section and for reading test results.
 - 6. Pressure gauges shall have minimum gradations of 0.1 psi and an accuracy of plus or minus 0.04 psi.

PART 3 EXECUTION

3.01 PRETESTING PROCEDURES

A. Preparations of Sewer Lines

1. Flush and clean sewer line prior to testing thus serving to wet pipe surface as well as removing any debris.
2. Plug all pipe outlets to resist test pressure.

3.02 TESTING PROCEDURES

A. Low air pressure test's procedures to be as follows:

1. All gravity sewer pipe shall be low pressure air tested as per ASTM C-828. Records of all tests shall be made available to the Engineer. The procedure for the low pressure air test shall conform to the procedures described in ASTM F-1417-98 as follows:
 - A section of sewer shall be isolated by inflatable stoppers or other suitable test plugs. Plug or cap the ends of all branches, laterals, tees, wyes, and stubs to be included in the test. Securely brace all plugs or caps to prevent blow-out. One of the plugs or caps should have an inlet tap, or other provision to connect a hose to a portable air source.
 - Once air hose is connected to inlet tap, air shall be added slowly until the pressure inside the pipe reaches 4.0 psig. Pressure shall then be allowed to stabilize such that a pressure between 4.0 and 3.5 psig is maintained for at least two minutes. A minimum pressure of 3.5 psig is required. Air supply shall then be disconnected, and pressure shall be decreased to 3.5 psig before starting the test.
 - Determine the minimum acceptable time for a 1 psig drop in pressure from 3.5 psig to 2.5 psig. Compare the minimum acceptable time to that actually observed in the field to determine if the rate of air loss is within acceptable limits. Minimum holding times are listed in the following table.

Pipe Diameter (inches)	Specification Time for Length Shown (Minutes : Seconds)							
	100-ft	150-ft	200-ft	250-ft	300-ft	350-ft	400-ft	450-ft
8	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	14:10	17:48	22:15	26:42	31:09	35:35	40:04
18	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33

- Prior to testing, the pipelines shall be supported in an approved manner to prevent movement during tests.
2. Retest. Sanitary sewers failing to meet requirements of low pressure air test shall be tested again after Contractor has located and remedied defects causing failure. No sanitary sewer line shall be accepted until the limits of test procedures are satisfied.
- B. Deflection tests shall be performed on all flexible pipes. For pipelines with inside diameters less than 27 inches, a rigid mandrel shall be used to measure deflection. The test shall be conducted after the final backfill has been in place at least 30 days. No pipe shall exceed a deflection of 5.0%. If a pipe should fail to pass the deflection test, the problem shall be corrected and a second test shall be conducted after the final backfill has been in place an additional 30 days. The tests shall be performed without mechanical pulling devices. The Contractor and Engineer, or a representative thereof, shall sign off on the results of the test which shall be provided to the TCEQ in accordance with §217 requirements as well as the Owner.
1. Mandrel Sizing. The rigid mandrel shall have an outside diameter (O.D.) equal to 95% of the inside diameter (I.D.) of the pipe. The inside diameter of the pipe, for the purpose of determining the outside diameter minus two minimum wall thicknesses for O.D. controlled pipe and the average inside diameter for I.D. controlled pipe, all dimensions shall be per appropriate standard. Statistical or other "tolerance packages" shall not be considered in mandrel sizing.
 2. Mandrel Design. The rigid mandrel shall be constructed of a metal or a rigid plastic material that can withstand 200 psi without being deformed. The mandrel shall have nine or more "runners" or "legs" as long as the total number of legs is an odd number. The barrel section of the mandrel shall have a length of at least 75% of the inside diameter of the pipe. A proving ring shall be provided and used for each size mandrel in use.
- C. Videotaping test. The contractor shall coordinate with LVWD for videotape test to be performed. The video tape will be looking for sags in the line, breaks, joints, etc.
1. Water needs to be put in the sewer line to be tested.

2. Video test shall start right after the water has been introduced.
3. General procedure for the testing is if there is more than an estimated 2-inches of water stagnated for any given 10-ft section, that section of line needs to be redone. Video will not be able to determine exactly the depth of the water stagnated. The estimation will be determined by the Engineer.
4. The above 2-inches of water might be allowable in some areas of the system as determined by the Engineer.
5. The video camera will be provided by LVWD.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. Measurement and payment for all pipelines and appurtenances shall be in accordance with Section 01025 of these specifications.

END OF SECTION

SECTION 02680

VALVES AND APPURTENANCES FOR SEWER FORCE MAINS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals required to provide and install all force main valves in manholes and underground vaults, and appurtenances complete with actuators and all accessories shall be for sewage use and as shown on the drawings and as specified herein.

1.02 RELATED WORK

- A. Excavating, Backfilling and Compacting for Utilities is included in Section 02221.

1.03 SUBMITTALS

- A. Submit materials required to establish compliance with the Specifications in accordance with Section 01300, Submittals, Submittals shall include the following:
 - 1. Manufacturer's literature, catalogs, illustrations, specifications, details, dimensions, weights, sizes, materials of construction, protective coating, actuator weights, torque calculations where applicable, and any information required to assemble, install, operate, and maintain all valves.
 - 2. When it is questionable that a manufacturer's products conform to Specifications, the Engineer reserves the rights to require submittal of more information before approving the product.
 - 3. Submit electronic PDF files of all certified test results specified herein as well as certifications that the product conforms to all referenced standards and these Specifications.
 - 4. Submit minimum of 6 sets of complete operation and maintenance manuals for each product furnished.
 - 5. The Engineer will keep 3 sets of all submittals.

1.04 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM Standard Specifications for Gray Iron Castings
 - 2. ASTM Standard Specifications for Gray Iron Casting for Valves Flanges and Pipe Fittings
- B. American National Standards Institute (ANSI)

1. ANSI B16 Cast Iron Pipe Flanges and Flanged Fittings
- C. American Water Works Associations (AWWA)
1. AWWA C606 Grooved and Shouldered Joints

1.05 QUALITY ASSURANCE

A. Manufacturer's Qualifications

1. Valves and appurtenances provided under this Section shall be the standard product in regular production by manufacturers whose products have proven reliable in similar services for at least 5 years. If required, the manufacturer shall furnish evidence of installation in satisfactory operation.
2. All units of the same type shall be the product of one manufacturer.

B. Design Criteria

1. All valves and appurtenances shall be new and in perfect working condition. Valves shall be designed for continuous use with a minimum of maintenance and service required and shall perform the required function without exceeding the safe limits for stress, strain, or vibration. In no case will used or damaged valves be acceptable. The selection of equipment to meet the specified design conditions is the responsibility of the Contractor. Both workmanship and material shall be of the very best quality and shall be entirely suitable for the service conditions specified.

C. Source Quality Control

1. Valves shall be shop tested in accordance with the applicable AWWA standards.
 - a. Combinations Valves: AWWA C512
2. Obtain each type of valve from no more than one manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver material to the site to ensure uninterrupted progress of the work.

B. Protect threads and seats from corrosion and damage. Rising stems and exposed stem valves shall be coated with a protective oil film which shall be maintained until time of use.

C. Furnish covers for all openings:

1. All valves 3-inches and larger shall be shipped and stored onsite until time of use with wood or plywood covers on each valve end.
2. All valves smaller than 3-inches shall be shipped and stored as above except that heavy cardboard covers may be furnished instead of wood.

D. Store equipment to permit easy access for inspection and identification. Any corrosion in

evidence at the time of Owner acceptance shall be removed, or at the Engineer's discretion, the valve shall be removed from the job.

- E. Store all equipment in covered storage off the ground.

1.07COORDINATION

- A. Review installation procedures under other Sections and coordinate with the work which is related to this section including buried piping installation and site utilities.

PART 2 PRODUCTS

2.01 GENERAL

- A. All valves shall open counter-clockwise.
- B. Installation of PVC and Ductile iron Pipe: Service saddles will not be accepted for installation of sewage combination air valves. Valves shall be installed in one of the following ways:
 1. DIP MJ x FLNG TEE with fittings and transition connections as required to makeup to and connect with sewage combination air valve.
 2. Install DIP at location of valve; install Tapping Sleeve with outlet and transition connections as required to makeup to and connect with sewage combination air valve. Tapping Sleeve shall be 622 Smith Blair, or approved equal. Tapping sleeve shall have min. 12 mil factory applied fusion bonded epoxy coat and bolts and nuts shall be 304 stainless steel.
 3. Install DIP with manufacturer welded-on outlet at location of valve. Provide fittings and transition connection as required to makeup to and connect with sewage combination air valve.
- C. Installation on other Pipe: Service saddles will not be acceptable for installation of sewage combination air valves. Tapping sleeves of the type appropriate for pipeline material, specials, or standard fittings shall be used. Contractor shall provide fittings and transition connections as required to makeup to and connect with sewage combination air valve.

2.03 PLUG VALVE FOR BLOW-OFF VALVE ASSEMBLY

- A. Plug valves shall be of the non-lubricated eccentric type with resilient faced plug, quarter turn type, and shall be furnished with end connectors as shown on the plans. Flanged valves shall be faced and drilled to the ANSI B16.1 Class 125 dimensions. Grooved end valves shall be in accordance with ANSI/AWWA C606-87. Valve seating shall provide a consistent opening/closing torque that is not dependent of field-adjusted stops. All surfaces are to be protected, both internally and externally, with a factory coated thermoset epoxy of thermoplastic nylon. These corrosion resistant coatings shall provide protection against corrosion in the shaft areas. All valves shall be bolted bonnet, top entry design with a stuffing box and packing seal around the shaft valve and shall be capable of repacking without removing the bonnet or valve from the pipe. The valves shall be capable of high cycle service. Valves shall be suitable for raw sewage service. Without any modifications,

all valves shall be manufactured by Val-Matic, or approved equal.

PART 3 EXECUTION

3.01 INSPECTION AND PREPARATION

- A. During installation of all valves and appurtenances, verify that all items are clean, free of defects in material and workmanship and function properly.
- B. All valves shall be installed in the closed position unless otherwise directed by the Engineer.

3.02 INSTALLATION OF COMBINATION VALVE AND BLOW-OFF VALVE FACILITIES

- A. Installation of the facilities of this section shall be in accordance with LVWD standard details and specifications and as shown on the Drawings.
- B. The Contractor shall operate the valves through their full range from total open to total closed. The valve shall be inspected in the closed position to assume full closure prior to pressure testing the new system.

3.03 TESTING

- A. All valves shall be hydrostatically, and leak tested in accordance with the latest revision of AWWA C504.
- B. Conduct functional field test of each valve of this section, in presence of Engineer to demonstrate that each part and all components together function correctly. All testing equipment required shall be furnished by the Contractor.

3.04 AFFIDAVIT OF COMPLIANCE

- A. In order to be accepted as an approved manufacturer, an affidavit of compliance is required from the manufacturer that that valves to be furnished comply with this Specification.

PART 4 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this contract.

END OF SECTION

SECTION 02700

SEWER SERVICE CONNECTIONS

PART 1 GENERAL

A. REQUIREMENTS

1. These specifications cover the requirements for materials and installation of sanitary sewer service connections used for utility projects.

B. WORK INCLUDED

1. Furnish labor, materials, equipment and incidental necessary to install sanitary sewer connections, complete for sewer service. All materials required shall be furnished and installed by the Contractor, whether specifically called for on the Plans or specified.

C. SUBMITTALS

1. Upon award of the contract, the Contractor shall furnish certifications from manufactures that the products comply with the appropriate ASTM, AWWA, and Utility Standards.

PART 2 PRODUCTS

A. MATERIAL

1. Fittings, service risers, and laterals shall be PVC SDR rated for PVC main lines and meeting the requirements of ASTM D3034 or F-789.
2. Where additional service connections are required on an existing PVC main line, an approved service saddle compatible to the size and type of both the collection line and service shall be installed. Where PVC saddles with rubber seals and stainless steel bands are used, the saddles shall be incased with a minimum layer of Class B (2000 psi) concrete to protect the steel bands form corrosion and to add stability.

PART 3 EXECUTION

A. INSTALLATION

1. TEE AND RISER: Where designated on the plans or directed by the Engineer in the field, the Contractor shall install tee or wye fittings for future and existing house service connections. Fittings shall be bell-type and shall be sealed on the branch outlet with an approved plug which can be easily removed for service riser or lateral line installation.
2. SERVICE LINE LATERALS: Where required by the Contract drawings and specifications, the Contractor shall extend minimum 4-inch diameter lateral service lines for customer service connections.

Unless otherwise specified or shown in the drawings, service lines shall be installed and extended 2 feet before the Property line as shown in the Contract Drawings. Service lines shall be installed at a minimum slope of 2 percent with a minimum cover at the terminus of 3.5 feet, unless otherwise directed by the Engineer. Service lines shall be laid such that the branch makes a 45 degree angle with the vertical on the side of the main facing the lot to be served. Service line shall be uniformly supported on bedding having a density not less than 90 percent of the maximum density per ASTM D-1557. Backfill on service line shall be carefully placed and compacted per the requirements of Section 02221 of these specifications. The terminus of the service shall be plugged with an approved universal cap compatible with the pipe size and material.

3. LOCATION MARKING AND RECORDING: The Contractor shall maintain as-built records of the horizontal and vertical location of installed sewer service lines. The plugged ends of risers or laterals shall be marked using wooden stacks and metallic marking tape as shown in the Contract drawings.
4. SEPTIC TANK DECOMMISSIONING: Where required by the Contract drawings and specifications, the Contractor shall remove and decommission all existing on-site sewage systems, haul existing septic tank by a licensed and approved hauler by the County of El Paso, and backfill the removed septic tank to original grade. The Contractor shall adhere the County of El Paso On-site Sewage/Environmental Department requirements. Septic tank decommissioning applications may be obtained from the County of El Paso On-site Sewage/Environmental Department located at 14612 Greg "C" in El Paso, Texas 79938.
5. SERVICE RECONNECTION: Where designated in the Contract drawings, the Contractor shall locate the exact location of septic tank connection to each house. The Contractor shall investigate and reconnect both gray water systems to the new service line as required.

PART 4 MEASUREMENT AND PAYMENT

- A. Measurement and payment for all pipelines and appurtenances shall be in accordance with Section 01025 of these specifications.

END OF SECTION

SECTION 03100

CONCRETE FORMWORK

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals required and design, install and remove formwork for cast-in-place concrete as shown on the Drawings and as specified herein.
- B. Secure to forms as required or set for embedment as required, all miscellaneous metal items, sleeves, reglets, anchor bolts, inserts, and other items furnished under other Sections and required to be cast into concrete.

1.02 RELATED WORK

- A. Concrete Reinforcement is included in Section 03200.
- B. Cast-in-Place Concrete is included in Section 03300.
- C. Grout is included in Section 03600.
- D. Modifications and Repair to Concrete are included in Section 03740.

1.03 SUBMITTALS

- A. Submit to the Engineer, in accordance with Section 01300, shop drawings and product data showing materials of construction and details of installation for:
 - 1. Form release agent
 - 2. Form ties

1.04 REFERENCE STANDARDS

- A. American Concrete Institute (ACI)
 - 1. ACI 301 - Specification for Structural Concrete
 - 2. ACI 318 - Building Code Requirements for Reinforced Concrete
 - 3. ACI 347 - Formwork for Concrete
- B. American Plywood Association (APA)
 - 1. Material grades and designations as specified
- C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 SYSTEM DESCRIPTION

- A. Structural design responsibility: All forms and shoring shall be designed at the Contractor's expense by a professional engineer registered in the state of Texas, as certified by Section 01300 of these specifications. Formwork shall be designed and erected in accordance with the requirements of ACI 301 and ACI 318 and as recommended in ACI 347 and shall comply with all applicable regulations and codes. The design shall consider any special requirements due to the use of plasticized and/or retarded set concrete.

PART 2 PRODUCTS

2.01 GENERAL

- A. The usage of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configurations desired.

2.02 MATERIALS

- A. Forms for cast-in-place concrete shall be made of wood, metal, or other approved material. Wood forms for the project shall be new and unused. Construct wood forms of sound lumber or plywood of suitable dimensions and free from knotholes and loose knots. Where used for exposed surfaces, dress and match boards. Sand plywood smooth and fit adjacent panels with tight joints. Metal forms may be used when approved by the Engineer and shall be of an appropriate type for the class of work involved. All forms shall be designed and constructed to provide a flat, uniform concrete surface requiring minimal finishing or repairs.
- B. Wall Forms
 - 1. Forms for all exposed exterior and interior concrete walls shall be new and unused "Plyform" exterior grade plywood panels manufactured in compliance with the APA and bearing the trademark of that group, or equal acceptable to the Engineer. Provide B grade or better veneer on all faces to be placed against concrete during forming. The class of material and grades of interior plies shall be of sufficient strength and stiffness to provide a flat, uniform concrete surface requiring minimal finishing and grinding.
 - 2. All joints or gaps in forms shall be taped, gasketed, plugged, and/or caulked with an approved material so that the joint will remain watertight and will withstand placing pressures without bulging outward or creating surface patterns.
- C. Moldings for chamfers and rustications shall be milled and planed smooth. Rustications and corner strips shall be of a nonabsorbent material, compatible with the form surface and fully sealed on all sides to prohibit the loss of paste or water between the two surfaces.
- D. Form Release Agent
 - 1. Coat all forming surfaces in contact with concrete using an effective, non-staining, non-residual, water-based, bond-breaking form coating, unless otherwise noted.
- E. Forms shall be constructed of materials and in a manner that will result in rigid forms with sufficient strength to withstand, without noticeable deflection, movement, or leakage, the high

hydraulic pressures resulting from rapid filling of the forms and heavy high frequency vibration of the concrete. Deflection in formwork shall be limited to $1/360$ of each component span. Form joints shall be laid out in a uniform pattern or as indicated on the Drawings.

F. Form Ties

1. Form ties encased in concrete other than those specified in the following paragraphs shall be designed so that, after removal of the projecting part, no metal shall remain within 1½-inch of the face of the concrete. The part of the tie to be removed shall be at least ½-inch diameter or be provided with a cone at least 1-inch diameter at the surface and 1½-inch deep. Form ties in concrete exposed to view shall be the cone-washer type.
2. Flat bar ties for panel forms shall have plastic or rubber inserts having a minimum depth of 1½-inch and sufficient dimensions to permit proper patching of the tie hole.
3. Ties for liquid containment structures shall have a waterstop washer that is tightly adhered to the tie.
4. Common wire shall not be used for form ties.
5. Alternate form ties consisting of tapered through-bolts at least 1-inch in diameter at smallest end or through-bolts that utilize a removable tapered sleeve of the same minimum size may be used at the Contractor's option. Obtain Engineer's acceptance of system and spacing of ties prior to ordering or purchase of forming. Clean, fill, and seal form tie hole with non-shrink cement grout. The Contractor shall be responsible for water tightness of the form ties and any repairs needed.

PART 3 EXECUTION

3.01 GENERAL

- A. Forms shall be used for all cast-in-place concrete including sides of footings. Forms shall be constructed and placed so that the resulting concrete will be of the shape, lines, dimensions, and appearance indicated on the Drawings.
- B. Forms for walls shall have removable panels at the bottom for cleaning, inspection, and joint surface preparation. Forms for walls of considerable height shall have closable intermediate inspection ports. Tremies and hoppers for placing concrete shall be used to allow concrete inspection, prevent segregation, and prevent the accumulation of hardened concrete on the forms above the fresh concrete.
- C. Molding, bevelling, or other types of chamfer strips shall be placed to produce block outs, rustications, or chamfers as shown on the Drawings or as specified herein. Chamfer strips shall be provided at horizontal and vertical projecting corners to produce a ¾-inch chamfer. Rectangular or trapezoidal moldings shall be placed in locations requiring sealants where specified or shown on the Drawings. Sizes of moldings shall conform to the sealant manufacturer's recommendations.
- D. Forms shall be sufficiently rigid to withstand construction loads and vibration and to prevent displacement or sagging between supports. Construct forms so that the concrete will not be damaged by their removal. The Contractor shall be entirely responsible for the adequacy of the forming system.

- E. Before form material is reused, all surfaces to be in contact with concrete shall be thoroughly cleaned, all damaged places repaired, all projecting nails withdrawn, and all protrusions smoothed. Reuse of wooden forms for other than rough finish will be permitted only if a "like new" condition of the form is maintained.

3.02 FORM TOLERANCES

- A. Forms shall be surfaced, designed, and constructed in accordance with the recommendations of ACI 347 and shall meet the following additional requirements for the specified finishes.
- B. Formed Surface Exposed to View: Edges of all form panels in contact with concrete shall be flush within $\frac{1}{32}$ -inch and forms for plane surfaces shall be such that the concrete will be plane within $\frac{1}{16}$ -inch in 4 feet. Forms shall be tight to prevent the passage of mortar, water and grout. The maximum deviation of the finish wall surface at any point shall not exceed $\frac{1}{4}$ -inch from the intended surface as shown on the Drawings. Form panels shall be arranged symmetrically and in an orderly manner to minimize the number of seams.
- C. Formed surfaces not exposed to view or buried shall meet requirements of Class "C" Surface in ACI 347.
- D. Formed rough surfaces including mass concrete, pipe encasement, electrical duct encasement, and other similar installations shall have no minimum requirements for surface smoothness and surface deflections. The overall dimensions of the concrete shall be ± 1 -inch.
- E. Formed concrete Surfaces to Receive Paint: Surface deflections shall be limited to $\frac{1}{32}$ -inch at any point and the variation in wall deflection shall not exceed $\frac{1}{16}$ -inch per 4 feet. The maximum deviation of the finish wall surface at any point shall not exceed $\frac{1}{4}$ -inch from the intended surface as shown on the Drawings.

3.03 FORM PREPARATION

- A. Wood forms in contact with the concrete shall be coated with an effective release agent prior to form installation.
- B. Steel forms shall be thoroughly cleaned, and mill scale and other ferrous deposits shall be sandblasted or otherwise removed from the contact surface for all forms, except those utilized for surfaces receiving a rough finish. All forms shall have the contact surfaces coated with a release agent.

3.04 REMOVAL OF FORMS

- A. The Contractor shall be responsible for all damage resulting from removal of forms. Forms and shoring for structural slabs or beams shall remain in place in accordance with ACI 301 and ACI 347. Form removal shall conform to the requirements specified in Section 03300.

3.05 INSPECTION

- A. The Engineer shall be notified when the forms are complete and ready for inspection at least 6 hours prior to the proposed concrete placement.

- B. Failure of the forms to comply with the requirements specified herein or to produce concrete complying with requirements of this Section shall be grounds for rejection of that portion of the concrete work. Rejected work shall be repaired or replaced as directed by the Engineer at no additional cost to the Owner. Such repair or replacement shall be subject to the requirements of this Section and approval of the Engineer.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this contract.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals required and install all concrete reinforcement complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Concrete Formwork is included in Section 03100.
- B. Cast-in-Place Concrete is included in Section 03300.
- C. Grout is included in Section 03600.
- D. Modifications and Repair to Concrete are included in Section 03740.

1.03 SUBMITTALS

- A. Submit to the Engineer, in accordance with Section 01300, shop drawings and product data showing materials of construction and details of installation for:
 - 1. Reinforcing steel. Placement drawings shall conform to the recommendations of ACI 315. Clearly identify the structure or portion of structure covered by each placing drawing. All reinforcement in a concrete placement shall be included on a single placement drawing or cross referenced to the main pertinent placement drawing. This drawing shall clearly show the placement of all required additional reinforcement (around openings, at corners, etc.) as shown on the standard detail sheets. All splice locations and lap lengths shall be clearly shown. Identify the placement of each bar listed in the bill of materials.
 - 2. Bar bending details. The bars shall be referenced to the same identification marks shown on the placement drawings.
 - 3. Product data for synthetic reinforcing fibers. The amount of fibers per cubic yard to be used shall be noted.
- B. Submit test reports, in accordance with Section 01300, of each of the following items.
 - 1. Certified copy of mill test on each steel proposed for use showing the physical properties of the steel and the chemical analysis.
 - 2. Certified copy of test reports for each foreign manufactured steel proposed for use in the fabrication of reinforcement. The tests shall be specifically made for this project at the expense of the Contractor by a domestic independent testing laboratory certified to perform the tests. The testing shall be for conformity to the applicable ASTM standard.

1.04 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM A185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
 - 2. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- B. American Concrete Institute (ACI)
 - 1. ACI 301 - Specification for Structural Concrete
 - 2. ACI 315 - Details and Detailing of Concrete Reinforcement
 - 3. ACI 318 - Building Code Requirements for Reinforced Concrete
 - 4. SP-66 (ACI 315) - ACI Detailing Manual
- C. Concrete Reinforcing Steel Institute (CRSI)
 - 1. Manual of Standard Practice
- D. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. A qualified field representative of the synthetic reinforcing fibers' manufacturer, specifically trained in the installation of the products, shall be available for consultation and assistance during installation of the material.

1.06 DELIVERY, HANDLING, AND STORAGE

- A. Reinforcing steel shall be substantially free from mill scale, rust, dirt, grease, or other foreign matter.
- B. Reinforcing steel shall be shipped and stored with bars of the same size and shape fastened in bundles with durable tags, marked in a legible manner with waterproof markings showing the same "mark" designations as those shown on the submitted placing drawings.
- C. Reinforcing steel shall be stored off the ground, protected from moisture and kept free from dirt, oil, or other injurious contaminants.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials shall be new and shall the following material specifications.
- B. Deformed Concrete Reinforcing Bars: ASTM A615, Grade 60 deformed bars.

- C. Welded Steel Wire Fabric: ASTM A185.
- D. Reinforcing Steel Accessories
 - 1. Plastic Protected Bar Supports: CRSI Bar Support Specifications, Class 1 - Maximum Protection.
 - 2. Stainless Steel Protected Bar Supports: CRSI Bar Support Specifications, Class 2 - Moderate Protection.
 - 3. Precast Concrete Block Bar Supports: CRSI Bar Support Specifications, Precast Blocks. Blocks shall have equal or greater strength than the surrounding concrete.
- E. Tie Wire
 - 1. Tie Wires for Reinforcement shall be 16 gauge or heavier, black annealed wire.
- F. Mechanical reinforcing steel splices shall not be used unless approved in writing by the Engineer. Where approved, they shall meet all ACI 318 Building Code requirements and shall be designed to produce a splice strength in tension of not less than 125 percent of the ASTM specified minimum yield strength of the rebar.
- G. Fiber Reinforcement

Synthetic reinforcing fiber for concrete shall be 100 percent polypropylene collated, fibrillated fibers, Fiber mesh, as manufactured by Fibermesh Company of Synthetic Industries, Inc. Chattanooga, Tennessee, or equal. Fiber length and quantity for the concrete mix shall be in strict compliance with the manufacturer's recommendations as approved by the Engineer.

2.02 FABRICATION

- A. Fabrication of reinforcement shall be in compliance with the CRSI Manual of Standard Practice and ACI 315.
- B. Bars shall be cold bent. Bars shall not be straightened or rebent.
- C. Bars shall be bent around a revolving collar having a diameter of not less than that recommended by the CRSI.
- D. Bar ends that are to be butt spliced, placed through limited diameter holes in metal, or threaded, shall have the applicable end(s) saw-cut. Such ends shall terminate in flat surfaces within 1½ degrees of a right angle to the axis of the bar.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Surface condition, bending, spacing and tolerances of placement of reinforcement shall comply with the CRSI Manual of Standard Practice and ACI 301. The Contractor shall be solely responsible for providing an adequate number of bars and maintaining the spacing and clearances shown on the Drawings.

- B. Except as otherwise indicated on the Drawings, the minimum concrete cover of reinforcement shall be as follows:
1. Concrete cast against and permanently exposed to earth: 3 inches
 2. Concrete exposed to soil, water, sewage, sludge, and/or weather (includes bottom of slabs over liquid containments): 2 inches
 3. Concrete not exposed to soil, water, sewage, sludge, and/or weather:
 - a. Slabs (top and bottom cover), walls, joists, shells, and folded plate members: 1 inch
 - b. Beams and columns (principal reinforcement, ties, spirals, and stirrups): 1½ inches
- C. Reinforcement which will be exposed for a considerable length of time after being placed shall be coated with a heavy coat of neat cement slurry.
- D. No reinforcing steel bars shall be welded either during fabrication or erection unless prior written approval has been obtained from the Engineer. All bars that have been welded, including tack welds, without such approval shall be immediately removed from the work.
- E. Reinforcing steel interfering with the location of other reinforcing steel, conduits or embedded items may be moved within the specified tolerances or one bar diameter, whichever is greater. Greater displacement of bars to avoid interference shall only be made with the approval of the Engineer. Do not cut reinforcement to install inserts, conduits, mechanical openings, or other items without the prior approval of the Engineer.
- F. Securely support and tie reinforcing steel to prevent movement during concrete placement. Secure dowels in place before placing concrete.
- G. Reinforcing steel bars shall not be field bent except where shown on the Drawings or specifically authorized in writing by the Engineer. If authorized, bars shall be cold-bent around the standard diameter spool specified in the CRSI. Do not heat bars. Closely inspect the reinforcing steel for breaks. If the reinforcing steel is damaged, replace, Cadweld or otherwise repair as directed by the Engineer. Do not bend reinforcement after it is embedded in concrete.

3.02 REINFORCEMENT AROUND OPENINGS

- A. Unless specific additional reinforcement around openings is shown on the Drawings, provide additional reinforcing steel on each side of the opening equivalent to one-half of the cross-sectional area of the reinforcing steel interrupted by an opening. The bars shall have sufficient length to develop bond at each end beyond the opening or penetration.

3.03 SPLICING OF REINFORCEMENT

- A. Tension lap splices shall be provided at all laps in compliance with ACI 318-89 and as shown on the Drawings. Class B splices shall be used unless otherwise noted.

- B. Install wire fabric in as long lengths as practicable. Wire fabric shall be rolled flat and firmly held in place. Splices in welded wire fabric shall be lapped in accordance with the requirements of ACI-318 but not less than 12 inches. The spliced fabrics shall be tied together with wire ties spaced not more than 24 inches on center and laced with wire of the same diameter as the welded wire fabric. Do not position laps midway between supporting beams, or directly over beams of continuous structures. Offset splices in adjacent widths to prevent continuous splices.

3.04 ACCESSORIES

- A. Determine, provide and install accessories such as chairs, chair bars, and the like in sufficient quantities and strength to adequately support the reinforcement and prevent its displacement during the erection of the reinforcement and the placement of concrete.
- B. Use precast concrete blocks where the reinforcing steel is to be supported over soil.
- C. Stainless steel bar supports or steel chairs with stainless steel tips shall be used where the chairs are set on forms for a concrete surface that will be exposed to weather, high humidity, or liquid (including bottom of slabs over liquid containing areas). Use of galvanized or plastic-tipped metal chairs is permissible in all other locations, unless otherwise noted on the Drawings or specified herein.
- D. Alternate methods of supporting top steel in slabs, such as steel channels supported on the bottom steel or vertical reinforcing steel fastened to the bottom and top mats, may be used if approved by the Engineer.

3.05 INSPECTION

- A. In no case shall any reinforcing steel be covered with concrete until the installation of the reinforcement, including the size, spacing, and position of the reinforcement has been observed by the Engineer and the Engineer's release to proceed with the concreting has been obtained. The Engineer shall be given ample prior notice of the readiness of placed reinforcement for observation. The forms shall be kept open until the Engineer has finished his/her observations of the reinforcing steel.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this contract.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials equipment, tools, superintendence, and incidentals required and install cast-in-place concrete complete as shown on the Drawings and as specified herein.
- B. Furnish all sampling and testing of products and materials proposed for use. Testing shall be performed by an independent testing laboratory acceptable to the Engineer but engaged by and at the expense of the Contractor.

1.02 RELATED WORK

- A. Grout is included in Section 03600.

1.03 SUBMITTALS

- A. Submit to the Engineer, in accordance with Section 01300, shop drawings and product data shall include the following:
 - 1. Sources of cement, pozzolan, and aggregates.
 - 2. Material Safety Data Sheets (MSDS) for all concrete components and admixtures.
 - 3. Air-entraining admixture. Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations, field testing methods, and conformity to ASTM standards.
 - 4. Water reducing admixture. Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations, and conformity to ASTM standards.
 - 5. High range water-reducing admixture (plasticizer). Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations, retarding effect, slump range, and conformity to ASTM standards. Identify proposed locations of use.
 - 6. Sheet curing material. Product data including catalogue cut, technical data, and conformity to ASTM standards.
 - 7. Liquid curing compound. Product data including catalogue cut, technical data, storage requirements, product life, application rate, and conformity to ASTM standards. Identify proposed locations of use.
- B. Samples
 - 1. Fine and coarse aggregates, 5 pounds each.

C. Test Reports

1. Sieve analysis, mechanical properties, and deleterious substance content for coarse and fine aggregate.
2. Chemical analysis and physical tests of each type of cement and conformity to ASTM standards.
3. Chemical analysis and physical tests of pozzolan and conformity to ASTM standards, where applicable.
4. Concrete mix for each formulation of concrete proposed for use including constituent quantities per cubic yard, water cementitious ratio, concrete slump, type, and manufacturer of cement.
 - a. Standard deviation data for each proposed concrete mix based on statistical records.
 - b. Water cementitious ratio curve for concrete mixes based on laboratory tests. Give average cylinder strength test results at 28 days for laboratory concrete mix designs. Provide results of 7- and 14-day tests if available.

D. Certifications

1. Certify admixtures used in the same concrete mix are compatible with each other and the aggregates.
2. Certify the Contractor is not associated with the independent testing laboratory nor does the Contractor or its officers have a beneficial interest in the laboratory.

E. Qualifications

1. Independent testing laboratory: Name, address, and qualifications. Laboratories affiliated with the Contractor, or in which the Contractor or its officers have a beneficial interest, are not acceptable.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C31 Standard Practice for Making and Curing Concrete Test Specimens in the Field
2. ASTM C33 Standard Specification for Concrete Aggregates
3. ASTM C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
4. ASTM C42 Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

5. ASTM C94 Standard Specification for Ready-Mixed Concrete
6. ASTM C143 Standard Test Method for Slump of Hydraulic Cement Concrete
7. ASTM C150 Standard Specification for Portland Cement
8. ASTM C171 Standard Specification for Sheet Materials for Curing Concrete
9. ASTM C173 Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
10. ASTM C231 Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
11. ASTM C260 Standard Specification for Air-Entraining Admixtures for Concrete
12. ASTM C309 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
13. ASTM C311 Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland-Cement Concrete
14. ASTM C494 Standard Specification for Chemical Admixtures for Concrete
15. ASTM C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete

B. American Concrete Institute (ACI)

1. ACI 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete
2. ACI 301 Specification for Structural Concrete
3. ACI 304R Guide for Measuring, Mixing, Transporting and Placing Concrete
4. ACI 304.2R Placing Concrete by Pumping Methods
5. ACI 305R Hot Weather Concreting
6. ACI 306R Cold Weather Concreting
7. ACI 318 Building Code Requirements for Reinforced Concrete
8. ACI 350R Environmental Engineering Concrete Structures

C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. Only one source of cement and aggregates shall be used on any one structure. Concrete shall be uniform in color and appearance.
- B. Well in advance of placing concrete, discuss with the Engineer the sources of individual materials and batched concrete proposed for use. Discuss placement methods, waterstops, and curing. Propose methods of hot and cold weather concreting as required.
- C. A meeting shall be held prior to placement of plasticized concrete. The plasticizer (high range water reducer) manufacturer's representative and the Contractor shall be available to discuss the properties and techniques of batching and placing plasticized concrete.
- D. If, during the progress of the work, it is impossible to secure concrete of the required workability and strength with the materials being furnished, the Engineer may order such changes in proportions or materials, or both, as may be necessary to secure the desired properties. All changes so ordered shall be made at the Contractor's expense.
- E. If, during the progress of the work, the materials from the sources originally accepted change in characteristics, the Contractor shall, at his expense, make new acceptance tests of aggregates and establish new design mixes. Such testing and design shall be accomplished with the assistance of an independent testing laboratory acceptable to the Engineer.
- F. Reinforced concrete shall comply with ACI 301, ACI 318, the recommendations of ACI 304R and ACI 350R, and other stated requirements, codes, and standards, except as modified herein.
- G. Samples of constituents and of concrete as-placed will be subjected to laboratory tests. All materials incorporated in the work shall conform to accepted samples.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Cement: Store in weather tight buildings, bins, or silos to provide protection from dampness and contamination and to minimize warehouse set.
- B. Aggregate: Arrange and use stockpiles to avoid excessive segregation or contamination with other materials or with other sizes of like aggregates. Build stockpiles in successive horizontal layers not exceeding 3 foot in thickness. Complete each layer before the next is started. Do not use frozen or partially frozen aggregate.
- C. Sand: Arrange and use stockpiles to avoid contamination. Allow sand to drain to a uniform moisture content before using. Do not use frozen or partially frozen aggregates.
- D. Admixtures: Store in closed containers to avoid contamination, evaporation or damage. Provide suitable agitating equipment to assure uniform dispersion of ingredients in admixture solutions which tend to separate. Protect liquid admixtures from freezing and other temperature changes which could adversely affect their characteristics.
- E. Pozzolan: Store in weather tight buildings, bins, or silos to provide protection from dampness and contamination.

- F. Sheet Curing Materials: Store in weather tight buildings or off the ground and under cover.
- G. Liquid Curing Compounds: Store in closed containers.

PART 2 PRODUCTS

2.01 GENERAL

- A. The use of manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.
- B. Like items of materials shall be the end products of one manufacturer in order to provide standardization for appearance, maintenance, and manufacturer's service.

2.02 MATERIALS

- A. Materials shall comply with this Section and any applicable state or local requirements.
- B. Cement: Domestic portland cement complying with ASTM C150. Air entraining cements shall not be used. Cement brand shall be subject to approval by the Engineer and one brand shall be used throughout the Work. The following cement type(s) shall be used:
 - 1. Type II low alkali cement.
 - 2. Type I low alkali cement with fly ash, resulting in C₃A being below 8 percent of total cementitious content.
 - 3. Type III low alkali cement limited to 8 percent C₃A, where approved by the Engineer.
 - 4. Type IV when in contact with wastewater.
- C. Fine Aggregate: Washed inert natural sand conforming to the requirements of ASTM C33.
- D. Coarse Aggregate: Well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33. Size numbers for the concrete mixes shall be as shown in Table 1 herein. Grading requirements shall be as listed in ASTM C33 Table 2 for the specified coarse aggregate size number. Limits of Deleterious Substances and Physical Property Requirements shall be as listed in ASTM C33 Table 3 for severe weathering regions.
- E. Water: Potable water free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other deleterious substances.
- F. Admixtures: Admixtures shall be free of chlorides and alkalis (except for those attributable to water). When it is required to use more than one admixture in a concrete mix, the admixtures shall be from the same manufacturer. Admixtures shall be compatible with the concrete mix including other admixtures.

1. Air Entraining Admixture: The admixture shall comply with ASTM C260. Proportioning and mixing shall be in accordance with manufacturer's recommendations.
2. Water Reducing Agent: The admixture shall comply with ASTM C494, Type A. Proportioning and mixing shall be in accordance with manufacturer's recommendations.
3. High-Range Water Reducer (Plasticizer): The admixture shall comply with ASTM C494 Type F and shall result in non-segregating plasticized concrete with little bleeding and with physical properties of low water/cement ratio concrete. The treated concrete shall be capable of maintaining its plastic state in excess of 2 hours. Proportioning and mixing shall be in accordance with manufacturer's recommendations.
4. Admixtures causing retarded or accelerated setting of concrete shall not be used without written approval from the Engineer. When allowed, the admixtures shall be retarding or accelerating water reducing or high range water reducing admixtures.

G. Pozzolan (Fly ash)

1. Pozzolan shall be Class C or Class F fly ash complying with ASTM C618, including the requirements of Table 1 except the Loss on Ignition (LOI) shall be limited to 3 percent maximum.
2. Testing of the fly ash and/or the fly ash and concrete mixture is required to provide test data confirming that the fly ash in combination with the cement to be used meets all strength requirements and is compatible with the other concrete additives. The testing shall be performed by the independent testing laboratory engaged by the Contractor.
 - a. Pozzolan shall be tested in compliance with ASTM C311 with the following restriction: A minimum of one sample weighing 4 pounds shall be taken from each 200 tons of pozzolan supplied for the project.

H. Sheet Curing Materials. Waterproof paper, polyethylene film, or white burlap-polyethylene sheeting all complying with ASTM C171.

I. Liquid Curing Compound. Liquid membrane-forming curing compound shall comply with the requirements of ASTM C309 Type 1-D (clear or translucent with fugitive dye) and shall contain no wax, paraffin, or oil.

2.03 MIXES

- A. Development of mix designs and testing shall be by an independent testing laboratory acceptable to the Engineer engaged by and at the expense of the Contractor.
- B. Select proportions of ingredients, in accordance with ACI 211.1, to meet the design strength and materials limits specified in Table 1, and to produce concrete having proper placability, durability, strength, appearance, and other required properties. Proportion ingredients to produce a homogenous mixture which will readily work into corners and angles of forms and

around reinforcement without permitting materials to segregate or allowing excessive free water to collect on the surface.

- C. The design mix shall be based on one of the following:
1. Standard deviation data of prior mixes, with essentially the same proportions of the same constituents, in accordance with ACI 318.
 2. Trial mixtures developed by laboratory tests. Water content of the concrete shall be based on a curve showing the relation between water cementitious ratio and 7- and 28-day compressive strengths of concrete made using the proposed materials. The curves shall be determined by four or more points, each representing an average value of at least three test specimens at each age. The curves shall have a range of values sufficient to yield the desired data, including the compressive strengths specified, without extrapolation. The water content of the concrete mixes to be used, as determined from the curve, shall correspond to strengths 16 percent greater than the required design strengths. The resulting mix shall not conflict with the limiting values for maximum water cementitious ratio and net minimum cementitious content as specified in Table 1.
- D. Compression Tests: Provide testing of the proposed concrete mix or mixes to demonstrate compliance with the compression strength requirements in conformity with the provisions of ACI 318.
- E. Entrained air, as measured by ASTM C231, shall be as shown in Table 1.
1. If the air entraining agent proposed for use in the mix requires testing methods other than ASTM C231 to accurately determine air content, make special note of this requirement in the air entraining admixture submittal.
- F. Slump of the concrete as measured by ASTM C143, shall be as shown in Table 1. If plasticizer is used, the slump indicated shall be that measured before plasticizer is added. Plasticized concrete shall have a slump ranging from 7- to 10-inches.
- G. Proportion admixtures according to the manufacturer's recommendations. Two or more admixtures specified may be used in the same mix provided that the admixtures in combination retain full efficiency and have no deleterious effect on the concrete or on the properties of each other.
- H. Where fly ash is included in the mix, the fly ash content shall be no less than 15 percent nor more than 25 percent of the total cement plus pozzolan content, by weight.
- I. Where Type III cement is used, the concrete shall conform to Table 1, except that the design strength shall be attained at 7 days.

Table 1				
Class	Design Strength (1)	Fine Aggregate (2)	Coarse Aggregate (3)	Cementitious Content (4)
A	2,500	C33	57	440
D	4,000	C33	57	560

Class	W/C Ratio (5)	AE Range (6)	WR (7)	Slump (8)
A	0.62 max.	3.5 to 5	Yes	1 to 4
D	0.44 max.	3.5 to 5	Yes	3 to 5

NOTES:

- (1) Minimum compressive strength in psi at 28 days
- (2) ASTM designation
- (3) Size Number in ASTM C33
- (4) Minimum cementitious content in pounds per cubic yard
- (5) W/C is Water Cementitious ratio by weight
- (6) AE is percent air entrainment
- (7) WR is water reducing admixture
- (8) Permissible slump range, inches

PART 3 EXECUTION

3.01 PREPARATION, INSPECTION, AND COORDINATION

- A. The batching, mixing, transporting, placing and curing of concrete shall be subject to the inspection of the Engineer at all times. The Contractor shall advise the Engineer of his/her readiness to proceed at least 24 hours prior to each concrete placement. The Engineer will inspect the preparations for concreting including the preparation of previously placed concrete, the reinforcing and the alignment, cleanliness, and tightness of formwork. No placement shall be made without the inspection and acceptance of the Engineer.
- B. Embedments
 1. Ensure that all required embedded items are accurately placed at correct locations and orientations.
 2. Support embedded items against displacement during concrete placement. Provide templates for positioning embedded anchor bolts.
 3. Voids in sleeves, inserts, anchors, etc. shall be filled temporarily with readily removable material to prevent the entry of concrete.
 4. Ensure that all aluminum embedments are effectively coated or covered to prevent aluminum concrete reaction or electrolytic action between aluminum and steel.

5. Unless otherwise shown or approved, conduits and pipes embedded within a slab, wall, or beam (other than those merely passing through) shall satisfy the following:
 - a. Maximum outside dimension shall be no greater than one-third the overall thickness of slab, wall, or beam.
 - b. Spacing shall be greater than or equal to three diameters or widths on center.
 - c. Size, number, and placement shall not significantly impair the strength of the member.
- C. Concrete for the work shall provide a homogeneous structure which, when hardened, will have the required strength, durability, and appearance. Mixtures and workmanship shall be such that concrete surfaces, when exposed, will require no patching or repairs due to defects. When concrete surfaces are stripped, the concrete when viewed in good lighting from 10 feet away shall be pleasing in appearance, and at 20 feet shall show no visible defects.

3.02 MEASURING MATERIALS

- A. Concrete shall be composed of portland cement, pozzolan (where applicable), fine aggregate, coarse aggregate, water, and admixtures, as specified and shall be produced by a concrete mixing plant conforming to ACI 301 and acceptable to the Engineer. All constituents, including admixtures, shall be batched at the plant.
- B. Measure materials for batching concrete by weighing in conformity with and within the tolerances given in ASTM C94 except as otherwise specified. Scales shall have been certified by the local Sealer of Weights and Measures within one year of use.
- C. Measure the amount of free water in fine aggregates within 0.3 of a percent with a moisture meter. Compensate for varying moisture contents of fine aggregates. Record the number of gallons of water as-batched on printed batching tickets.
- D. Admixtures shall be dispensed either manually using calibrated containers or measuring tanks, or by means of an automatic dispenser approved by the manufacturer of the specific admixture.
 1. Charge air-entraining and chemical admixtures into the mixer as a solution using an automatic dispenser or similar metering device.
 2. Inject multiple admixtures separately during the batching sequence.

3.03 MIXING AND TRANSPORTING

- A. Concrete shall be ready-mixed concrete produced by equipment acceptable to the Engineer. No hand-mixing will be permitted. Clean each transit mix truck drum and reverse drum rotation before the truck proceeds under the batching plant. Equip each transit-mix truck with a continuous, nonreversible, revolution counter showing the number of revolutions at mixing speeds.

- B. Ready-mix concrete shall be transported to the site in watertight agitator or mixer trucks loaded not in excess of their rated capacities as stated on the nameplate.
- C. Keep the water tank valve on each transit truck locked at all times. Any addition of water must be directed by the Engineer. Added water shall be incorporated by additional mixing of at least 35 revolutions. All added water shall be metered and the amount of water added shall be shown on each delivery ticket.
- D. All central plant and rolling stock equipment and methods shall comply with ACI 301 and ACI 318.
- E. Select equipment of size and design to ensure continuous flow of concrete at the delivery end. Metal or metal-lined non-aluminum discharge chutes shall be used and shall have slopes not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20 feet long and chutes not meeting slope requirements may be used if concrete is discharged into a hopper before distribution.
- F. Retempering of concrete or mortar, (that is, mixing with or without additional cement, aggregate, or water), which has obtained initial set, will not be permitted.
- G. Handle concrete from mixer to placement as quickly as practicable while providing concrete of required quality in the placement area. Dispatch trucks from the batching plant so they arrive at the work site just before the concrete is required, thus avoiding excessive mixing of concrete while waiting or delays in placing successive layers of concrete in the forms.
- H. Furnish a delivery ticket for ready mixed concrete to the Engineer as each truck arrives. Each ticket shall provide a printed record of the weight of cement and each aggregate as batched individually. Use the type of indicator that returns for zero punch or returns to zero after a batch is discharged. Clearly indicate the weight of fine and coarse aggregate, cement and water in each batch, the quantity delivered, the time any water is added, and the numerical sequence of the delivery. Show the time of day batched and time of discharge from the truck. Indicate the number of revolutions of transit mix truck.
- I. Temperature and Mixing Time Control
 - 1. In cold weather (see Paragraph 3.05D below) maintain the as-mixed temperature of the concrete and concrete temperatures at the time of placement in the forms as indicated in Table 2.
 - 2. If water or aggregate has been heated, combine water with aggregate in the mixer before cement is added. Do not add cement to mixtures of water and aggregate when the temperature of the mixture is greater than 90°F.
 - 3. In hot weather, cool ingredients before mixing to maintain temperature of the concrete below the maximum placing temperature of 90°F. If necessary, substitute well-crushed ice for all or part of the mixing water.
 - 4. The maximum time interval between the addition of mixing water and/or cement to the batch and the placing of concrete in the forms shall not exceed the following:

Table 2	
Concrete Temperature	Maximum Time
80 to 90°F (27 to 32°C)	45 minutes
70 to 79°F (21 to 26°C)	60 minutes
40 to 69°F (5 to 20°C)	90 minutes

If an approved high range water reducer (plasticizer) is used to produce plasticized concrete, the maximum time interval shall be 90 minutes.

- J. Concrete mix showing either poor cohesion or poor coating of the coarse aggregate with paste shall be remixed. If this does not correct the condition, the concrete shall be rejected. If the slump is within the allowable limit, but excessive bleeding, poor workability, or poor finishability are observed, changes in the concrete mix shall be obtained only by adjusting one or more of the following:
1. The gradation of aggregate.
 2. The proportion of fine and coarse aggregate.
 3. The percentage of entrained air, within the allowable limits.

3.04 PLACING AND COMPACTING

A. Placing

1. Verify that all formwork completely encloses concrete to be placed and is securely braced prior to concrete placement. Remove ice, excess water, dirt, and other foreign materials from forms. Confirm that reinforcement and other embedded items are securely in place. Have a competent workman at the location of the pour who can assure that reinforcement and embedded items remain in designated locations while concrete is being placed. Sprinkle semiporous subgrades or forms to eliminate suction of water from the mix. Seal extremely porous subgrades in an approved manner.
2. Deposit concrete as near its final position as possible to avoid segregation due to rehandling or flowing. Place concrete continuously at a rate which ensures the concrete is being integrated with fresh plastic concrete. Do not deposit concrete which has partially hardened or has been contaminated by foreign materials or on concrete which has hardened sufficiently to cause formation of seams or planes of weakness within the section. If the section cannot be placed continuously, place construction joints as specified or as approved.
3. Pumping of concrete will be permitted in accordance with the recommendations of ACI 304.2R. Use a mix design and aggregate sizes suitable for pumping and submit for approval.
4. Remove temporary spreaders from forms when the spreader is no longer useful. Temporary spreaders may remain embedded in concrete only when made of galvanized metal or concrete and if prior approval has been obtained.

5. Do not place concrete for supported elements until concrete previously placed in the supporting element (columns, slabs, and/or walls) has reached adequate strength.
6. Where surface mortar is to form the base of a finish, especially surfaces designated to be painted, work coarse aggregate back from forms with a suitable tool to bring the full surface of the mortar against the form. Prevent the formation of excessive surface voids.
7. Slabs
 - a. After suitable bulkheads, screeds, and jointing materials have been positioned, the concrete shall be placed continuously between construction joints beginning at a bulkhead, edge form, or corner. Each batch shall be placed into the edge of the previously placed concrete to avoid stone pockets and segregation.
 - b. Avoid delays in casting. If there is a delay in casting, the concrete placed after the delay shall be thoroughly spaded and consolidated at the edge of that previously placed to avoid cold joints. Concrete shall then be brought to correct level and struck off with a straightedge. Bullfloats or darbies shall be used to smooth the surface, leaving it free of humps or hollows.
 - c. Where slabs are to be placed integrally with the walls below them, place the walls and compact as specified. Allow 1 hour to pass between placement of the wall and the overlying slab to permit consolidation of the wall concrete. Keep the top surface of the wall moist so as to prevent cold joints.
8. Formed Concrete
 - a. Place concrete in forms using tremie tubes and taking care to prevent segregation. Bottom of tremie tubes shall preferably be in contact with the concrete already placed. Do not permit concrete to drop freely more than 4 feet. Place concrete for walls in 12- to 24-inch lifts, keeping the surface horizontal. If plasticized concrete is used, the maximum lift thickness may be increased to 7 feet and the maximum free fall of concrete shall not exceed 15 feet.

B. Compacting

1. Consolidate concrete by vibration, puddling, spading, rodding, or forking so that concrete is thoroughly worked around reinforcement, embedded items, and openings and into corners of forms. Puddling, spading, etc. shall be continuously performed along with vibration of the placement to eliminate air or stone pockets which may cause honeycombing, pitting, or planes of weakness.
2. All concrete shall be placed and compacted with mechanical vibrators. The number, type, and size of the units shall be approved by the Engineer in advance of placing operations. No concrete shall be ordered until sufficient approved vibrators (including standby units in working order) are on the job.

3. A minimum frequency of 7,000 revolutions per minute is required for mechanical vibrators. Insert vibrators and withdraw at points from 18- to 30-inches apart. At each insertion, vibrate sufficiently to consolidate concrete, generally from 5 to 15 seconds. Do not overvibrate so as to segregate. Keep a spare vibrator on the site during concrete placing operations.
4. Concrete Slabs: Concrete for slabs less than 8-inches thick shall be consolidated with vibrating screeds; slabs 8- to 12-inches thick shall be compacted with internal vibrators and (optionally) with vibrating screeds. Vibrators shall always be placed into concrete vertically and shall not be laid horizontally or laid over.
5. Walls and Columns: Internal vibrators (rather than form vibrators) shall be used unless otherwise approved by the Engineer. In general, for each vibrator needed to melt down the batch at the point of discharge, one or more additional vibrators must be used to densify, homogenize and perfect the surface. The vibrators shall be inserted vertically at regular intervals, through the fresh concrete and slightly into the previous lift, if any.
6. Amount of Vibration: Vibrators are to be used to consolidate properly placed concrete but shall not be used to move or transport concrete in the forms. Vibration shall continue until:
 - a. Frequency returns to normal
 - b. Surface appears liquefied, flattened, and glistening
 - c. Trapped air ceases to rise
 - d. Coarse aggregate has blended into surface but has not disappeared

3.05 CURING AND PROTECTION

- A. Protect all concrete work against injury from the elements and defacements of any nature during construction operations.
- B. Curing Methods
 1. Curing Methods for Concrete Surfaces: Cure concrete to retain moisture and maintain specified temperature at the surface for a minimum of 7 days after placement. Curing methods to be used are as follows:
 - a. Water Curing: Keep entire concrete surface wet by ponding, continuous sprinkling, or covering with saturated burlap. Begin wet cure as soon as concrete attains an initial set and maintain wet cure 24 hours a day.
 - b. Sheet Material Curing: Cover entire surface with sheet material. Securely anchor sheeting to prevent wind and air from lifting the sheeting or entrapping air under the sheet. Place and secure sheet as soon as initial concrete set occurs.

- c. Liquid Membrane Curing: Apply over the entire concrete surface except for surfaces to receive additional concrete. Curing compound shall NOT be placed on any concrete surface where additional concrete is to be placed, where surface coatings are to be used, or where the concrete finish requires an integral floor product. Curing compound shall be applied as soon as the free water on the surface has disappeared and no water sheen is visible, but not after the concrete is dry or when the curing compound can be absorbed into the concrete. Application shall follow the manufacturer's recommendations.
 - 2. Specified applications of curing methods.
 - a. Slabs for water containment structures: Water curing only.
 - b. Slabs on grade and footings (not used to contain water): Water curing, sheet material curing, or liquid membrane curing.
 - c. Structural Slabs (other than water containment): Water curing or liquid membrane curing.
 - d. Horizontal surfaces which will receive additional concrete, coatings, grout, or other material that requires bond to the substrate: Water curing.
 - e. Formed surfaces: None if nonabsorbent forms are left in place for 7 days. Water cure if absorbent forms are used. Sheet cure or liquid membrane cure if forms are removed prior to 7 days. Exposed horizontal surfaces of formed walls or columns shall be water cured for 7 days or until next placement of concrete is made.
 - f. Concrete Joints: Water cured or sheet material cured.
 - 3. Curing time may be reduced to 3 days after placement where Type III cement is approved and used.
- C. Finished surfaces and slabs shall be protected from the direct rays of the sun to prevent checking and crazing.
- D. Cold Weather Concreting:
- 1. "Cold weather" is defined as a period when for more than 3 successive days, the average daily outdoor temperature drops below 40°F. The average daily temperature shall be calculated as the average of the highest and the lowest temperature during the period from midnight to midnight.
 - 2. Concrete placed during cold weather shall be batched, delivered, placed, cured, and protected in compliance with the recommendations of ACI 306R and the additional requirements specified herein.
 - 3. Discuss a cold weather work plan with the Engineer. The discussion shall encompass the methods and procedures proposed for use during cold weather including the production, transportation, placement, protection, curing and

temperature monitoring of the concrete. The procedures to be implemented upon abrupt changes in weather conditions or equipment failures shall also be discussed. Cold weather concreting shall not begin until the work plan is acceptable to the Engineer.

4. The minimum temperature of concrete immediately after placement and during the protection period shall be as indicated in Table 3. The temperature of the concrete in place and during the protection period shall not exceed these values by more than 20°F. Prevent overheating and non-uniform heating of the concrete.

Table 3	
Minimum Dimension of Section	Minimum Concrete Temperatures
< 12 inches	55°F
12 to 36 inches	50°F

5. During periods of cold weather, concrete shall be protected to provide continuous warm, moist curing (with supplementary heat when required) for a total of at least 350 degree-days of curing.
 - a. Degree-days are defined as the total number of 24-hour periods multiplied by the weighted average daily air temperature at the surface of the concrete (e.g., 5 days at an average 70°F = 350 degree-days).
 - b. To calculate the weighted average daily air temperature, sum hourly measurements of the air temperature in the shade at the surface of the concrete taking any measurement less than 50°F as 0°F. Divide the sum thus calculated by 24 to obtain the weighted average temperature for that day.
6. Salt, manure, or other chemicals shall not be used for protection.
7. At the end of the protection period, allow the concrete to cool gradually to the ambient temperature. If water curing has been used, the concrete shall not be exposed to temperatures below those shown in Table 3 until at least 24 hours after water curing has been terminated.
8. During periods not defined as cold weather, but when freezing temperatures are expected or occur, protect concrete surfaces from freezing for the first 24 hours after placing.

E. Hot Weather Concreting

1. "Hot weather" is defined as any combination of high air temperatures, low relative humidity and wind velocity which produces a rate of evaporation as estimated in ACI 305R, approaching or exceeding 0.2 pounds per square foot per hour.

2. Concrete placed during hot weather, shall be batched, delivered, placed, cured and protected in compliance with the recommendations of ACI 305R and the additional requirements specified herein.
 - a. Temperature of concrete being placed shall not exceed 90°F and every effort shall be made to maintain a uniform concrete mix temperature below this level. The temperature of the concrete shall be such that it will cause no difficulties from loss of slump, flash set, or cold joints.
 - b. All necessary precautions shall be taken to promptly deliver, to promptly place the concrete upon its arrival at the job, and to provide vibration immediately after placement.
 - c. The Engineer may direct the Contractor to immediately cover plastic concrete with sheet material.
3. Discuss with the Engineer a work plan describing the methods and procedures proposed to use for concrete placement and curing during hot weather periods. Hot weather concreting shall not begin until the work plan is acceptable to the Engineer.

3.06 REMOVAL OF FORMS

- A. Except as otherwise specifically authorized by the Engineer, forms shall not be removed before the concrete has attained a strength of at least 30 percent of its specified design strength, nor before reaching the following number of day-degrees of curing (whichever is the longer):

Table 4	
Forms for	Degree Days
Beams and slabs	500
Walls and vertical surfaces	100

(See definition of degree-days in Paragraph 3.05D above).

- B. Shores shall not be removed until the concrete has attained at least 60 percent of its specified design strength and also sufficient strength to support safely its own weight and the construction live loads upon it.

3.07 FIELD TESTS

- A. Sets of field control cylinder specimens will be taken by the Engineer (or inspector) during the progress of the work, in compliance with ASTM C31. The number of sets of concrete test cylinders taken of each class of concrete placed each day shall not be less than once a day, nor less than once for each 150 cubic yards of concrete nor less than once for each 5,000 square feet of surface area for slabs or walls.

1. A "set" of test cylinders consists of four cylinders: one to be broken at 7 days and two to be broken and their strengths averaged at 28 days. The fourth may be used

for a special break at 3 days or to verify strength after 28 days if 28-day breaks are low.

2. When the average 28-day compressive strength of the cylinders in any set falls below the required compressive strength or below proportional minimum 7-day strengths (where proper relation between 7- and 28-day strengths have been established by tests), proportions, water content, or temperature conditions shall be changed to achieve the required strengths.
- B. Cooperate in the making of tests by allowing free access to the work for the selection of samples, providing an insulated closed curing box for specimens, affording protection to the specimens against injury or loss through the operations, and furnish material and labor required for the purpose of taking concrete cylinder samples. All shipping of specimens will be paid for by the Contractor. Curing boxes shall be acceptable to the Engineer.
 - C. Slump tests will be made in the field immediately prior to placing the concrete. Such tests shall be made in accordance with ASTM C143. If the slump is greater the specified range, the concrete shall be rejected.
 - D. Air Content: Test for air content shall be made on a fresh concrete sample. Air content for concrete made of ordinary aggregates having low absorption shall be made in compliance with either the pressure method complying with ASTM C231 or by the volumetric method complying with ASTM C173. If lightweight aggregates or aggregates with high absorptions are used, the latter test method shall be used.
 - E. All passing construction tests requested by the Engineer will be paid for by the testing allowance. Should construction testing reveal that the item tested does not meet the requirements of the Construction Documents, retesting shall be required until the item does meet the requirements. All failing tests shall be at the Contractor's expense and shall not be paid for by the testing allowance. The Contractor may obtain any additional tests which he may require for quality control, using his testing laboratory, at his expense.

3.08 FIELD CONTROL

- A. The Engineer may have cores taken from any questionable area in the concrete work such as construction joints and other locations as required for determination of concrete quality. The results of tests on such cores shall be the basis for acceptance, rejection, or determining the continuation of concrete work.
- B. Cooperate in obtaining cores by allowing free access to the work and permitting the use of ladders, scaffolding, and such incidental equipment as may be required. Repair all core holes. The work of cutting and testing the cores will be at the expense of the Owner.

3.09 FAILURE TO MEET REQUIREMENTS

- A. Should the strengths shown by the test specimens made and tested in compliance with the previous provisions fall below the values given in Table 1, the Engineer shall have the right to require changes in proportions outlined to apply to the remainder of the work. Furthermore, the Engineer shall have the right to require additional curing on those portions of the structure represented by the test specimens which failed. The cost of such additional curing shall be at the Contractor's expense. In the event that such additional curing does not

give the strength required, as evidenced by core and/or load tests, the Engineer shall have the right to require strengthening or replacement of those portions of the structure which fail to develop the required strength. The cost of all such core borings and/or load tests and any strengthening or concrete replacement required because strengths of test specimens are below that specified, shall be entirely at the expense of the Contractor. In such cases of failure to meet strength requirements, the Contractor and Engineer shall confer to determine what adjustment, if any, can be made in compliance with Sections titled "Strength" and "Failure to Meet Strength Requirements" of ASTM C94. The "purchaser" referred to in ASTM C94 is the Contractor in this Section.

- B. When the tests on control specimens of concrete fall below the required strength, the Engineer will permit check tests for strengths to be made by means of typical cores drilled from the structure in compliance with ASTM C42 and C39. In case of failure of the cores, the Engineer may require, at the Contractor's expense and in addition to other recourses, load tests on any one of the slabs, beams, piles, caps, and columns in which such concrete was used. Test need not be made until concrete has aged 60 days.
- C. Should the strength of test cylinders fall below 60 percent of the required minimum 28-day strength, the concrete shall be rejected and shall be removed and replaced.

3.10 PATCHING AND REPAIRS

- A. Immediately after the forms have been stripped and before the concrete has changed color, fins and other projections shall be removed; recesses left by the removal of form ties shall be filled; and surface defects which do not impair structural strength shall be repaired. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete, to approval of the Engineer.
- B. Immediately after removal of forms, remove plugs and break off metal ties as required by Section 03100. Holes are then to be promptly filled upon stripping as follows: Moisten the hole with water, followed by a $\frac{1}{16}$ -inch brush coat of neat cement slurry mixed to the consistency of a heavy paste. Immediately plug the hole with a 1 to 1.5 mixture of cement and concrete sand mixed slightly damp to the touch (just short of "balling"). Hammer the grout into the hole until dense, and an excess of paste appears on the surface in the form of a spider web. Trowel smooth with heavy pressure. Avoid burnishing.
- C. Surface defects which do not impair the structural integrity shall be repaired as approved by the Engineer. Defective concrete and honeycombed areas, as determined by the Engineer, shall be replaced or repaired using methods specified in Section 03740.
- D. When patching defects in exposed surfaces, the same source of cement and sand as used in the parent concrete shall be employed. Adjust color if necessary, by addition of proper amounts of white cement. Rub lightly with a fine Carborundum stone at an age of 1 to 5 days if necessary to bring the surface down with the parent concrete. Exercise care to avoid damaging or staining the virgin skin of the surrounding parent concrete. Wash thoroughly to remove all rubbed matter.

3.11 SCHEDULE

- A. The following (Table 5) are the general applications for the various concrete classes and design strengths:

Table 5		
Class	Design Strength (psi)	Description
A	2,500	Concrete fill and duct encasement
D	4,000	Walls, slabs on grade, suspended slab and beam systems, columns, grade beams, sidewalks and all other structural concrete

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this work item, but it shall be included in the unit price bid for pipeline, as noted in the Proposal.

END OF SECTION

SECTION 03600

GROUT

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, tools, superintendence, and incidentals required and install grout complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Cast-in-Place Concrete is included in Section 03300.

1.03 SUBMITTALS

- A. Submit to the Engineer, in accordance with Section 01300, shop drawings and product data showing materials of construction and details of installation for:
 - 1. Commercially manufactured nonshrink cementitious grout. The submittal shall include catalog cuts, technical data, storage requirements, product life, working time after mixing, temperature considerations, conformity to required ASTM standards, and Material Safety Data Sheet.
 - 2. Commercially manufactured nonshrink epoxy grout. The submittal shall include catalog cuts, technical data, storage requirements, product life, working time after mixing, temperature considerations, conformity to required ASTM standards, and Material Safety Data Sheet.
 - 3. Cement grout. The submittal shall include the type and brand of the cement, the gradation of the fine aggregate, product data on any proposed admixtures, and the proposed mix of the grout.
 - 4. Concrete grout. The submittal shall include data as required for concrete as delineated in Section 03300 and for fiber reinforcement as delineated in Section 03200. This includes the mix design, constituent quantities per cubic yard, and the water/cement ratio.
- B. Laboratory Test Reports
 - 1. Submit laboratory test data as required under Section 03300 for concrete to be used as concrete grout.
- C. Certifications
 - 1. Manufacturers of commercially manufactured grout products shall submit certification of their qualifications for supply of the specified grout products.

1.04 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM C531 Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical Resistant Mortars, Grouts and Monolithic Surfacing
 - 2. ASTM C827 Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures
 - 3. ASTM C1107 Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
 - 4. ASTM D695 Standard Test Method for Compressive Properties of Rigid Plastics
- B. U.S. Army Corps of Engineers Standard (CRD)
 - 1. CRD-C 621 Corps of Engineers Specification for Nonshrink Grout
- C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. Qualifications
 - 1. Manufacturers of commercially manufactured grout products shall have a minimum of 10 years of experience in the production and use of the type of grout proposed for the work.
- B. Services of Manufacturer's Representative
 - 1. A qualified field technician of the nonshrink grout manufacturer, specifically trained in the installation of the products, shall be available for consultation and assistance during the installation of each type of nonshrink grout. Services shall also be provided, as required, to correct any installation problems at no additional cost to the Owner.
- C. Field Testing
 - 1. The field testing of concrete grout will be as specified for concrete in Section 03300.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the jobsite in original, unopened packages, clearly labeled with the manufacturer's name, product identification, batch numbers, and printed instructions.
- B. Store materials in full compliance with the manufacturer's recommendations. Total storage time from date of manufacture to date of installation shall be limited to 6 months or the manufacturer's recommended storage time, whichever is less.

- C. Material which becomes damp or otherwise unacceptable shall be immediately removed from the site and replaced with acceptable material at no additional expense to the Owner.
- D. Nonshrink cement-based grouts shall be delivered as preblended, prepackaged mixes requiring only the addition of water.
- E. Nonshrink epoxy grouts shall be delivered as premeasured, prepackaged, three component systems requiring only blending as directed by the manufacturer.

1.07 DEFINITIONS

- A. Nonshrink Grout: A commercially manufactured product that does not shrink in either the plastic or hardened state, is dimensionally stable in the hardened state and bonds to a clean base plate.

PART 2 PRODUCTS

2.01 GENERAL

- A. The use of a manufacturer's name and product or catalog number is for the purpose of establishing the standard of quality desired.
- B. Like materials shall be the products of one manufacturer or supplier in order to provide standardization of appearance.

2.02 MATERIALS

- A. Nonshrink Cementitious Grout
 - 1. Nonshrink cementitious grouts shall meet or exceed the requirements of ASTM C1107 Grades B or C and CRD-C 621. Grouts shall be portland cement based, contain a pre-proportioned blend of selected aggregates and shrinkage compensating agents and shall require only the addition of water. Nonshrink cementitious grouts shall not contain expansive cement or metallic particles. The grouts shall exhibit no shrinkage when tested in conformity with ASTM C827.
 - a. General purpose nonshrink cementitious grout shall conform to the standards stated above and shall be SikaGrout 212 by Sika Corp.; Set Grout by Master Builders, Inc.; Gilco Construction Grout by Gifford Hill & Co.; Euco NS by The Euclid Chemical Co.; NBEC Grout by U.S. Grout Corp.; or equal.
 - b. Flowable (precision) nonshrink cementitious grout shall conform to the standards stated above and shall be Masterflow 928 by Master Builders, Inc.; Hi-Flow Grout by the Euclid Chemical Co.; SikaGrout 212 by Sika Corp.; Supreme Grout by Gifford Hill & Co.; Five Star Grout by U.S. Grout Corp.; or equal.
- B. Nonshrink Epoxy Grout

1. Nonshrink epoxy-based grout shall be a pre-proportioned, three component, 100 percent solids system consisting of epoxy resin, hardener, and blended aggregate. It shall have a compressive strength of 14,000 psi in 7 days when tested in conformity with ASTM D695 and have a maximum thermal expansion of 30 by 10^{-6} when tested in conformity with ASTM C531. The grout shall be Ceilcote 648 CP by Master Builders, Inc.; Five Star Epoxy Grout by U.S. Grout Corp.; Sikadur 42 Grout-Pak by Sika Corp.; High Strength Epoxy Grout by the Euclid Chemical Co.; or equal.
- C. Cement Grout
1. Cement grouts shall be a mixture of one part portland cement conforming to ASTM C150 Types I, II, III or IV and 1 to 2 parts sand conforming to ASTM C33 with sufficient water to place the grout. The water content shall be sufficient to impart workability to the grout but not to the degree that it will allow the grout to flow. Compressive strength shall be in accordance with ASTM C150.
- D. Concrete Grout
1. Concrete grout shall conform to the requirements of Section 03300, except as specified herein. It shall be proportioned with cement, coarse and fine aggregates, water, water reducer, and air entraining agent to produce a mix having a minimum compression strength of 2,500 psi at 28 days. Coarse aggregate size shall be $\frac{1}{4}$ -inch maximum. Slump should not exceed 5-inches and should be as low as practical yet still retain sufficient workability.
 2. Synthetic reinforcing fibers as specified in Section 03200 shall be added to the concrete grout mix at the rate of 1.5 pounds of fibers per cubic yard of grout. Fibers shall be added from the manufacturer's premeasured bags and according to the manufacturer's recommendations in a manner which will ensure complete dispersion of the fiber bundles as single monofilaments within the concrete grout.
- E. Water
1. Potable water, free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other deleterious substances.

PART 3 EXECUTION

3.01 PREPARATION

- A. Grout shall be placed over cured concrete which has attained its full specified design strength unless otherwise approved by the Engineer.
- B. Concrete surfaces to receive grout shall be clean and sound; free of ice, frost, dirt, grease, oil, curing compounds, laitance, and paints, and free of all loose material or foreign matter which may affect the bond or performance of the grout.
- C. Roughen concrete surfaces by chipping, sandblasting, or other mechanical means to ensure bond of the grout to the concrete. Remove loose or broken concrete. Irregular voids or

projecting coarse aggregate need not be removed if they are sound, free of laitance, and firmly embedded into the parent concrete.

1. Air compressors used to clean surfaces in contact with grout shall be the oil less type or equipped with an oil trap in the air line to prevent oil from being blown onto the surface.
- D. Remove all loose rust, oil, or other deleterious substances from metal embedments or bottom of baseplates prior to the installation of the grout.
- E. Concrete surfaces shall be washed clean and then kept moist for at least 24 hours prior to the placement of cementitious or cement grout. Saturation may be achieved by covering the concrete with saturated burlap bags, use of a soaker hose, flooding the surface, or other method acceptable to the Engineer. Upon completion of the 24-hour period, visible water shall be removed from the surface prior to grouting. The use of an adhesive bonding agent in lieu of surface saturation shall only be used when approved by the Engineer for each specific location of grout installation.
- F. Epoxy-based grouts do not require the saturation of the concrete substrate. Surfaces in contact with epoxy grout shall be completely dry before grouting.
- G. Construct grout forms or other leak proof containment as required. Forms shall be lined or coated with release agents recommended by the grout manufacturer. Forms shall be of adequate strength, securely anchored in place, and shored to resist the forces imposed by the grout and its placement.
 1. Forms for epoxy grout shall be designed to allow the formation of a hydraulic head and shall have chamfer strips built into forms.
- H. Level and align the structural or equipment bearing plates in accordance with the structural requirements and the recommendations of the equipment manufacturer.
- I. Equipment shall be supported during alignment and installation of grout by shims, wedges, blocks, or other approved means. The shims, wedges, and blocking devices shall be prevented from bonding to the grout by appropriate bond breaking coatings and removed after grouting unless otherwise approved by the Engineer.

3.02 INSTALLATION - GENERAL

- A. Mix, apply, and cure products in strict compliance with the manufacturer's recommendations and this Section.
- B. Have sufficient manpower and equipment available for rapid and continuous mixing and placing. Keep all necessary tools and materials ready and close at hand.
- C. Maintain temperatures of the foundation plate, supporting concrete, and grout between 40°F and 90°F during grouting and until grout compressive strength reaches 1,000 psi or as recommended by the grout manufacturer, whichever is longer. Take precautions to minimize differential heating or cooling of baseplates and grout during the curing period.

- D. Take special precautions for hot weather or cold weather grouting as recommended by the manufacturer when ambient temperatures and/or the temperature of the materials in contact with the grout are outside of the 60°F and 90°F range.
- E. Install grout in a manner which will preserve the isolation between the elements on either side of the joint where grout is placed in the vicinity of an expansion or control joint.
- F. Reflect all existing underlying expansion, control and construction joints through the grout.

3.03 INSTALLATION - CEMENT GROUTS AND NONSHRINK CEMENTITIOUS GROUTS

- A. Mix in accordance with manufacturer's recommendations. Do not add cement, sand, pea gravel, or admixtures without prior approval by the Engineer.
- B. Avoid mixing by hand. Mixing in a mortar mixer (with moving blades) is recommended. Pre-wet the mixer and empty excess water. Add premeasured amount of water for mixing, followed by the grout. Begin with the minimum amount of water recommended by the manufacturer and then add the minimum additional water required to obtain workability. Do not exceed the manufacturer's maximum recommended water content.
- C. Placements greater than 3 inches in depth shall include the addition of clean, washed pea gravel to the grout mix when approved by the manufacturer. Comply with the manufacturer's recommendations for the size and amount of aggregate to be added.
- D. Place grout into the designated areas in a manner which will avoid segregation or entrapment of air. Do not vibrate grout to release air or to consolidate the material. Placement should proceed in a manner which will ensure the filling of all spaces and provide full contact between the grout and adjoining surfaces. Provide grout holes as necessary.
- E. Place grout rapidly and continuously to avoid cold joints. Do not place cement grouts in layers. Do not add additional water to the mix (retemper) after initial stiffening.
- F. Just before the grout reaches its final set, cut back the grout to the substrate at a 45 degree angle from the lower edge of bearing plate unless otherwise approved by the Engineer. Finish this surface with a wood float (brush) finish.
- G. Begin curing immediately after form removal, cutback, and finishing. Keep grout moist and within its recommended placement temperature range for at least 24 hours after placement or longer if recommended by the manufacturer. Saturate the grout surface by use of wet burlap, soaker hoses, ponding, or other approved means. Provide sunshades as necessary. If drying winds inhibit the ability of a given curing method to keep grout moist, erect wind breaks until wind is no longer a problem or curing is finished.

3.04 INSTALLATION - NONSHRINK EPOXY GROUTS

- A. Mix in accordance with the procedures recommended by the manufacturer. Do not vary the ratio of components or add solvent to change the consistency of the grout mix. Do not over mix. Mix full batches only to maintain proper proportions of resin, hardener, and aggregate.
- B. Monitor ambient weather conditions and contact the grout manufacturer for special placement procedures to be used for temperatures below 60°F or above 90°F.

- C. Place grout into the designated areas in a manner which will avoid trapping air. Placement methods shall ensure the filling of all spaces and provide full contact between the grout and adjoining surfaces. Provide grout holes as necessary.
- D. Minimize "shoulder" length (extension of grout horizontally beyond base plate). In no case shall the shoulder length of the grout be greater than the grout thickness.
- E. Finish grout by puddling to cover all aggregate and provide a smooth finish. Break bubbles and smooth the top surface of the grout in conformity with the manufacturer's recommendations.
- F. Epoxy grouts are self curing and do not require the application of water. Maintain the formed grout within its recommended placement temperature range for at least 24 hours after placing, or longer if recommended by the manufacturer.

3.05 INSTALLATION - CONCRETE GROUT

- A. Screed underlying concrete to the grade shown on the Drawings. Provide the surface with a broomed finish, aligned to drain. Protect and keep the surface clean until placement of concrete grout.
- B. Remove the debris and clean the surface by sweeping and vacuuming of all dirt and other foreign materials. Wash the tank slab using a strong jet of water. Flushing of debris into tank drain lines will not be permitted.
- C. Saturate the concrete surface for at least 24 hours prior to placement of the concrete grout. Saturation may be maintained by ponding, by the use of soaker hoses, or by other methods acceptable to the Engineer. Remove excess water just prior to placement of the concrete grout. Place a cement slurry immediately ahead of the concrete grout so that the slurry is moist when the grout is placed. Work the slurry over the surface with a broom until it is coated with approximately 1/16- to 1/8-inch thick cement paste. (A bonding grout composed of 1 part portland cement, 1.5 parts fine sand, an approved bonding admixture and water, mixed to achieve the consistency of thick paint, may be substituted for the cement slurry.)
- D. Place concrete grout to the slopes shown on the Drawings.
- E. Finish and cure the concrete grout as specified for cast-in-place concrete.

3.06 SCHEDULE

- A. The following list indicates where the particular types of grout are to be used:
 1. General purpose nonshrink cementitious grout: Use at all locations where non shrink grout is called for on the plans except for base plates greater in area than 3-feet wide by 3-feet long and except for the setting of anchor rods, anchor bolts or reinforcing steel in concrete.
 2. Flowable nonshrink cementitious grout: Use under all base plates greater in area than 3-feet by 3-feet. Use at all locations indicated to receive flowable nonshrink grout by the Drawings. The Contractor, at his/her option and convenience, may also

substitute flowable nonshrink grout for general purpose nonshrink cementitious grout.

3. Nonshrink epoxy grout: Use for the setting of anchor rods, anchor bolts and reinforcing steel in concrete and for all locations specifically indicated to receive epoxy grout.
4. Cement grout: Cement grout may be used for grouting of incidental base plates for structural and miscellaneous steel such as post base plates for platforms, base plates for beams, etc. It shall not be used when nonshrink grout is specifically called for on the Drawings or for grouting of primary structural steel members such as columns and girders.
5. Concrete grout: Use where specifically noted on the Drawings.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this work item, but it shall be included in the unit price bid for pipeline, as noted in the Proposal.

END OF SECTION

SECTION 03740

MODIFICATIONS AND REPAIR TO CONCRETE

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, tools, superintendence, and incidentals required to cut, repair, or otherwise modify parts of in-place concrete structures or appurtenances as shown on the Drawings and as specified herein, as necessary to complete the Work under this Contract.
- B. Repairs to concrete structures shall be made, when so directed by the Engineer, in accordance with methods specified herein.

1.02 RELATED WORK

- A. Cast-In-Place Concrete is included in Section 03300.
- B. Grout is included in Section 03600.

1.03 SUBMITTAL

- A. Submit product data, including catalog cut, technical data, storage requirements, installation requirements, locations of use, and conformity to ASTM standards, in accordance with Section 01300, for any of the following products proposed to be used in the Work:
 - 1. Repair Mortar
 - 2. Epoxy Paste Adhesive
 - 3. Crack Sealant
 - 4. Bonding Agent
- B. Submit shop drawings showing materials of construction and details of installation for any proposed repair methods.

1.04 REFERENCE STANDARDS

- 1. American Society for Testing and Materials (ASTM)
- 2. ASTM C881 Epoxy-Resin-Base Bonding Systems for Concrete
- 3. ASTM C1059 Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete

Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply, unless otherwise noted.

1.05 DESCRIPTION

- A. No structure or concrete requiring modification or repair shall be shifted, cut, removed, or otherwise altered until authorization is given by the Engineer.
- B. When removing materials or portions of structures and when making openings to in-place structures, all precautions shall be taken and all necessary barriers, shoring, and bracing, and other protective devices shall be erected to prevent damage to the structure beyond the limits necessary for the modifications, to protect personnel, and to prevent damage by falling or flying debris. Unless otherwise permitted, shown, or specified, line drilling will be required in cutting in-place concrete.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Repair Mortar:
 - 1. Repair mortar shall be a two-component, polymer-modified, cementitious, fast-setting, trowel grade, structural repair mortar suitable for use on horizontal, vertical and overhead surfaces, and above or below grade on concrete and mortar.
 - 2. Materials:
 - a. The mortar shall not contain chlorides, nitrates, added gypsum, added lime, or high alumina cements. The system shall be non-combustible, either before or after cure. The system shall not produce a vapor barrier.
 - b. Properties of Cured Material
 - c. Color - Concrete Gray
 - d. Bond Strength (pull off method) - 100 percent concrete substrate failure
 - e. Repair mortar shall be SikaTop 122 or SikaTop 123 as manufactured by Sika Corporation, Lyndhurst, New Jersey, or equal.
- B. Epoxy Paste Adhesive:
 - 1. Epoxy paste adhesive shall be a two-component, solvent-free, moisture insensitive epoxy resin material suitable for bolt grouting, as an adhesive for mating surfaces where the glue line is c-inch or less, and to bond fresh, plastic concrete to clean, sound, hardened concrete.
 - 2. The material shall conform to Type IV, Grade 3 adhesive in accordance with ASTM C881-90.
 - 3. Epoxy paste adhesive shall be Sikadur 31, Hi-Mod Gel, as manufactured by Sika Corporation, Lyndhurst, New Jersey, or equal.

- C. Crack Sealant:
1. Crack sealant shall be a two-component, solvent-free, moisture-insensitive epoxy resin material suitable for crack grouting, by injection or gravity feed.
 2. The epoxy material shall conform to Type IV, Grade 1 adhesive in accordance with ASTM C881-90.
 3. Crack sealant shall be Sikadur 35, Hi-Mod LV, as manufactured by Sika Corp., Lyndhurst, New Jersey, or equal.
- D. Bonding Agent:
1. Epoxy bonding agent shall be a two-component, solvent-free, moisture insensitive, epoxy resin material conforming to ASTM C881-90, Type V. The bonding agent shall be Sikadur 32 Hi-Mod by Sika Corporation of Lyndhurst, New Jersey; Concrete Liquid (LPL) by Master Builders of Cleveland, Ohio; or equal.
 2. Latex bonding agent shall be a non-reemulsifiable acrylic-polymer latex conforming to ASTM C1059, Type II.
- E. Grout shall be in accordance with Section 03600, Grout.

PART 3 EXECUTION

3.01 GENERAL

- A. Concrete removal and repairs shall be as directed by the Engineer and as specified herein.
- B. In all cases where the joint between the modification and the in-place concrete will be exposed in the finished work, the limit of concrete removal shall be defined by a 1-inch deep saw cut on each exposed surface of the in-place concrete, unless otherwise noted or specified.
- C. When the finished surface is not specified to be coated, the color of new concrete in the exposed surfaces shall match the color of the existing adjoining concrete as closely as possible.
- D. Where indicated or specified, in-place concrete shall be removed to the depth indicated or required to expose sound concrete. The surface exposed shall be roughened by chipping, sandblasting, scarifying, or other appropriate means before applying bonding agents or repair material as specified.
- E. Where in-place reinforcing steel is to be incorporated in a repair, the reinforcing steel shall be cleaned by mechanical means to remove all loose material and products of corrosion before proceeding with the repair. If more than half of the diameter of the reinforcing steel is exposed, chip out behind the steel. The distance chipped behind the steel shall be a minimum of 2-inch. Reinforcing to be left in place shall not be damaged during the repair operation. It shall be cut, bent, or lapped to new reinforcing steel as directed and provided with 1-inch minimum cover all around.

- F. All commercial products specified in this Section shall be stored, mixed, and applied in strict accordance with the manufacturer's recommendations.
- G. In all cases where concrete is repaired in the vicinity of an expansion joint or control joint, the repairs shall be made so as to preserve the isolation between components on either side of the joint.
- H. Where exposed embedded metal is required to be painted, prepare substrate as approved and paint with two coats zinc rich primer before installation of adjacent new materials.
- I. When drilling holes in in-place concrete for dowels or bolts, drilling shall stop if reinforcing steel is encountered. As approved by the Engineer, the hole shall be relocated to avoid rebar. Rebar shall not be cut without prior approval by the Engineer. Where possible, rebar locations shall be identified prior to drilling using "rebar locators" so that drilled hole locations may be adjusted to avoid rebar interferences.
- J. Concrete specified to be left in place which is damaged by the Contractor shall be repaired by approved means to the satisfaction of the Engineer, at no cost to the Owner.
- K. Where existing reinforcement is to remain at an exposed cut surface, coat the exposed surface with repair mortar.
- L. Installation of grout materials shall be in accordance with Section 03600, Grout.

3.02 REPAIR METHODS

- A. Surface Repair and Patching:
 - 1. Remove fractured, loose, deteriorated, and unsound concrete by saw cutting, bush hammering, chipping, or other appropriate means. Restore area to original limits or as shown using repair mortar in accordance with manufacturer's recommendations.
- B. Epoxy Injection:
 - 1. Cracks shall be repaired by epoxy injection where directed by the Engineer, as required for repair of in-place concrete structures.
 - 2. Installation shall be by pressure injecting crack sealant through polyethylene valves sealed to the surface with epoxy paste adhesive for vertical cracks and by gravity feeding crack sealant into horizontal cracks.
- C. All exposed efflorescence, laitance, surface encrustations, and foreign material shall be removed by abrasive blasting, grinding, acid etching and flushing, or other approved means, as required for epoxy injection or surface repairs.

3.03 CONCRETE CONNECTION METHODS

- A. The following are specific concrete "connection methods" to be used where called for on the Drawings or as directed by the Engineer.

1. Method A Bonding by using cement paste: After the concrete surface at connection has been roughened and cleaned, thoroughly moisten the surface with water. Brush on a 1/4-inch layer of neat cement slurry mixed to the consistency of a heavy paste. Immediately after application of cement paste, place new concrete or grout mixture, as specified.
2. Method B Bonding by using bonding agent: After the concrete surface has been roughened and cleaned, apply an approved bonding agent at connection surface. The field preparation and application of the bonding agent shall comply strictly with the manufacturer's recommendations. Place new concrete or grout mixture as specified within time constraints recommended by the manufacturer to ensure bond.
3. Method C Drilled dowels or bolts using epoxy paste: Drill a hole 3-inch larger than the diameter of the dowel. The hole shall be blown clear of loose particles and dust just prior to installing epoxy. The drilled hole shall first be filled with epoxy paste and the dowel/bolt buttered with paste, and then the dowel/bolt shall be inserted by tapping. Unless otherwise shown on the Drawings, deformed bars shall be drilled and set to a depth of 10 bar diameters and smooth bars shall be drilled and set to a depth of 15 bar diameters. If not noted or shown on the Drawings, the Contractor shall request details regarding the size and depth of anchor bolts from the Engineer.
4. Method D Drilled dowels or bolts using cement grout: Drill a hole 2-inch larger than the diameter of the dowel. The hole shall be blown clear of loose particles and dust just prior to installing grout. The drilled hole shall first be filled with nonshrink cementitious grout and then the dowel inserted by turning and tapping to the specified embedment depth.
5. Method E Drilled dowels or bolts using adhesive capsule anchors: Capsule anchor system shall be as specified in Section 05500, Miscellaneous Metals.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this work item, but it shall be included in the or unit price bid for pipeline, as noted in the Proposal.

END OF SECTION

SECTION 04730

ROCKWALLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This item shall govern for the construction of rockwalls and retaining walls (collectively referred to as “rockwalls”) complete with concrete foundations at locations indicated on the plans.

1.02 SUBMITTAL

- A. Design Mixtures: For each mortar mixture.

PART 2 PRODUCTS

2.01 SELECT FILL

- A. The soil under the foundation shall comply with Division 2 Section 02235 “Granular Fill Material”.

2.02 STONE

- A. Stone for rockwalls shall consist of quarried limestone as nearly uniform in section as is practicable.
- B. Field stone or salvaged stone from rockwalls shall be used only where directed by the Engineer or its designated representative or representative.
- C. The stone shall be dense, resistant to the action of air and water, clean of old mortar and suitable in all respects for the purpose intended.
- D. All stone shall be thoroughly soaked before being placed.
- E. River stone will not be allowed.

2.03 MORTAR

- A. The mortar shall consist of one (1) part Portland cement, one-half (1/2) to one-fourth (1/4) part hydrated lime, and three (3) parts clean sand.
- B. Mortar shall have a consistency such that it can be easily handled and spread by trowel, and that shall flow into and completely fill all voids.
- C. Mortar shall be Type S, ASTM Specification C270-73. Minimum compressive strength = 1800 psi (28 days).
- D. Mortar joints shall not exceed -half (1/2”) inches.

2.04 CONCRETE

- A. The foundation shall conform to Division 03 Section 03300 "Site Concrete Work".

2.05 STEEL REINFORCEMENTS

- A. Plain -Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.
- B. Deformed -Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.
- C. Galvanized -Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from galvanized steel wire into flat sheets
- D. Epoxy -Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A coated, Type 1, deformed steel.
- E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

PART 3 EXECUTION

3.01 FOUNDATION WORK

- A. Prior to placing the concrete foundation, the excavation for the rockwalls shall be made to the proper section, and if considered necessary by the Owner or its designated representative, the bottom of excavation shall be hand-tamped and sprinkled.
 - 1. An additional minimum of twelve (12") inches below rockwall footings shall be excavated.
 - 2. Twelve (12") inches of Select Fill surrounding the concrete foundation is required. Select Fill shall be compacted to ninety-five (95%) percent as per ASTM D-1557
- B. The excavation area for rockwalls shall be moist when the concrete is placed.
- C. Reinforcing steel shall be placed continuously as shown on the plans and properly supported throughout the placement of concrete.
- D. Reinforcing steel shall consist of deformed rebar Grade 40 according to ASTM A615.
- E. The surface of the concrete shall not be troweled.
- F. The concrete shall be cured to a minimum of twenty-four (24) hours before any stone or mortar is placed on the foundation.
- G. The concrete shall be cured a minimum of forty-eight (48) hours before more than 300 pounds per square foot of stone and mortar is placed on the foundation. Contractor shall embed the first four (4") inches of the first layer into the fresh concrete of the footing.

- H. The concrete shall have a minimum compressive strength of 3,000 psi at twenty eight (28) days.
- I. The aggregate shall have a 3/8" maximum size.

3.02 STEEL REINFORCEMENTS

A. GENERAL

- 1. Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
- 2. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.03 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete flat work are not impaired.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints into areas as indicated) that complies with TxDOT standards. Construct contraction joints for a depth equal to one-fourth of concrete thickness and within eight (8) hours of placement as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

3.03 STONWORK

- A. Stone, as far as practicable, shall be selected as to size and shape in order to secure fairly large, flat-surfaced stone which may be erected with true and even surface faces and a minimum of exposed mortar.
- B. All stones shall be thoroughly cleaned, water soaked (24 hour minimum), hand placed and embedded in mortar so that no stones shall touch each other or the concrete foundation but shall be firmly bound together with mortar.
- C. The finished surface shall present a neat, clean and workmanlike and true to line of typical

sections as shown in the plans.

- D. The interior of the rockwall shall be completely filled with spalls and pieces of the specified stone, completely embedded and surrounded by mortar with no voids.
- E. The spacing between stone shall be no more than one-and-a-half (1 1/2") inches.

3.04ERECTION

- A. The erection of the rockwall shall not be more than three (3') feet in height for every twenty four (24) hour period to allow time for the lower portions to become sufficiently set. All stones shall be thoroughly wet before being placed in fresh mortar.
- B. The weep holes shall not be more than ten (10') feet apart on center. The weep holes shall consist of four (4") inch vitrified PVC or other pipe as approved by the Owner or its designated representative neatly cut to the exposed surface of the rockwall.
- C. No less than one cubic yard of 3/4 inch of graded gravel shall be placed at the inlet of each weep hole as shown in the plans.

3.05REPOINTING

- A. Existing rockwall mortar repointing shall be in accordance with this section, plans and specifications.
- B. Tests: Tests shall be performed according to ASTM procedures.
 - 1. Testing Frequency:
 - a. At least one (1) Moisture-Density Relationship test (proctor) for each type of in-situ soil and/or imported material to be used, according to ASTM D1557. Additional tests shall be requested during the course of earthwork operations to ensure that the fill soil materials are maintained uniform and constant with respect the specified plasticity limits, gradation and soil classification requirements indicated.
 - b. Sampling and testing for quality assurance of placed grout materials (3/8" maximum aggregate with a minimum compressive strength of 1,800 psi) should be performed for the project. Grout field testing shall include testing for temperature and slump (8 to 10 inches maximum). The design strength of the grout mix shall be evaluated by collecting prisms specimens molded with approved grout boxes for lab curing and testing in accordance with applicable ASTM procedures. Grout with additives should be batched and placed in not more than two (2) cubic yard volumes. The grout specimens should be tested at seven (7) days (1 prism) and twenty-eight (28) days (3 prisms) for verification of the specified design strength or as directed by the project plans and specifications.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this contract.

END OF SECTION

SECTION 07900

JOINT SEALANT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. This section covers the furnishing of material and installation including equipment, appliances necessary to properly complete, all caulking and sealing for interior and exterior joints where indicated or specified herein.

1.02 DESCRIPTION OF WORK

- A. Sealants: The extent of each form and type of joint sealant is indicated on drawings and by provisions of this section.

1.03 REFERENCES

- A. The latest editions of the following specifications and references govern the work in this section and constitute minimum requirements. Where specific requirements of this section are more stringent, they shall supersede the corresponding requirements of these Reference Specifications.

FEDERAL SPECIFICATIONS

- | | |
|---------------|--|
| 1. TTS-001657 | Sealing Compound, Single-Component, Butyl Rubber |
| 2. (COM-NBS) | Based, Solvent Release Type (for Buildings and Other Types of Construction). |
| 3. UU-P-270F | Paper Wrapping, Waxed (dry) & Am-1. |
| 4. PPP-T-42C | Tape, Packaging/Masking, Paper. |

AMERICAN SOCIETY FOR TESTING AND MATERIALS SPECIFICATIONS (ASTM)

- | | |
|---------------|----------------------------|
| 1. ASTM C 834 | Latex Sealing Compounds |
| 2. ASTM C 920 | Elastomeric Joint Sealants |

NATIONAL SCIENCE FOUNDATION (NSF)

- 1. Standard 61

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's product data sheets in accordance with Section 01300
- B. Certification: Submit manufacturer's certification, or certified laboratory test reports, confirming that materials meet Specification requirements and are suitable for intended use.
- C. Manufacturer's Instructions: Submit manufacturer's printed installation instructions and recommended joint size data in accordance with Section 01300.
- D. Samples: Submit manufacturer's Color Chart of standard colors.

1.05 QUALITY ASSURANCE

- A. Applicators: Qualified applicators thoroughly skilled and specially trained in application techniques of sealant products.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in unopened container as packaged by manufacturer.
- B. Store materials in manner to protect from damage or contamination by weather or construction operations.

1.07 WARRANTIES

- A. Submit an executed copy of Sealant Manufacturer's Standard Warranty Agreement signed by an authorized representative of the Sealant System Manufacture for the periods of time listed in 1.6.B.1 and 1.6.2.2 of this section.
- B. Submit an executed copy of Contractor's Warranty Agreement, in the form of the sample warranty at the end of this Section, against leakage and defects in materials and workmanship of sealants installed in and on the reservoir for the time periods listed in 1.6.2.1 and 1.6.B.2 of this Section, signed by authorized representatives of the General Contractor and the Sealants Subcontractor.
 - 1. Two (2) year warranty after date of Substantial Completion against cohesion failure.
 - 2. Five (5) year warranty after date of Substantial Completion against adhesive failure.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General Performance: Except as otherwise indicated, joint sealants are required to establish and maintain waterproof continuous seals on a permanent basis, within the time period covered in Section 1.6: WARRANTIES. Failure of installed sealants to comply with this requirement will be recognized as failures of materials and workmanship.

1. Joint Primer/Sealer:

Provide type of joint primer/sealer recommended by sealant manufacturer.

- B. Provide colors as selected by Engineer from manufacturer's standard colors. Select materials for compatibility with joint surfaces and other indicated exposures, and except as otherwise indicated select modulus of elasticity and hardness or grade recommended by manufacturer for each application indicated.

C. Elastomeric Sealants

1. Two- Component Polyurethane Sealant: Polyurethane-based, two-part elastomeric sealant, complying with ASTM C 920, Class A, Type I (non-sag).
2. Exterior Silicone Rubber Sealant: Silicone rubber-based, one-part elastomeric sealant, complying with ASTM C 920, Class A; recommended by manufacturer for exterior joints. Silicone Rubber Sealant: Silicone rubber-based, one-part elastomeric sealant, complying with ASTM C 920, Class A; recommended by manufacturer for exterior joints.
3. Provide non-acid, porous-bond type silicone rubber sealant where one or both joint faces are masonry, stone, concrete or other porous materials.
4. Two Part Rubber Sealant: Two part, non-sag polysulfide based, synthetic rubber sealant: Comply with ASTM C 920, Type II, Class B. Must comply with F.D.A. regulations for use in potable water reservoirs.

D. Miscellaneous Materials

1. Joint Primer/Sealer: Provide type of joint primer/sealer recommended by sealant manufacturer for joint surfaces to be primed or sealed.
2. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer to be applied to sealant-contact surface where bond to substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape where applicable.
3. Sealant Backer Rod: Compressive rod stock of polyethylene foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable nonabsorptive material as recommended by sealant manufacturer for compatibility with sealant.
4. Fiber Joint Filler: Provide resilient and non-extruding type premolded fiberboard units.

E. Application

1. The applications for joint sealants as work under this Section include the following:

- | | | |
|----|-----------------|--|
| a. | Wall Joints | Exterior: Exterior Silicone Rubber
Interior - Two-Part Rubber Sealant |
| b. | Slab Joints | Exterior Silicone Rubber |
| c. | Crack Repair | Exterior – Silicone Rubber
Interior – Two-Part Rubber Sealant |
| d. | Sidewalk Joints | Self-leveling, two-part, pourable polyurethane sealant meeting the requirements of ASTM C 920, Type M, Grade 25, Class P |

PART 3 EXECUTION

3.01 APPLICATION

- A. Comply with manufacturer's printed instructions except where more stringent requirements are shown or specified, and except where manufacturer's technical representative directs otherwise.

3.02 JOINT PREPARATION

- A. Clean joint surfaces; immediately before installation of sealant or caulking compound. Remove dirt, insecure coatings, moisture and other substances, which could interfere with bond of sealant or caulking compound. Etch concrete joint surfaces as recommend by sealant manufacturer. Include other joint preparation requirements as indicated on Contract Drawings.
- B. Prime or seal joint surfaces: where indicated and where recommended by sealant manufacturer. Do not allow primer/sealer to spill or migrate onto adjoining surfaces.

3.03 INSTALLATION

- A. Set joint filler units at proper depth or position in joint to coordinate with other work, including installation of bond breakers, backer rods and sealants. Do not leave voids or gaps between ends of joint filler units.
- B. Install sealant backer rod for liquid elastomeric sealants, except where shown to be omitted or recommended to be omitted by sealant manufacturer for application indicated.
- C. Install bond breaker tapes where indicated and where required by manufacturer's recommendations to ensure that elastomeric sealants will perform properly.

- D. Employ only proven installation techniques, which will ensure that sealants are deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces equally on opposite concave surface, slightly below adjoining surfaces.
- E. Where horizontal joints are between a horizontal surface and vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.
- F. For sidewalks, and similar joints sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to a depth equal to 75% of joint width, but neither more than 5/8" deep nor less than 3/8" deep.
- G. For normal moving joints sealed with elastomeric sealants but not subject to traffic, fill joints to a depth equal to 50% of joint width, but neither more than 1/2" deep nor less than 1/4" deep.
- H. For joints sealed with semi-elastomeric sealants and caulking compounds, fill joints to a depth in range of 75% to 125% of joint width.
- I. Spillage: Do not allow gaskets or compounds to overflow or spill onto adjoining surfaces, or to migrate into voids of adjoining surfaces. Clean adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage.
- J. Recess exposed edges of gasket and exposed joint filler slightly behind adjoining surfaces, unless otherwise shown, so that compressed units will not protrude from joints.
- K. Bond ends of gaskets together with adhesive or "weld" by other means as recommended by manufacturer to ensure continuous watertight and airtight performance. Miter-cut and bond ends at corners unless molded corner units are provided.

3.04 CURE AND PROTECTION

- A. Cure sealants and caulking compounds in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability. Sealant Installer shall advise Contractor of procedures required for cure and protection of joint sealants during construction period, so that they will be without deterioration or damage (other than normal wear and weathering) at time of substantial completion.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this contract.

END OF SECTION

SECTION 10400

SIGNAGE

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, tools, superintendence, and incidentals required to install signage as shown, as schedule and specific herein.
- B. Types to be furnished are as follows:
 - 1. Room Identification Signs
 - 2. Restrictive/Caution Signs and Hazard Identification Signs
 - 3. Interior Information Signs

1.02 RELATED WORK

- A. N/A

1.03 SUBMITTALS

- A. Submit to the Engineer for review the Manufacturer's complete color range and type styles.
- B. Submit to the Engineer as provided in Section 01300 shop drawings and product data showing details of construction, electrical work, where required, and erection details
- C. Submit two each of the following samples for review. Resubmit as required until approved:
 - 1. NFPA 49 – Hazardous Chemicals Data
 - 2. NFPA 325M – Properties of Flammable Liquid, Gases and Volatile Solids
 - 3. NFPA 704 – Identification of Fire Hazards of Materials
- D. Submit to the Engineer for review cleaning and maintenance instructions for all signage components.

1.04 REFERENCE STANDARDS

- A. National Fire Protection Association (NFPA)
 - 1. NFPA 49 – Hazardous Chemicals Data
 - 2. NFPA 325M – Properties of Flammable Liquid, Gases and Volatile Solids
 - 3. NFPA 704 – Identification of Fire Hazards of Materials

B. Occupational Safety and Health Act (OSHA)

1. Standards

PART 2 PRODUCTS

2.01 MATERIALS

- A. Signs shall be manufactures by ASI Sign Systems, Dallas, Texas (214-352-9140); equal by Architectural Graphics Inc., Norfolk, Virginia; or approved equal. Catalog numbers indicated are those of Architectural Signing Inc. (ASI), unless otherwise indicated. All lettering shall be Helvetica Medium, sized and in both upper and lower case, as specified and schedule.
- B. Restrictive/Caution Signs shall be ASI Group 1 SPF constructed of 0.080-inch vinyl laminated to a 0.080-inch acrylic backing. Letters or symbols shall be screen printing or ASP process both in subsurface locations. Restrictive/Caution Signs shall have 1-inch radius rounded corners. Size of sign: 10-inches by 14-inches. Color of acrylic and letters shall be in accordance with OSHA standards. All other aspects of the Restrictive/Caution Sign shall be in accordance with OSHA standards. If OSHA standards do not apply, the color of the acrylic shall be red with white letters 1-inch high. Signs shall be wall surface mounted generally by the SA method fastening of ASI or equal, continuous across sign with concealed fasteners. Other means of fastening may be used on fences and other unusual mounting locations such as tanks. Signs shall be suitable for interior or exterior use.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Signage shall be installed at the locations shown on the Drawings or as directed, in accordance with the Manufacturer's recommendations and shop drawings.
- B. Damaged items shall be removed and replaced at no cost to the owner.
- C. Signage shall be cleaned to the satisfaction of the Engineer using the approved methods, and upon completion of the installation and again, just prior to acceptance of the project.
- D. Restrictive Signs:

Quantity	Sign Copy	Location
1	DANGER NO TRESPASSING Violators will be prosecuted	To be located by Owner
1	WARNING Call 915-XXX-XXXX when alarm lights turn on	To be located by Owner
1	PROPERTY OF LOWER VALLEY WATER DISTRICT	To be located by Owner

PART 4 MEASUREMENT AND PAYMENT

- 4.01 No separate measurement and payment shall be made for this work item, but it shall be included in the Lump Sum price bid for the Lift Station as noted in the Proposal.

END OF SECTION

SECTION 11000

PUMP STATION EQUIPMENT, GENERAL

PART 1 GENERAL

1.01 GENERAL

- A. All pump manufacturers must ensure that the design operates per Hydraulic Institute (HI) Standards, if than what is provided in plans. Each pump manufacturer is responsible for the design of the suction intakes per HI. The basin geometry and suction intakes must be approved by the Pump Manufacturers Applications Engineer Manager and Stamped by a licensed professional engineer that is qualified to seal the design in accordance with all state and federal requirements.

1.02 SCOPE OF WORK

- A. The specifications shall govern all work necessary to furnish, install and place into operation the electrical submersible pump(s) required to complete this project. This section includes electric submersible pump(s) to be supplied with motor, pumping unit, pump discharge tube, power cable and accessories. All pumps shall be sand blasted and coated using a Plasite 7172 or approved equal product.

1.03 QUALITY ASSURANCE

- A. The pump(s) shall be heavy duty; electric submersible, centrifugal non-clog units designed for handling raw, unscreened stormwater and shall be fully guaranteed for this use. The pumps provided shall be capable of operating in an ambient liquid temperature of 104 DEGREES F. Since the high temperature of 104 DEGREES F is specified by the National Electrical Manufacturers Association (NEMA) and Factory Mutual (FM), motors with a maximum ambient temperature rating below 104 DEGREES F shall not be acceptable.
- B. The pump, mechanical seals and motor units provided under this specification shall be from the same manufacturer in order to achieve standardization of operation, maintenance, spare parts, manufacturer's service and warranty.

1.04 SUBMITTALS

- A. Submit to the Engineer, in accordance with Section 01300, shop drawings and product data showing materials of construction and details of installation for proper operation of the pumps.
 - 1. Pump Performance Curves.

2. Pump Outline Drawing.
3. Station Drawing for Accessories.
4. Electrical Motor Data.
5. Control Drawing and Data.
6. Access Frame Drawing.
7. Typical Installation Guides.
8. Technical Manuals.
9. Parts List.
10. Printed Warranty.
11. Manufacturer's Equipment Storage Recommendations.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 TESTING

- A. Testing performed on each pump shall include the following inspections:
 1. Impeller, motor rating and electrical connections shall be checked for compliance with this specification.
 2. Prior to submergence, each pump shall be run dry to establish correct rotation.
 3. Each pump shall be run submerged in water.
 4. Motor and cable insulation shall be tested for moisture content or insulation defects.
 5. Each and both pumps shall be tested with EP Electric and by Generator power supply.
 6. Primary duty points, secondary duty points, and best efficiency points.

- B. A written quality assurance record confirming the above testing/inspections shall be supplied with each pump at the time of shipment.
- C. Each pump shall be witness tested in accordance with the latest test code of the Hydraulic Institute (H.I.) at the manufacturer's testing facility to determine head vs. capacity and kilowatt draw required.
- D. The Contractor shall include in his price a sum sufficient to reimburse the Engineer for all reasonable expenses which the Engineer will incur in order to witness the test. Expenses include airfare from El Paso, Texas, automobile expenses, lodging, meals, parking, tolls, taxi or car rental costs and the Engineer's time, including travel time, will be billed at \$1,200.00 per day. The Engineer's time shall include the round trip travel time to and from the factory shop. The sum shall include repetitive visits, if required, and shall be deducted from payments due the Contractor by the Owner.
- E. The pump(s) shall be rejected if the above requirements are not satisfied.
- F. Water for field testing shall be the responsibility of the Contractor.

3.02 START-UP SERVICE

- A. The equipment manufacturer shall furnish the services of a qualified factory trained field service engineer for 8-hour working day(s) at the site to inspect the installation and instruct the owner's personnel on the operation and maintenance of the pumping units. After the pumps have been completely installed and wired, the contractor shall have the manufacturer do the following:
 - 1. Megger stator and power cables.
 - 2. Check seal lubrication.
 - 3. Check for proper rotation.
 - 4. Check power supply voltage.
 - 5. Measure motor operating load and no load current.
 - 6. Check level control operation and sequence.
- B. During this initial inspection, the manufacturer's service representative shall review recommended operation and maintenance procedures with the owner's personnel.

3.03 FACTORY SERVICE

- A. Factory-Approved service facilities with qualified factory-trained mechanics shall be

available for prompt emergency and routine service.

3.04 GUARANTEE

- A. See individual market sector Warranty policies as presented under General Information in this catalog.
- B. The warranty shall be in printed form and previously published as the manufacturer's standard warranty for all similar units manufactured.

3.05 EXPERIENCE

- A. The pump manufacturer shall have a minimum of 1,000 heavy-duty submersible storm water pumps installed and operating for no less than 5 years in the United States.

3.06 MANUFACTURERS

- A. The main storm water and sump pumps shall be from the same manufacturer.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this contract.

END OF SECTION

SECTION 11300

SUBMERSIBLE PUMP

PART 1 GENERAL

2.01 RELATED WORK

- A. Section 01300 – Submittals
- B. Section 11000 – Pump Station Equipment, General

PART 2 PRODUCTS

2.01 REQUIREMENTS

- A. Furnish and install 2 submersible non-clog wastewater pumps. The pump shall be equipped with a max 10 HP submersible electric motor, connected for operation on 460 volts, 3 phase, 60 hertz, with 50 feet of submersible cable (SUBCAB) suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and also meet with P-MSHA Approval.

2.02 PUMP DESIGN CONFIGURATION

- A. The pump shall be supplied with a mating cast iron 4-inch discharge connection and be capable of delivering 390 GPM at 45.5 FT. TDH. The pump(s) shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet-well. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. No portion of the pump shall bear directly on the sump floor. Each pump shall be fitted with 20 feet of stainless-steel lifting chain or stainless-steel cable. The working load of the lifting system shall be 50% greater than the pump unit weight.

2.03 PUMP CONSTRUCTION

- A. Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be of stainless-steel construction. All metal surfaces into contact with the pump, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer or 2-part epoxy with a polyester resin paint finish on the exterior of the pump.
- B. Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.
- C. Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-

rings, grease or other devices shall be used.

2.04 COOLING SYSTEM

- A. Each unit shall be provided with an integral motor cooling system, if required, to keep the motor cool in ambient temperature of up to 104°F. A motor cooling jacket shall encircle the stator housing, providing for dissipation of motor heat regardless of the type of pump installation. An impeller, integral to the cooling system and driven by the pump shaft, shall provide the necessary circulation of the cooling liquid through the jacket. The cooling liquid shall pass about the stator housing in the closed loop system in turbulent flow providing for superior heat transfer. The cooling system shall have one fill port and one drain port integral to the cooling jacket. The cooling system shall provide for continuous pump operation in liquid or ambient temperatures of up to 104°F (40°C.). Operational restrictions at temperatures below 104°F are not acceptable. Fans, blowers or auxiliary cooling systems that are mounted external to the pump motor are not acceptable.

2.05 CABLE ENTRY SEAL

- A. The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of dual cylindrical elastomer grommets, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter. The grommets shall be compressed by the cable entry unit, thus providing a strain relief function. The assembly shall provide ease of changing the cable when necessary, using the same entry seal. The cable entry junction chamber and motor shall be sealed from each other, which shall isolate the stator housing from foreign material gaining access through the pump top. The use of Epoxy as a primary seal to ensure that leaking of fluid into the motor housing is eliminated is acceptable.

2.06 MOTOR

- A. The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of pins, bolts, screws or other fastening devices used to locate or hold the stator and that penetrate the stator housing are not acceptable. The motor shall be designed for continuous duty while handling pumped media of up to 104°F. The motor shall be capable of withstanding at least 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of aluminum. Three thermal switches shall be embedded in the stator end coils, one per phase winding, to monitor the stator temperature. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the motor control panel.
- B. If required, the junction chamber is required, the junction chamber shall be sealed off from the stator housing and shall contain a terminal board for connection of power and pilot sensor cables using threaded compression type terminals. The use of wire nuts or crimp-type connectors is not acceptable. The motor and the pump shall be produced by the same manufacturer. Otherwise, the cable entry shall be sealed to ensure that no entry of moisture

is possible into the voltage motor/terminal area even if the cable is damaged or severed below water level.

- C. The motor service factor (combined effect of voltage, frequency and specific gravity) shall be 1.15. The motor shall have a voltage tolerance of +/- 10%. The motor shall be designed for continuous operation in up to a 40°C ambient and shall have a NEMA Class B maximum operating temperature rise of 80° C. A motor performance chart shall be provided upon request exhibiting curves for motor torque, current, power factor, input/output kW and efficiency. The chart shall also include data on motor starting and no-load characteristics.
- D. Motor horsepower shall be sufficient so that the pump is non-overloading throughout its entire performance curve, from shut-off to run-out. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

2.07 BEARINGS

- A. The integral pump/motor shaft shall rotate on two bearings. The motor bearings shall be sealed and permanently grease lubricated with high temperature grease. The upper and lower bearings shall be capable of handling radial and thrust loads of the pump. The minimum L10 bearing life shall be 50,000 hours at any usable portion of the pump curve.

2.08 MECHANICAL SEALS

- A. Each pump shall be provided with a positively driven dual, tandem mechanical shaft seal system consisting of two seal sets, each having an independent spring. The lower primary seal, located between the pump and seal chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten/silicon-carbide ring. The upper secondary seal, located between the seal chamber and the seal inspection chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten/silicon-carbide seal ring. All seal rings shall be individual solid sintered rings. Each seal interface shall be held in place by its own spring system. The seals shall not depend upon direction of rotation for sealing. Mounting of the lower seal on the impeller hub is not acceptable. Shaft seals without positively driven rotating members or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces are not acceptable. The seal springs shall be isolated from the pumped media to prevent materials from packing around them, limiting their performance.
- B. Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and shall provide capacity for lubricant expansion. The seal lubricant chamber shall have one drain and one inspection plug that are accessible from the exterior of the motor unit. The seal system shall not rely upon the pumped media for lubrication.
- C. If required, a separate seal leakage chamber shall be provided so that any leakage that may occur past the upper, secondary mechanical seal will be captured prior to entry into the motor stator housing. Such seal leakage shall not contaminate the motor lower bearing. The leakage chamber shall be equipped with a float type switch or resistive type switch that will signal if the chamber should reach 50% capacity.

2.09 PUMP SHAFT

- A. The pump and motor shaft shall be a single piece unit. The pump shaft is an extension of the motor shaft. Shafts using mechanical couplings shall not be acceptable. The shaft shall be stainless steel – ASTM A479 S43100-T or 302 stainless-steel. Shaft sleeves will not be acceptable.

2.10 IMPELLER

- A. The impeller shall be of gray cast iron, ASTM A-48 Class 35B, dynamically balanced, semi-open, multi-vane, back swept, screw-shaped or closed radial design, non-clog design. The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction. If the screw-shaped is used, the screw-shaped leading edges of the impeller shall be hardened to Rc 45 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw. The Impeller shall be locked to the shaft and held by an impeller bolt.

2.11 VOLUTE/SUCTION COVER

- A. The pump volute shall be a single piece gray cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. If the semi-open impeller design is used the volute shall have integral spiral-shaped, sharp-edged groove(s) that is cast into the suction cover. The spiral groove(s) shall provide the sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The internal volute bottom shall provide effective sealing between the multi-vane semi-open impeller and the volute if the enclosed type of impeller is used, the volute shall have a stainless-steel casing wear ring.

2.12 MIX FLUSH VALVE

- A. Provide sump mixing feature equal to the Flygt Mix Flush Valve or approved equal. The valve shall automatically bypass a portion of the pumped flow and agitate the solids and greases in the sump. After 30 to 40 seconds the valve shall automatically close and allow the suspended solids to be pumped out of the basin. No electricity or outside sources shall be used to activate the valve.

2.13 PROTECTION

- A. Each pump motor stator shall incorporate three thermal switches, one per stator phase winding and be connected in series, to monitor the temperature of the motor. Should the thermal switches open, the motor shall stop and activate an alarm. A float switch or resistive type switch shall be installed in the seal leakage chamber and will activate if leakage into the chamber reaches 50% chamber capacity, signaling the need to schedule an inspection.
- B. The thermal switches, float switch and/or resistive type switch shall be connected to a control module monitoring unit. The module unit shall be designed to be mounted in the pump control panel.

PART 3 EXECUTION (NOT USED)

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this item, but it shall be included in the total bid under this contract.

END OF SECTION

SECTION 11310
PACKAGED UTILITY WASTEWATER PUMPING STATION

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The work in this section shall include furnishing and placing into operation 2 submersible pumps with integrated pump control system and appurtenances as specified herein.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM) International:
 - 1. A 48: Standard Specification for Gray Iron Castings.
 - 2. A743: Standard Specification Iron-Chromium Nickel, Corrosion Resistant
- B. American National Standards Institute (ANSI):
 - 1. B16.1: Standard for Cast Iron Pipe Flanges and Flanged Fittings, 125 lb.
- C. Hydraulic Institute: Current Standards.
 - 1. HI 14.6: Hydrodynamic Pumps for Hydraulic Performance Acceptance Tests.
 - 2. HI 11.6: Submersible Pump Tests

1.3 SUBMITTALS

- A. Submittals shall include but not be limited to the following:
 - 1. Dimensional and installation drawings
 - 2. Pump performance curve
 - 3. Submersible motor data
 - 4. Bill of Material (BOM)
 - 5. Installation and Operation manual

1.4 QUALIFICATION REQUIREMENTS

- A. The manufacturer shall provide data on alternate equipment manufacturer's experience. Only Manufacturers with 20 or more years of experience who have furnished at least 5 similar lift stations and having factory certified representative and repair facility within 500 miles of project site shall be considered.
- B. All manufacturers must provide pump, control, and design information showing how they meet the performance requirements 10-days prior to bid to be considered for equivalency.

Equivalency will only be evaluated prior to bid and at the engineers and owner's discretion.

- C. After installation, a pump station start-up shall be performed by the installing contractor under the supervision of the manufacturer's authorized representative. Minimum of 8 hours of field service shall be provided by an authorized, factory trained representative of the pump manufacturer. Services shall include, but not be limited to, inspection of the completed pump station installation to ensure that it has been performed in accordance with the manufacturer's instructions and recommendations, supervision of all field-testing and activation of the Pump Manufacturer's Warranty. The test shall demonstrate to the satisfaction of the Owner that the equipment meets all specified performance criteria, is properly installed and anchored, and operates smoothly without exceeding the full load amperage rating of the motor. The Contractor shall be responsible for coordinating the required field services with the Pump Manufacturer or manufacturer's certified representative.
- D. The factory start up form shall be submitted for approval prior to start up and approved by the Engineer/Owner. The Engineer/Owner, at their discretion, may add items to be completed at start up that they feel proves compliance with all project requirements and will notify the Contractor of these items prior to start up. The factory start up form must be signed after completion and retained for records

1.5 DELIVERY, STORAGE AND HANDLING

- A. All equipment shall be factory assembled, crated and delivered, to protect against damage during shipment.
- B. All exposed flanges shall be covered and sealed with shrink-wrap to prevent the entrance of moisture. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.
- C. All equipment delivered to the site shall be stored as specified in accordance with the manufacturer's instructions.

1.6 OPERATIONAL REQUIREMENTS AND WARRANTY

- A. The pump station shall be equipped with 2 submersible sewage pump(s) with integrated pump control system. Each pump shall be rated to lift up to 255 US gpm of municipal sewage containing fibrous and abrasive solids and rated for a total dynamic head of up to 45 feet.
- B. CLOG FREE GUARANTEE

The manufacturer shall guarantee clog-free operation for a period of 24 months from the date of start-up of the pumps by the local authorized factory representative. A certificate shall be provided to the Owner on the day of start up with the local contact information and effective date. Should the impeller clog with typical solids and/or modern trash debris normally found in domestic wastewater during this period, an authorized representative shall travel to the jobsite, remove the pump, clear the obstruction and reinstall the pump at no cost or shall reimburse the Owner for reasonable cost to provide this service. A written report shall be provided to the Owner detailing the service call with pictures for verification purposes.

- C. The pumping system, consisting of submersible wastewater pumps and intelligent control panel, shall be provided with a 7-year warranty against defects in materials and or workmanship. The warranty shall be in printed form, included with the product submittal, and previously published as the manufacturer’s standard warranty for all similar units manufactured. Upon warranty occurrence, the manufacturer's authorized service center shall repair the pump. A detailed failure analysis shall be submitted to the Owner for their records summarizing corrective action taken.

PART 2 – PRODUCTS

2.1 Submersible sewage pump with integrated control system (FLYGT Concertor)

Submersible pumps shall be installed in the sump automatically and firmly, connected to the permanently mounted discharge connection, guided by no less than two guide pipes which extend from the top of the station to the discharge connection. Sealing of the pump unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. Sealing of the pump discharge interface with an O-ring, diaphragm or profile gasket is not acceptable.

Base bid submersible pumping units shall be as manufactured by Flygt.

A. GENERAL

The pumps shall be capable of handling raw domestic wastewater, scum, or activated sludge and shall meet the following performance requirements.

Design Duty Point	255 GPM	45 TDH

* In case the pump manufacturer cannot meet this performance with a pump model, the control panel shall be equipped with Adjustable Speed Drives (ASD) with bypass starters and a PLC programmed to meet the above specified performance field, housed in an

enclosure equipped with fans, louvers sized to ensure proper ASD operation. Five (5) spare louver filters and one (1) spare fan shall be provided per panel.

The pump shall be equipped with a 10 HP submersible synchronous electric motor, capable to operate on a 230-volt, 3 phase, 60 hertz power supply. It shall be submersible a minimum of 65 feet (20m) according IEC 60034 and protection class IP 68.

The discharge flange of the pump shall be 6" and drilled according ANSI pattern.

B. IMPELLER

Due to the likely presence of sand and grit in typical wastewater, the impeller shall be of ASTM A-532 Alloy III A 25% chrome cast iron, semi-open, multi-vane, back swept, screw-shaped, non-clog design.

The leading edges of the impeller shall be hardened to Rc 60 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater.

The impeller blades shall be self-cleaning upon each rotation as they pass across a sharp relief groove in the Insert ring and shall keep the impeller blades clear of debris. It shall move axially upwards to allow larger debris to pass through and immediately return to normal operating position. The clearance between the insert ring and the impeller leading edges shall be adjustable.

C. The impeller shall be mounted on the motor shaft. Couplings shall not be accepted. The pump shaft shall be stainless steel – ASTM A479 S43100-T. Shaft material of lower quality than stainless steel will not be considered equal to stainless steel shafts.

D. MOTOR

The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out. The motor shall be able to operate non-submerged without damage while pumping under load.

The pump shall be driven by a synchronous motor and an integrated control system and shall be capable of running at constant power at any point of the performance field without being overloaded. The motor shall utilize a permanent magnet rotor to maintain synchronous speed and sustain level IE4 super premium efficiency standards.

E. The motor shall withstand at least 60 starts per hour.

F. An integrated pump motor control system located in the sealed pump/motor housing shall start the pump by gradually increasing the pump motor speed. The starting current shall not be higher than the rated current.

- G. An integrated pump control system installed in the pump/motor housing shall ensure that the direction of the impeller rotation is always correct. There shall be no need for any human intervention to ensure that the impeller is rotating in the correct direction within the volute. The integrated control system shall be inside the motor and encapsulated to protect it against moisture ingress, and vibration.
- If selected pump manufacturer cannot meet the design as specified in sections 2.01 D. E. F. G., then the manufacturer shall provide Adjustable Speed Drives (ASD) in the control system along with a PLC programmed to include the features described above.
- H. The motor and the pump control system shall receive sufficient cooling from the pumped liquid to operate the pump at continuous duty in a liquid with a temperature with 104°F. Operational restrictions on the liquid temperature below 104°F or the demand of auxiliary cooling systems like fans or blowers are not acceptable. Stator shall be insulated with class H trickle impregnated insulation rated at 356°F.
- I. Motor, pump and control system shall be designed and supplied by the pump manufacturer.
- J. The control system shall continuously monitor a leakage sensor located in the stator housing and the temperature of the motor. The operator shall be able to modify the setting of the control system to decide if the active leakage signal shall alarm or stop the pump. The pump shall operate at constant horsepower, making it impossible to overload the motor. If the motor temperature is too high, the pump shall continue to operate at reduced power level until conditions are normalized. External trips or overload devices for motor protection shall not be required.
- K. The pump shall incorporate a “pump-cleaning” function to remove debris from the impeller. The cleaning function shall be initiated when the integral control system senses an increase in current draw due to debris in the pump. The cleaning function shall consist of alternating stopping, reversal and forward operation, timed to allow for debris to be cleared from the impeller. After the cleaning cycle is complete, the pump shall resume to automatic operation. If the pump impeller/volute does not clear itself after the programmed number of attempts, the control shall initiate and alarm to notify that the pump inlet / volute is blocked by large debris.
- L. Starting method: Speed ramp up at reduced current. All devices to soft start the pump via reduced voltage shall be incorporated within the pump/motor housing. These same devices shall also provide for a “soft stop” of the pumping element.

- M. It shall be possible to access and adjust the pump system with a Human Machine Interface (HMI) ranging from basic monochrome displays to full-color touch screen units and smartphone or tablet. It shall enable the operator to view and control entire pump system and logged operational data like number of starts, avoided clogging instances, pump run-time, motor power, motor current, power factor, temperature, pump leakage etc.
- If the selected pump manufacturer cannot meet the design as specified in sections 2.01 K. L. M. within the pump housing, these functions shall be incorporated to the PLC control system with Adjustable Speed Drives (ASD).
- N. The shaft shall rotate on two bearings. The motor bearings shall be sealed and permanently grease lubricated with high temperature grease. The upper motor bearing shall be a single row ball bearing to handle radial loads. The lower bearing shall be a double row angular contact ball bearing to handle the thrust and radial forces. Single row lower bearings are not acceptable. The minimum L10 bearing life shall be 50,000 hours at any usable portion of the pump performance field.
- O. The Materials of construction shall be as follows:
1. Pump housing: ASTM A-48, Class 35B
 2. Impeller and insert ring: A 532 ALLOY III A (Hardness 60 HRC)
 3. Stator housing: ASTM A-48, Class 35B
 4. Shaft: ASTM A479 S43100-T.
 5. Shaft seal: Pump side: - Corrosion resistant Tungsten carbide WCCR
 6. Shaft seal Motor side: - Corrosion resistant Tungsten carbide WCCR
- P. All castings must be blasted before coating. All wet surfaces are to be coated with two-pack oxyrane ester Duasolid 50. The total layer thickness should be at least 120 microns. Zink dust primer shall not be used.
- Q. The motor shall be equipped with 50 feet (see plans to verify cable length) of shielded cable S3x6+3x6/3+S(4x0,5) suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. The motor unit with submersible cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of at least 65 feet.
- R. MOTORS IN CLASSIFIED ENVIRONMENTS

The pump system including the pump, motor, integrated control system and power cable shall be approved for use in areas classified as hazardous locations in accordance with the NEC Class I, Div. 1, Group C and D service as determined and approved by a U.S. nationally recognized testing laboratory (U.L., FM, CSA) at the time of the bidding of the project. As required by Factory Mutual (FM) the motor shall be capable of operating in pumped media up to 104 degrees F. Motor thermal switches shall monitor and protect the motor from excessive temperature. An internal Float Switch shall be installed in the motor chamber. Service of explosion-proof submersible units shall be performed by qualified FM qualified personnel. The pump manufacturer shall provide training schools to qualify personnel in the proper service and repair of explosion-proof pumps.

- S. Each completed and assembled pump/motor unit shall undergo the following factory tests at the manufacturer's plant prior to shipment:
1. Hydraulic performance test
 2. No-Leak seal integrity test
 3. Electrical integrity test

2.2 INSTALLATION & LIFTING EQUIPMENT FOR PUMPS

- A. Each pump shall be supplied with a mating cast iron discharge connection. The pumps shall be automatically and firmly connected to the discharge connection, guided by no less than two stainless steel guide bars extending from the top of the station to the discharge connection to ensure pump stability when installing or removing the machine. There shall be no need for personnel to enter the wet well to access the pump. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. Sealing off the discharge interface with a diaphragm, O-ring or profile gasket shall not be acceptable. No portion of the pump shall bear directly on the wet well floor.
- B. The guide rail system shall consist of two parallel 2" guide bars, supported by pump manufacturer supplied upper guide rail brackets. Guide bars and guide brackets shall be type 304 Stainless Steel.
- C. Each pump shall be fitted with stainless steel lifting chain. Lifting chain shall be connected to the lifting handle of the pump and be long enough to reach the top elevation of the station. Lifting chain shall be compatible with the Grip-Eye Pump Lift System. The working load of the lifting system shall be 50% greater than the pump unit weight.

- D. One pump lift system Grip-Eye shall be provided for each pump station. The Grip-Eye shall allow for utilizing the hoist for lifting each pump from its installed position to above the top elevation of the station. The Grip-Eye device shall be configured to slide down the stainless-steel lifting chain and grip the lifting chain near pump handle. The retrieval system shall be appropriately sized for the weight of the pump to be lifted.

END OF SECTION 11310

SECTION 11700

FIRST AID EQUIPMENT

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals necessary to install the first aid equipment as specified herein and as directed.

1.02 SUBMITTALS

- A. Submit to the Engineer for review in accordance with Section 1300 for shop drawings, copies of the list of equipment, catalog number, and other pertinent information for all equipment required hereunder.

1.03 PROTECTION OF MATERIALS

- A. All items specified herein shall be delivered, stored, and handled so as to preclude damage of any nature.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Furnish one First Aid Kit, Model 8162 by Johnson and Johnson, Abco Model 25, or approved equal. Provide with approved stainless steel wall fastening devices.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Equipment shall be uncrated, when directed, assembled as required, placed (or attached as required) where shown or otherwise directed and tested as directed where applicable.
- B. Equipment will be checked for nicks, scratches, imperfections, and malfunctions. At the discretion of the Engineer, unsatisfactory equipment will either be repaired to the satisfaction of the Engineer or replaced at no cost to the Owner.
- C. All equipment shall be cleaned to the satisfaction of the Engineer prior to acceptance.

PART 4 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment shall be made for this work item but shall be included in the Lump Sum price bid for the Lift Station as noted in the Proposal.

END OF SECTION

SECTION 13340

PRE-CAST CONCRETE STRUCTURE

PART 1 GENERAL

1.1 WORK INCLUDED

Contractor shall furnish a precast concrete transportable building to be delivered and placed on owner-prepared crushed stone foundation in accordance with manufacturer's recommendations. Precast building to be EASI-SET® brand Model 1012 as manufactured by a licensed producer of Easi-Set Buildings. Building shall be provided by manufacturer with all necessary openings as specified by contractor in conformance with manufacturer's structural requirements.

1.2 REFERENCES

- A. ACI-318-11: Building Code Requirements for Structural Concrete and Commentary
- B. ASCE/SEI 7-10: Minimum Design Loads for Buildings and Other Structures
- C. IBC 2012: International Building Code
- D. PCI Design Handbook, 7th Edition
- E. Concrete Reinforcing Institute, Manual of Standard Practice
- F. UL-752 (Test Method level 5) for bullet resistance certified by a military approved laboratory.

1.3 SYSTEM DESCRIPTION

DESIGN REQUIREMENTS

- A. Building Dimensions:

Exterior: 10' x 12' x 8'-8"

Interior: 9'-6" x 11'-6" x 8'-0"

Design case to be selected to correspond to the design criteria indicated in the aforementioned codes for the geographical location of the project or as specified.

CASE 1: Typical

- B. Design Loads:

- 1. Seismic Design Category 'C', Risk Design Category II
- 2. Roof Live Load (Snow) – 30 PSF

3. Floor Live Load – 150 PSF
4. Wind Loading* – 115 MPH

*Design loads relate to precast components only, not accessories (i.e. doors, windows, vents, etc.)

CASE 2: Heavy

C. Design Loads:

1. Seismic Design Category ‘D’, Risk Design Category III
2. Roof Live Load (Snow) – 60 PSF
3. Floor Live Load – 250 PSF
4. Wind Loading* – 165 MPH

*Design loads relate to precast components only, not accessories (i.e. doors, windows, vents, etc.)

- D. Roof: Roof panel shall slope ½” from front to back in 10-foot direction. The roof shall extend a minimum of 2 ½” beyond the wall panel on each side and have a turndown design which extends ½” below the top edge of the wall panels to prevent water migration into the building along top of wall panels. Roof shall also have an integral architectural ribbed edge.
- E. Roof, floor, and wall panels must each be produced as single component monolithic panels. No roof, floor, or vertical wall joints will be allowed, except at corners and along perimeter. Wall panels shall be set on top of floor panel.
- F. Floor panel must have ½” step-down around the entire perimeter to prevent water migration into the building along the bottom of wall panels.

1.4 SUBMITTALS

- A. Engineering calculations that are designed and sealed by a professional engineer, licensed to practice in the state where the project is located, shall be submitted for approval.
- B. Manufacturers’ product literature shall be provided for any plumbing, electrical, and miscellaneous installed fixtures demonstrating compliance with these specifications.

1.5 QUALITY ASSURANCE

- A. The precast concrete building producer shall be a plant-certified member of either the National Precast Concrete Association (NPCA), The Precast/Prestressed Concrete Institute (PCI), or equal.

- B. The precast concrete building producer shall demonstrate product knowledge and must have a minimum of 5 years experience manufacturing and setting precast concrete.
- C. The manufacturer must be a licensed producer of Easi-Set Buildings
- D. No alternate building designs to the pre-engineered EASI-SET® building will be allowed unless pre-approved by the owner 10 days prior to the bid date.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Concrete: Steel-reinforced, 5000 PSI minimum 28-day compressive strength, air-entrained (ASTM C260).
- B. Reinforcing Steel: ASTM A615, grade 60 unless otherwise specified. Welded Wire Fabric: ASTM 185 Grade 65
- C. Post-tensioning Strand: 41K Polystrand CP50, ½” 270 KSI Seven-Wire strand, enclosed within a greased plastic sheath (ASTM A416). Roof and floor each shall be post-tensioned by a proprietary, second generation design using a single, continuous tendon. Said tendon is placed in the concrete slab to form a perimeter loop starting from one corner of the slab to a point where the cable entered the slab. The tendon then turns 90 degrees and follows the cable member(s) in the periphery to a point midway along the “X” axis of the concrete building panel and then turns 90 degrees along the “Y” axis of the concrete building panel. This bisects the concrete building panel and crosses the opposite parallel portion of the cable member and exits from an adjacent side of the concrete building panel. This creates a cable pattern with no less than 2.5 parallel cables in any direction. To ensure a watertight design, no alternate methods shall be substituted for the post-tensioning.
- D. Sealant: All joints between panels shall be caulked on the exterior and interior surface of the joints. Caulking shall be DOW CORNING 790 silicone sealant or equal. Exterior caulk reveals to be 3/8”x 3/4” deep so that sides of the joint are parallel for proper caulk adhesion. Back of the joint to be taped with bond breaking tape to ensure adhesion of caulk to parallel sides of joint and not the back.
- E. Vents: Two screened aluminum vents to be cast in rear wall. Vents shall be SUNVENT INDUSTRIES Model FL-164 or equal.
- F. Panel Connections: All panels shall be securely fastened together with 3/8” thick steel brackets. Steel is to be of structural quality, hot-rolled carbon complying with ASTM A36 and hot dipped galvanized after fabrication. All fasteners to be ½” diameter bolts complying with ASTM A325 for carbon steel bolts. Cast-in anchors used for panel connections to be Dayton-Superior F-63 coil inserts, or equal. All inserts for corner connections must be secured directly to form before casting panels. No floating-in of connection inserts shall be allowed.

2.2 ACCESSORIES

- A. Doors and Frames: Shall comply with Steel Door Institute “Recommended Specifications for Standard Steel Doors and Frames” (SDI-100) and as herein specified. All door and frame galvanizing shall be in accordance with ASTM A924 and A653, A60 minimum coating thickness.
1. The buildings shall be equipped with a single door 4'-0" x 6'-8" x 1-3/4" thick insulated, 18-gauge, metal doors with 16-gauge frames (to meet wall thickness). Doors to have flush top cap. 12-gauge flat astragals shall be applied to the active leaf to protect against the elements or forced opening. Doors and frames shall be factory bonderized and painted with one coat of rust inhibitive primer and one finish coat of enamel paint; color to be BOLT BROWN unless specified otherwise.
 2. Doors and frames shall meet SDI standard Level 2, 1³/₄" heavy duty. Approved manufacturers: Republic, Steelcraft, Ceco, Black Mountain, Pioneer, Curries, Mesker, MPI, Door components or equal

Approved distributor: Integrated Entry Systems

B. Door Hardware:

1. Pull Handle: Shall meet requirements of ANSI A156.2. Shall be thru bolt attached and constructed of a minimum 3/4" diameter stainless pull handle sized 8" center to center with a stainless backer plate, minimum 0.053" on both sides.

Approved manufacturers: Design Hardware, Don-Jo, or equal

2. Hinges: Shall comply with ANSI A156.1 and be of the ball bearing, non-removable pin type (3 per door minimum). Hinges shall be 4 1/2" x 4 1/2" US26D (652) brushed chrome finish. Manufacturer shall provide a lifetime limited warranty.

Approved manufacturers: Design Hardware, or equal

3. Deadbolt: Commercial Grade Deadbolt conforming to ANSI 156.5 furnished with a 2 1/4" face plate and a 1" projecting deadbolt with hardened steel pins. Dead bolts shall be UL and ADA approved. Finish shall be US26D (626) brushed chrome finish. Manufacturer shall provide a lifetime limited warranty.

Approved manufacturers: Design Hardware, Dorma, or equal

4. Surface Bolt: 8" Surface bolt UL listed. Finish US26D (626) brushed chrome finish. (2 per inactive leaf)

Approved manufacturers: Don-Jo, Design Hardware, or equal

5. Threshold: Bumper Seal type threshold with a maximum 1” rise to prevent water intrusion. Thresholds shall be approved for UL 10B suitable for use with fire doors rated up to three hours.

Approved manufacturers: National Guard Products or equal

6. Overhead Door Holder: Heavy duty surface mounted hold open device with hold open/stop angle of 85 to 110 degrees. Construction shall be stainless steel. Finish US32D (630) satin stainless steel finish.

Approved manufacturers: ABH, Rockwood, or equal

7. Drip Cap: Aluminum drip cap with minimum projection of 2 ½” shall be furnished.

Approved Manufacturers: Design Hardware, National Guard Products, or equal

8. Door Stop: ANSI 156.16 approved wall mounted door stop with keeper constructed of a corrosion resistant cast brass material. Finish US26D (626) brushed chrome finish.

Approved manufacturers: Don-Jo, Rockwood, or equal

- C. The following items shall be supplied by the building manufacturer:
 1. 3 interior duplex GFI receptacles and 1 exterior duplex weather proof GFI receptacle shall be provided by manufacturer at the locations indicated on the contract drawings.
 2. Interior lighting, Emergency exit fixture, exterior door light with photocell and motion detector shall also be provided.
 3. Exhaust fan with Thermostat.
 4. 120/240VAC, 100A MCB, 24 Space Electrical Panelboard with breakers as indicated on the contract drawings.
 5. Fire Extinguisher
 6. Emergency Exit Fixture
 7. 2 – 120VAC, Interior LED 1’ x’ 4’ fixtures
 8. Door Light – Controlled by switch, motion detector and photocell
 9. 120V Smoke detector with dry contact relay for alarm function

All conduit installed in building shall be Rigid Galvanized Steel Conduit

Building contractor shall install all conduit and wire associated with each circuit or piece of equipment including homeruns back to the lighting panel

2.3 FINISHES

- A. Interior of Building: Smooth form finish on all interior panel surfaces unless exterior finish is produced using a form liner, then smooth hand-troweled finish.
- B. Exterior of Building: (Standard) Architectural precast concrete brick finish: Finish must be imprinted in top face of panel while in form using an open grid impression tool similar to EASI-BRICK®. Finished brick size shall be 2 3/8” x 7 5/8” with vertical steel float or

light broom finish. Joints between each brick must be 3/8" wide x 3/8" deep. Back of joint shall be concave to simulate a hand-tooled joint. Each brick face shall be coated with the following water-based acrylic, water repellent penetrating concrete stain: 1) Canyon Tone stain by United Coatings, 2) Sherwin Williams (H&C concrete stain) or equal. Stain shall be applied per manufacturer's recommendation. Joints shall be kept substantially free of stain to maintain a gray concrete color. The final finish shall be approved by the owner prior to installation.

PART 3 EXECUTION

3.1 SITE PREPARATION (MANUFACTURER'S RECOMMENDATION)

Work under this section relates to placement of the building by Easi-Set licensed producer on the customer's prepared foundation and site.

- A. EASI-SET® building shall bear fully on a crushed stone base that is at least two feet larger than the length and width of building.
- B. Stone shall be a minimum of 4" thick and down to firm subgrade. The vertical soil capacity under stone shall be compacted to have minimum bearing of 1,500 pounds per square foot. Stone shall be 3/8" or smaller and must be screened level within 1/4" in both directions. Stone shall be placed within a perimeter form with flat and level top edge for screening. Forming material shall remain around stone until after the building is set.
- C. The crushed stone base shall be kept within the confines of the soil or perimeter form. Do not allow the base to become unconfined so that it may wash, erode, or otherwise be undermined.

OR

If building is placed on pavement or a concrete slab, substrate below pavement or slab must have a vertical soil capacity of 1,500 pounds per square foot. Ensure bearing surface for building is flat and level. As required, place adequate material (stone or sand) to 1" above highest point of area where building will be placed and at least 1'-0" wide all around the building footprint. Retain stone or sand with a perimeter form to prevent the material from washing out.

- D. Provide positive drainage for the fill, pad or slab as required.

3.2 SITE ACCESS

- A. Contractor must provide a level, unobstructed area large enough for a crane and a tractor-trailer to park adjacent to the pad. Crane must be able to place outriggers within 5'-0" of edge of pad; truck and crane must be able to get side by side under their own power. No overhead lines may be within 75' radius of center of pad. Firm roadbed with turns that allow 65' lowbed tractor-trailer must be provided directly to site. No building shall be placed closer than 2'-0" to an existing structure unless specifically permitted.

PART 4 MEASUREMENT AND PAYMENT

4.1 MEASUREMENT AND PAYMENT

A. Measurement and payment for this work is covered under section 01025.

END OF SECTION

SECTION 15100
HYDROXYL RADICAL FOG CONTROL SYSTEM

PART 1 GENERAL

1.01 SUMMARY

- A. One (1) hydroxyl radical fog odor control system (base cabinet).
- B. Atomizing nozzle(s), fluid transfer hose assembly, clamping devices, supports, and related items.
- C. Instrumentation and electrical control system.
- D. Installation assistance/inspection and equipment startup.
- E. Training of OWNER'S Personnel.
- F. Warranty

1.02 SYSTEM DESCRIPTION

- A. The specified equipment is designed to destruct odorous compounds within the proposed structure regardless of flows, temperature, or level.
 - 1. Atomizing nozzle generates hydroxyl radical fog and sprays it into odorous spaces, filling the headspace above the wastewater and chemically reacting with:
 - a. Vapor phase hydrogen sulfide, amines, other reduced sulfur compounds
 - b. Fats, Oils and Grease collecting above the surface of the wastewater
 - c. Biofilm and/or bacterial growth
 - 2. Lift stations, enclosed screening chambers, covered holding or retention tanks and other are- as are a suitable enclosure for the fog, because they act as reaction chambers, and the re- acted mist condenses back into the water stream.
 - 3. There is no need to withdraw odorous air from the structure and pass it through a separate odor-control scrubbing process.
 - 4. Process utilizes the volume of the structure as the reaction vessel for the odorous com- pounds-hydroxyl radical fog reaction to take place. The process will allow for an equilibrium concentration of both oxidants and odorous compounds to exist in the form of a stirred mixed reactor.
 - 5. Process consumes no external chemicals in its operation, nor will there be any waste product to dispose of and, in particular, there will be no increase in total dissolved solids to the waste stream.
- B. The purpose of the hydroxyl fog is to destroy odorous compounds within the headspace, to re- move any biofilm or bacterial growth covering the structure

walls eliminating the typical corrosion effect associated with the low pH of the various biological processes, and to impart a residual oxidant to the structure space so as to be able to absorb any unexpected event within the influent piping.

1.03 PERFORMANCE REQUIREMENTS

- A. Design Requirements: Provide the hydroxyl radical fog odor control systems to comply with the requirements listed in Table 1.

Table 1	
Hydroxyl Radical Fog Odor Control System Requirements	
Item	Requirements
System Identification	NANO
Atomizing Nozzles per Unit	1 HV
Oxidant Output	20 g/hr (maximum)
Nozzle Water Consumption Supply Pressure Flow Rate	Potable 25-75 psi HV nozzle: 8 gal/hour per nozzle
Nozzle Air Output	30 cfm per nozzle (average) 40 cfm per nozzle (maximum)
Cooling Air Exhaust	150 scfm (maximum)
Coverage Area, cubic feet	10,000 (maximum)
Power Requirements	208-240 VAC, 30A, 60Hz, 1Ø 208-240VAC, 50A, 60Hz, 1 Ø with ENV Enclosure
Enclosure Type	Outdoor
Air Conditioner	12,000 BTU Mini-Split Air Conditioner

- B. Additional materials shall be provided with the system shall be listed in Table 2.

Table 2
Additional System Requirements

Component	Material
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Oxidant Tubing	
Material	Type 316 SS and Teflon
Minimum supplied length	100 ft/ nozzle
Water Tubing	
Material	Low-density polyethylene
Minimum supplied length	100 ft/ nozzle
Nozzle	
HV Nozzle	Gray PVC
Base Cabinet Material	Triglycidyl isocyanurate (TGIC) Polyester coated aluminum
ENV Enclosure	Triglycidyl isocyanurate (TGIC) Polyester coated aluminum
RXN Vent	
Material	PVC
Size	4"
Zipper Cable Sheath	
Material	PVC
Minimum supplied length	
Fasteners	Type 316 SS
PLC/HMI	One (1) PLC/HMI

1.04 SUBMITTALS

- A. Product Data: For Hydroxyl Radical Odor Control System
- B. Shop Drawings: For Hydroxyl Radical Odor Control System. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Wiring Diagrams: For power, signal, and control wiring.
- C. Information Submittals:
 - 1. Manufacturer's Certification of Compliance.
 - 2. Special shipping, storage and protection, and handling instructions.
 - 3. Manufacturer's instructions for installation
 - 4. Manufacturer's Certificate of Proper Installation.
 - 5. Qualification Data: For manufacturer and manufacturer's representative, if applicable & required.
 - 6. Spare parts list to maintain the equipment in service for a period of one year.

1.05 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. The manufacturer shall have been in business for a minimum of ten (10) years.
2. All equipment shall be the product of a manufacturer having at least ten (10) U.S. installations of the type being proposed, each with a minimum of five (5) years of satisfactory service.
3. Hydroxyl radical production verified by an independent, third party (e.g. university or consulting engineer).

B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle and store equipment components in accordance with shop drawings and manufacturer's written instructions.

1.07 PROJECT CONDITIONS

A. System Arrangement:

1. The equipment, sizes, materials, and arrangements described in this Specification section are typically based on recommendations by equipment manufacturers and shall be considered minimum limits of acceptability.
2. Modifications to structural design due to a manufacturer's varying space requirements, foundation requirements, floor slope requirements, or dimension changes to fit manufacturer specific requirements shall be coordinated by CONTRACTOR and included in the Bid.
3. The CONTRACTOR shall be responsible for any modifications to the piping, electrical, structural, mechanical layouts and ensure materials compatibility to accommodate the odor control system.

B. Environmental Conditions

1. All equipment including controls and drives specified herein shall be specifically designed for this service and the environment encountered in this installation.

2. When installed in wastewater treatment areas, the environment will be moist, and corrosive, exhibiting hydrogen sulfide and other corrosive gases encountered in municipal wastewater treatment plants.
3. Odor control unit is installed in a place recommended by the manufacturer.
4. Designed and capable of operation at ambient temperatures of 20°F to 100°F (0°F to 120°F if ENV Enclosure is used)
5. Furnish heat tracing and insulation as required, if required for exterior installation. Insulation alone shall not be sufficient to fulfill freeze protection provisions of this section.

1.09 WARRANTY

- A. Equipment Warranty: The equipment shall include a warranty period of 12 months from substantial completion of the Project.

PART 2 PRODUCTS

2.01 MANUFACTURER AND MODEL

- A. Hydroxyl Radical Fog Odor Control system shall be VAPEX™ NANO Hydroxyl Radical Fog Odor Control System or approved equal.

2.02 HYDROXYL RADICAL FOG ODOR CONTROL UNIT

- A. Hydroxyl radical fog generation system shall consist of two (2) primary subsystems; the base cabinet and the injection nozzles.
 1. Process module functions to deliver water, compressed air, and oxidant to the injection nozzle. Injection nozzle combines the three (3) raw components to form the atomized hydroxyl fog, whereas the fog is released from the nozzle drives the reaction within the lift station space.
 2. The process module functions shall have the following attributes and capacities:
 - a. The base cabinet is water resistant, sound resistant and conforms to NEMA 3R specifications.
 - b. The oxidant generator is capable of producing a maximum of 20 grams per hour of ozone and modulates the oxidant output within this specified range.
 - c. The base cabinet shall include a compressor and an oxygen concentration unit that removes up to 95% of the nitrogen and water vapor prior to use by the oxygen dis-charge unit.

- d. The base cabinet shall contain safety interlocks for low water flow, low nozzle air pressure, low oxygen concentration, low oxygen flow and high oxidant generator temperature. Any out-of-range condition will cause a shutdown of the affected system and will trigger an alarm.
- e. The base cabinet shall be constructed of Triglycidylisocyanurate (TGIC) polyester coated Aluminum with sound reduction and access panel gasketing. The cabinet shall be a rain-tight design, capable of operating with direct exposure to the elements.
- f. The base cabinet shall include individual flow meters for water, oxygen and oxidant flow to the nozzles.
- g. The equipment shall be manufactured to meet UL approved standards and will include CE or UL approval of electrical components (CE/UL listing certification optional – add 6 to 8 weeks to lead time).
- h. The equipment shall include an Ethernet connection to connect to SCADA.
- i. The equipment shall include a dry-contact relay for operation status.
- j. All components inside the base cabinet shall be modular in design and require only basic tools to remove or maintain.

B. The process module will have the following attributes and capacities:

- 1. Ozone is generated using concentrated oxygen and a plasma generator.
- 2. The plasma generator will be of a plasma type capable of the specified grams per hour ozone production. The plasma generator will be of a variable output design.
- 3. The process module includes a compressor and oxygen generation unit capable of removing up to 98% of the nitrogen and water vapor present in the cabinet prior to use by the plasma discharge units.
- 4. The air blower shall be of oil-less design capable of delivering the required air volume at the required pressures and shall have a minimum service life of 10,000 hours.
- 5. The process module shall contain safety interlocks for water flow, compressor low pressure, ozone generator over-temperature, and cooling fan operation. Any out-of-range condition will cause a shutdown of the affected are and will also cause and alarm contact set to be made.
- 6. The process module cabinet shall be constructed of TGIC polyester coated aluminum with sound proofing and access panel gasketing. The cabinet will be of a rain tight de- sign capable of operating with direct exposure to the elements.

7. Flow meters shall be provided for water and oxygen flow.
8. Ozone and Hydrogen sulfide sensors shall be provided to monitor air quality in the process module.

C. Atomizing Injection Nozzle:

1. Designed and constructed, allowing up to 98% absorption of the produced ozone into the atomized water flow. The efficiency of the absorption process is directly tied to the size of the atomized water particle, which shall be no larger than 5-micron in diameter.
2. Nozzle shall be adjustable, allowing an optimization of the air/water dispersion ratio. The adjustment will be by means of a simple threaded barrel requiring no tools or particular skill to accomplish the adjustment with the results being clearly obvious when observing the nozzle.
3. Nozzle can be up to three hundred feet (300') from the process module.

D. Miscellaneous Items:

1. Provide the required lengths of specific tubing, allowing the fluids to be transferred directly to the nozzle.
2. Provide all supports, clamping devices, related components, and slip fit connections allowing for removal and inspection of the nozzle without the necessity of entering the odorous space or disassembling the injection plumbing.
3. Inspection shall be able to be accomplished without the use of tools or specialized skills.

2.3 SOURCE QUALITY CONTROL

- A. Prior to shipment from the manufacturer, the odor control system shall be inspected and certified to operate and perform in connection with the usual purpose for which it is designed.
- B. All control panels shall be factory tested under simulated operating conditions verifying all devices function.
- C. Complete factory performance assurance testing shall be required prior to shipment.

PART 3 EXECUTION

3.1 GENERAL

- A. Install and adjust equipment in accordance with the Drawings, approved shop drawings, and the manufacturer's instructions. Do not operate the equipment until the installation is approved by the manufacturer's representative.

3.2 ASSEMBLY AND INSTALLATION

- A. Assemble and install equipment in accordance with the manufacturer's instructions.
 - 1. Remove protective coatings and oils used for protection during shipment and installation.
 - 2. Check equipment for correct direction of rotation and freedom of moving parts.
 - 3. Align equipment to Manufacturer's tolerances.
 - 4. Adjust or modify equipment to ensure proper operation.

3.3 MANUFACTURER'S CERTIFICATES

- A. Provide equipment manufacturer's Certificate of Installation stating that the equipment is installed per the manufacturer's recommendations and in accordance with the Drawings and Specifications.

3.4 MANUFACTURER'S SERVICES

- A. Manufacturer's Representative: Present at Project site and/or classroom designated by OWNER, for 2 days for installation inspection, startup, and operator training.
- B. Services Provided:
 - 1. Two semi-annual service visits after startup.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. Measurement and payment for pipelines shall be in accordance with Section 01025 of these specifications under Odor Control bid item.

END OF SECTION

SECTION 25 14 13

INTEGRATED AUTOMATION REMOTE CONTROL PANELS

PART 1--GENERAL

1.01 DESCRIPTION

A. SCOPE

1. This Section specifies requirements for Integrated Automation Remote Control Panels for the LVWD Panorama Village Lift Station which utilize programmable logic controllers (PLC) to execute discrete and continuous control logic with high reliability in industrial applications. Enclosures and components are specified in Section 40 67 19.
2. All PLCs provided for this project shall comply with the requirements of this Section.

1.02 QUALITY ASSURANCE

A. REFERENCES

1. This Section contains references to the following documents or documents listed herein. They are a part of this Section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this Section as if referenced directly. In the event of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.
2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids).
3. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued.
4. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
IEC 61131-3	Programmable Controllers – Part 3: Programming Languages
NEMA IA 2.2	Programmable Controllers – Equipment Requirements and Tests
NEMA IA 2.3	Programmable Controllers – Programming Languages

1.03 SUBMITTALS

A. SHOP DRAWINGS

1. Marked product literature of all the PLC equipment and components mounted on or within the control panel.

PART 2--PRODUCTS

2.01 GENERAL

A. MANUFACTURER

The Owner and Construction Manager require the specified Manufacturer to provide the equipment and/or products to be furnished under this Section. The Owner and Construction Manager believe the Manufacturer is capable of producing equipment and/or products that will satisfy the requirements of this Section. This statement, however, shall not be construed to mean that the named Manufacturer's standard product will comply with the requirements of this Section.

B. MATERIALS

Equipment and/or products shall be new and unused at the time of system assembly.

- B. Controller conforming to NEMA IA 2.2 and with required memory and functional capacity to perform specified sequence of operation with scheduled input and output points.

2.02 PROGRAMMABLE LOGIC CONTROLLER

A. Manufacturers: Allen-Bradley / Rockwell Automation

- a. Allen-Bradley / Rockwell Automation
- b. IDEC

B. Controller TUV SIL2 Certified.

C. NEMA IA 2.3 and IEC 61131-3 compliant program editor with program written in **Ladder Logic** Language.

D. Networking Connections: Provide all communication interfaces, network cables, taps, terminators, power supplies, and accessories for a complete operating network.

1. Ethernet Switch:
 - a. Automation Direct SE2 8-Port Industrial Switch or Approved equal
2. Ethernet/Serial Radio:
 - a. MDS SD Series SD090MD-C-ES-NNSNN
 - b. ELPRO 945U-E
3. Antenna:

- a. Clearwave 97-3194A1A, 902-960 MHz, 10 DBD Yagi w/6 elements, N Female Terminal and mounting bracket or Approved Equal
- E. Processor: The control system shall include a controller, with embedded power supply, and embedded input and outputs.
 - 1. Manufacturer: Allen-Bradley
 - a. Controller Type: CompactLogix
 - 2. Manufacturer: IDEC
 - a. Controller Type: MicroSmart FC6A Plus
- F. Analog Input Module: The analog module shall provide four isolated-differential analog input channels.
 - 1. Manufacturer: Allen-Bradley
 - a. Module Type: Compact 1769 Series
 - 2. Manufacturer: IDEC
 - a. Module Type: FC6A-J8A1 Series

2.03 PROGRAMMING SOFTWARE

Software shall be provided by the Systems Integrator for this project.

2.04 SPARE PARTS

- A. Five fuses for every different amperage used.

2.05 CONTROL PANEL FABRICATION

- A. Detail shop drawings showing field connections and any terminal block jumpers required.
- B. Terminate all used and spare I/O wiring to terminal blocks.
- C. Create wire markers with “to-from” component name, PLC slot/base, or terminal column number and terminal number information identical at each end.
- D. Provide terminal Blocks for field connections to PLC Input/Output Distribution Terminal Blocks.
 - 1. One Disconnect terminal block for each Fused Output (PLC, HMI, Radio and I/O).
 - 2. Fused terminal connected with LED to the terminal blocks for the digital output to Interposing Relays.
 - 3. Two terminals per PLC input point.
 - 4. Two terminals per PLC output point
- E. Provide terminal Blocks for field connections to PLC Analog Inputs/Outputs:
 - 1. One fused terminal with LED for each analog input and output, connected to +24 VDC.
 - 2. Two terminals per PLC input.

3. One common terminal for each analog input and output, connected to 24 VDC common.
4. One ground terminal for each input drain wire, connected to signal ground bus.
5. One surge protecting terminal for each analog input grounded to the signal ground bus.

2.06 PRODUCT DATA

A. OPERATING AND MAINTENANCE INFORMATION

Operating and maintenance information shall be provided and shall include the following:

1. Manufacturer, Representative, and Supplier contact information.
2. Manufacturer instruction manuals shall include only the following as applicable to the PLC system:
 - a. Safety Precautions.
 - b. Environmental Conditions.
 - c. Troubleshooting guides and diagnostic techniques.
 - d. Component connection diagrams.
 - e. Removal and replacement instructions.
3. Warranty information.
4. Final reviewed submittal.
5. As-built drawings with record of switch and jumper settings for all components.
6. List of spare parts provided.

PART 3--EXECUTION

3.01 INSTALLATION

- A. Connect input and output devices to the PLC via control panel terminal blocks, not directly to the PLC.

3.02 FIELD INSPECTION AND TESTING

A. EQUIPMENT MANUFACTURER (RTU) AND SYSTEMS INTEGRATOR

1. The supplier/fabricator of the RTU system shall provide a qualified service representative to perform the following:
2. Inspect the RTU installation including I/O and network systems, hardware configuration switch and jumper settings.

3. Monitor all RTU system diagnostic indicators, both hardware and software, and certify that the PLC system performance meets or exceeds the Manufacturer's published specifications.
4. Assist in all testing. The Systems Integrator will provide a minimum of one man-week on-site for each RTU.
5. Assist programmer in all testing.
6. Certify in writing to the Construction Manager that the RTU system has been installed and configured in accordance with the Manufacturer's published guidelines.

C. CONTRACTOR

1. Fault or trouble conditions shall be investigated and resolved by the Contractor to the satisfaction of the RTU supplier/fabricator.

END OF SECTION

SECTION 26 00 00
BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.1 **WORK INCLUDED**

- A. General Requirements specifically applicable to Division 26.
- B. The Contractor shall be responsible for:
 - 1. The work included consists of furnishing all materials, supplies, equipment and tools, and performing all labor and services necessary for installation of a completely functional power, lighting and SCADA systems. Complete systems in accordance with the intent of Contract Documents.
 - 2. Coordinating the details of facility equipment and construction for all Specification Divisions, which affect the work covered under this Division.
 - 3. Furnishing and installing all incidental items not actually shown or specified, but which are required by good practice to provide complete functional systems.
- C. Intent of Drawings:
 - 1. The Drawings are necessarily diagrammatic by their nature, and are not intended to show every connection in detail or every device or raceway in its exact location, unless specifically dimensioned. The Contractor shall carefully investigate structural and finish conditions and shall coordinate the work in order to avoid interference between the various phases of work. The Contractor shall be responsible for the proper routing of raceway, subject to prior review by the Owner and Engineer. Work shall be organized and laid out so that it will be concealed in furred chases and ceilings, etc., in finished portions of the building, unless specifically noted to be exposed. All work shall be installed parallel or perpendicular to the lines of the building unless otherwise noted.
 - 2. The intent of the Drawings is to establish the type of systems and functions, but not to set forth each item essential to the functioning of the system. The drawings and specifications are cooperative, and work or materials called for in one and not mentioned in the other shall be provided. Review pertinent drawings and adjust the work to conditions shown. In case of doubt as to work intended, or where discrepancies occur between drawings, specifications, and actual conditions, immediately notify the Engineer and the Owner's representative, and propose a resolution.

1.2 **RELATED WORK**

- A. This Section shall be used in conjunction with the following other specifications and related Contract Documents to establish the total general requirements for the project electrical systems and equipment.
 - 1. Division 01 Sections included in the project specifications.
 - 2. The contract.

1.3 **DESIGN CRITERIA**

- A. Equipment and devices to be installed outdoors or in enclosures where the temperatures are not controlled shall be capable of continuous operation under such conditions per manufacturer's requirements.
- B. Compliance by the Contractor with the provisions of this Specification does not relieve him of the

responsibilities of furnishing equipment and materials of proper design, mechanically and electrically suited to meet operating guarantees at the specified service conditions.

C. Electrical components shall be UL listed and labeled.

1.4 REFERENCE CODES AND STANDARDS, REGULATORY REQUIREMENTS

A. Standards of the following organizations as well as those listed in Division 01, may be referenced in the specification. Unless noted otherwise, references are to standards or codes current at the time of bidding.

1. Association of Edison Illuminating Companies (AEIC)
2. American National Standards Institute (ANSI)
3. Institute of Electrical and Electronics Engineers (IEEE)
4. Insulated Cable Engineers Association (ICEA)
5. National Electrical Code (NEC)
6. National Electrical Manufacturers Association (NEMA)
7. Electrical Safety in the Workplace
8. National Fire Protection Association (NFPA)
9. Underwriter's Laboratories (UL)
10. ASHRAE/IES 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings

B. Work, materials and equipment must comply with the latest rules and regulations of the following.

1. National Electrical Code (NEC)
2. Electrical Safety in the Workplace
3. Occupational Safety and Health Act (OSHA)
4. American Society for Testing and Materials (ASTM)
5. Applicable state and federal codes, ordinances and regulations

C. Discrepancies. The drawings and specifications are intended to comply with listed codes, ordinances, regulations and standards. Where discrepancies occur, immediately notify the Owner's representative in writing and ask for an interpretation. Should installed materials or workmanship fail to comply, the Contractor is responsible for correcting the improper installation. Additionally, where sizes, capacities, or other such features are required in excess of minimum code or standards requirements, provide those specified shown.

D. Contractor shall obtain permits and arrange inspections required by codes applicable to this Section and shall submit written evidence to the Owner and Engineer that the required permits, inspections and code requirements have been secured.

1.5 SUBMITTALS

A. Submit the following in addition to and in accordance with the requirements of Division 01 for submittal requirement.

1. Include inspection and permit certificates and certificates of final inspection and acceptance from the authority having jurisdiction.

2. Manufacturer's standardized schematic diagrams and catalog cuts shall not be acceptable unless applicable portions of it are clearly indicated and non-applicable portions clearly deleted or crossed out.
 3. All schematic, connection and/or interconnection diagrams in accordance with the latest edition of NEMA.
 4. Provide submittals as required by individual specification Section.
- B. Provide the following with each submittal:
1. Catalog cuts with manufacturer's name clearly indicated. Applicable portions shall be circled and non-applicable portions shall be crossed out.
 2. Line-by-line specification review by equipment manufacturer and contractor with any exceptions explicitly defined.
- C. Within the specified time window after award of contract, submit list of equipment and materials to be furnished.
1. Itemize equipment and material by specification Section number; include manufacturer and identifying model or catalog numbers.
 2. Replace rejected items with an acceptable item within 2 weeks after notification of rejection.
 3. If a satisfactory replacement is not submitted within a two-week period, owner will notify contractor as to equipment manufacturer or type and make or material to be furnished. Provide designated items at no additional cost to owner.
- D. As-Built Record Drawings: The Contractor shall maintain a master set of As-Built Record Drawings that show changes and any other deviations from the drawings. The markups must be made as the changes are done. At the conclusion of the job, these As-Built Record Drawings shall be transferred to AutoCad electronic files, in a format acceptable to the Owner, and shall be complete and delivered to the Owner's Representative prior to final acceptance. Refer Project Administration for other requirements.

1.6 SAFETY

- A. The Contractor shall follow the safety procedures in addition to, and in accordance with, the requirements of Project Safety Manual (PSM).
1. The Contractors shall be responsible for training all personnel under their employ in areas concerning safe work habits and construction safety. The Contractor shall continually inform personnel on hazards particular to this project and update the information as the project progresses.
 2. The Contractor shall secure all electrical rooms, to limit access, prior to energizing any switchgear and shall control access during the project after energization. The Contractor shall post and maintain warning and caution signage in areas where work is on going near energized equipment. The Contractor shall cover all energized live parts when work is not being done in the equipment. This includes lunch and breaks.
 3. The Contractor shall strictly enforce OSHA lock out/tag out procedures. Initial infractions shall result in a warning; a second infraction shall result in the removal of the workman and his foreman from the site. Continued infractions shall result in removal of the Contractor from the site.

1.7 SHORING AND EQUIPMENT SUPPORTS

- A. The Contractor shall provide all permanent and temporary shoring, anchoring, and bracing required to make all parts absolutely stable and rigid; even when such shoring, anchoring, and bracing are not explicitly called for.
- B. The Contractor shall adequately support all freestanding panels, enclosures, and other equipment. This shall include bolting to the floor or solid structural steel to prevent tipping. Install free-standing electrical equipment on 4" thick concrete housekeeping pads. Under no condition shall equipment be fastened to non-rigid building steel (i.e., removable platform steel gratings, handrails, etc.).
- C. The Contractor shall provide racks and supports, independently mounted at structure, to support electrical equipment and systems supplied and installed under this contract. At no time shall the Contractor mount or suspend equipment from other disciplines' supports.

1.8 SUBSTITUTION OF MATERIALS AND EQUIPMENT:

- A. Refer to Uniform General Conditions and Supplementary General Conditions for substitution of materials and equipment.
- B. The intent of the Drawings and/or Specifications is neither to limit products to any particular manufacturer nor to discriminate against an "APPROVED EQUAL" product as produced by another manufacturer. Some proprietary products are mentioned to set a definite standard for acceptance and to serve as a reference in comparison with other products. When a manufacturer's name appears in these Specifications, it is not to be construed that the manufacturer is unconditionally acceptable as a provider of equipment for this project. The successful manufacturer or supplier shall meet all of the provisions of the appropriate specification(s).
- C. The specified products have been used in preparing the Drawings and Specifications and thus establish minimum qualities with which substitutes must at least equal to be considered acceptable. The burden of proof of equality rests with the Contractor. The decision of the designer is final.
- D. When requested by the Engineer, the Contractor shall provide a sample of the proposed substitute item. In some cases, samples of both the specified item and the proposed item shall be provided for comparison purposes.
- E. Timeliness: The burden of timeliness in the complete cycle of submittal data, shop Drawings, and sample processing is on the Contractor. The Contractor shall allow a minimum of six (6) weeks time frame for review of each submission by the office of the design discipline involved after receipt of such submissions by that design discipline. The Contractor is responsible for allowing sufficient time in the construction schedule to cover the aforementioned cycles of data processing, including time for all resubmittal cycles on unacceptable materials, equipment, etc. covered by the data submitted. Construction delays and/or lack of timeliness in the above regard are the responsibility of the Contractor and will not be considered in any request for scheduled construction time extensions and/or additional costs to the Owner.
- F. All equipment installed on this project shall have local representation; factory authorized service, and a local stock of repair parts.
- G. Acceptance of materials and equipment will be based on manufacturer's published data and will be tentative subject to the submission of complete shop Drawings indicating compliance with the contract documents and that adequate and acceptable clearances for entry, servicing, and maintenance will exist. Acceptance of materials and equipment under this provision shall not be construed as authorizing any deviations from the Specifications, unless the attention of the Engineer has been directed in writing to the specific deviations. Data submitted shall not contain unrelated information unless all pertinent information is properly identified.

- H. Certification: The Contractor shall carefully examine all data forwarded for approval and shall sign a certificate to the effect that the data has been carefully checked and found to be correct with respect to dimensions and available space and that the equipment complies with all requirements of the Specifications.
 - I. Physical Size of Equipment: Space is critical; therefore, equipment of larger sizes than shown, even though of specified manufacturer, will not be acceptable unless it can be demonstrated that ample space exists for proper installation, operation, and maintenance.
 - J. Should a substitution be accepted, and should the substitute material prove defective, or otherwise unsatisfactory for the service intended within the guarantee period, this material or equipment shall be replaced with the material or equipment specified at no additional cost to the Owner.
- 1.9 The Civil and Structural Plans and Specifications including the General Conditions of the Contract, Special Requirements, Instructions to Bidders, and all supplements issued thereto, information to Bidders and other pertinent documents issued by the Engineer, are a part of these specifications and the accompanying electrical plans, and shall be complied with in every respect. All the above is included herewith, and shall not relieve the Contractor of responsibility or be used as a basis for additional compensation due to omission of civil and structural details from the electrical drawings.
- 1.10 The Contractor shall obtain all permits, inspections, and approvals as required by all authorities having jurisdiction. All fees and costs of any nature whatsoever incidental to these permits, inspections, and approvals shall be paid by the contractor.
- 1.11 All work shall be executed in accordance with the current local and state codes, ordinances, regulations, standards and requirements governing the particular class of work involved. The Contractor shall be responsible for the final execution of the work under this heading to suit these requirements. On completion of the various portions of the work, the installation shall be tested by the constituted authorities and approved, and upon completion of the work, the Contractor shall obtain and deliver to the Owner final certificate of acceptance.
- 1.12 Contractor shall be responsible for final arrangement of all equipment in electrical rooms and for compliance with code required clearances and working spaces. Layout of equipment is shown on the plans for illustration and informational purposes. Prior to any rough-in work, Contractor shall provide a layout of all equipment in the electrical rooms for review and acceptance. Layout shall show all equipment to scale at a scale of 1/4" = 1'-0". Working clearances on the sides and front of all equipment shall be outlined using a dashed line. If equipment does not fit, Contractor shall notify the Engineer so that the space may be modified as necessary. Rough-in work may proceed only after the layout has been reviewed and accepted.
- 1.13 Contractor shall be responsible for final coordination of service points with all utilities. Any adjustments required to accommodate changes in service points and metering provisions shall be made by the contractor at no additional cost to the Owner.
- 1.14 All wiring and cabling of every type, size and description shall be run in conduit unless noted or specified otherwise. Minimum size shall be 3/4".

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and Equipment: UL or equivalent labeled and/or listed as acceptable to the authority having jurisdiction as suitable for the use intended. Materials shall be of a standard industrial quality if no specifications or specific model numbers are given.
- B. Where two or more units of the same class of material are required, provide products of a single manufacturer. Component parts of materials or equipment need not be products of the same manufacturer.
- C. All materials shall be new and unused.
- D. Provide non-metallic material in corrosive areas or as otherwise specified.

2.2 ANTI-SEIZE COMPOUND

- A. Provide anti-seize compound when using bolts and screws to install any and all of pre-manufactured equipment. This includes transformers, panels, switchgear, motors, motor controllers, panels and other fixtures that are Contractor installed. This does not apply to factory-assembled systems that have a UL or similar label. Acceptable anti-seize compounds are:
 - 1. Permatex Anti-Seize
 - 2. Loctite Anti-Seize
 - 3. Bostik Never Seez

2.3 ANTI-CORROSION COMPOUND

- A. Provide anti-corrosion compound to protect busbar splices or conductor terminations in corrosive areas. The user shall be required to apply it in compliance with manufacturer instructions and also require wiping off all excess compound to prevent accumulation of dirt or contaminants. In corrosive areas insulating boots shall also be required over splices. Acceptable anti-corrosion compound is no-OX-id A Special Electrical Grade or EPWU approved equal.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. Install work in compliance with the 2014 NEC as adopted and amended by the City of El Paso.
- B. Install material and equipment in accordance with manufacturers' instructions. Provide calibrated torque wrenches and screwdrivers and tighten all terminals, lugs, and bus joints using it.
- C. Comply with startup procedures as defined by Construction Manager and Owner.
- D. Arrange electrical work in a neat, well-organized manner. Do not block future connection points of electrical service. Install all electrical work parallel or perpendicular to building lines unless noted otherwise, properly supported with purpose-designed apparatus, in a neat manner.
- E. Store, apply, install, connect, erect, use, clean, adjust, and condition materials and equipment as recommended by the manufacturers in their published literature.
- F. Make opening through masonry and concrete by core drilling in acceptable locations. Restore openings to original condition to match remaining surrounding materials.

3.2 HAZARDOUS LOCATIONS

- A. Equipment, wiring, devices, and other components located within hazardous areas to be of appropriate type per NFPA requirements for Class I, Division 1 or Division 2, Group D.

- B. Bond exposed non-current carrying parts of entire electrical system in hazardous areas, in accordance with NEC and as instructed by Owner.

3.3 SLEEVES AND SEALS

- A. Provide sealing and/or fire stopping where electrical equipment passes through roofs, walls, ceilings, and floors. Seals shall be watertight and/or fire rated as applicable.

3.4 CONSTRUCTION REVIEW

- A. The Engineer or Owner's representative will review and observe installation work to insure compliance by the Contractor with requirements of the Contract Documents.
- B. Review, observation, assistance, and actions by the Engineer or Owner's representative shall not be construed as undertaking supervisory control of the work or of methods and means employed by the Contractor. The review and observation activities shall not relieve the Contractor from the responsibilities of these Contract Documents.
- C. The fact that the Engineer or Owner's representative do not make early discovery of faulty or omitted work shall not bar the Engineer or Owner's representative from subsequently rejecting this work and insisting that the Contractor make the necessary corrections.
- D. Regardless of when discovery and rejection are made, and regardless of when the Contractor is ordered to correct such work, the Contractor shall have no claim against the Engineer or Owner's representative for an increase in the Contract price, or for any payment on account of increased cost, damage, or loss.

3.5 WARRANTY

- A. Provide warranties in accordance with the requirements of Uniform General and Supplementary Conditions (UGC).

END OF SECTION

SECTION 26 05 00
BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Hinged cover enclosures and cabinets
- B. Contactors
- C. Control relays
- D. Push buttons, and selector switches
- E. Terminal blocks and accessories

1.2 APPLICABLE CODES AND STANDARDS

- A. NFPA 70, National Electrical Code (2014 Edition as adopted by the City of El Paso, Tx.)
- B. American National Standard, National Electrical Safety Code, (latest edition)
- C. Applicable publications of NEMA, ANSI, IEEE, and ICEA
- D. Underwriters Laboratories, Inc. Standards (UL)
- E. Federal, city, state, and local codes and regulations having jurisdiction
- F. OSHA requirements
- G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)
- H. NEMA WD 1 – General-Purpose Wiring Devices
- I. UL 98 - Enclosed Switches

1.3 INTENT

- A. This Section is not, and shall not be interpreted to be, a complete listing of all materials or equipment that is Contractor furnished and erected. It is intended to clarify and further define the Contractor scope of work, procurement, and responsibilities for those incidental materials that are not specified by other specifications, but important to a complete and operational system.
- B. The Contractor shall furnish all equipment and materials, specified in other Sections of specification and on drawings, for installation and connection required to place equipment into satisfactory operating service. The Contractor shall review the Drawings and specifications for clarification of his responsibility in the handling and installation of equipment and material. Where applicable, and not in contradiction with the Drawings and specifications, the Contractor shall install and connect the equipment in accordance with the manufacturer's recommendations and instructions.
- C. All materials and equipment shall be of types and manufacturer specified wherever practical. Should materials or equipment so specified be unattainable, the Contractor shall submit the description and manufacturer's literature, reason for substitution request and shall secure the approval of the Engineer before substitution of other material or equipment is purchased. This Section establishes performance requirements and the quality of equipment acceptable for use and shall in no way be construed to limit procurement from other manufacturers.

1.4 SUBMITTALS

- A. Provide submittals in addition and in accordance with Section 26 00 00, Basic Electrical Requirements, and Division 01 for submittal requirement.
- B. Submit manufacturer's literature and specification data sheets for each type of basic material, which is applicable to the project.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Provide factory-wrapped waterproof flexible barrier material for covering materials, where applicable, to protect against physical damage in transit. Damaged materials shall be removed from project site.
- B. In their factory-furnished coverings, store materials in a clean, dry indoor space, which provides protection against the weather and elements.

PART 2 PRODUCTS

2.1 ENCLOSURES AND CABINETS

- A. Enclosures and cabinets for all Contractor furnished electrical equipment and devices shall be suitable for the location and environmental conditions and shall be of the NEMA type as shown in Table 16050-1. Exceptions shall be specifically designated on the Drawings.

Table 16050-1 Enclosures		
Location	Environment	Enclosure Type
Indoor Utility	Dry, subject to dust, falling dirt and dripping non-corrosive liquids	NEMA 12
Indoor	Clean, Dry	NEMA 1
Outdoor	Subject to windblown dust and rain, splashing water, and hose-directed water	NEMA 4
Indoor	Wet, subject to hose-directed water	NEMA 4
Outdoor	Subject to falling rain, sleet, and external ice formation	NEMA 3R
Indoor or Outdoor	Subject to corrosion, windblown dust and rain, splashing water and hose-directed water	NEMA 4X

- B. Enclosures shall have the following properties:
 - 1. Hinged Cover Enclosures: NEMA 250.
 - a. Type 1: Steel.
 - b. Type 4: Steel with gasket door, rain tight.
 - c. Type 4X: Stainless steel, (polycarbonate or fiberglass reinforced polyester (FRP) in corrosive areas).
 - d. Type 12: Steel with gasketed door, dust-tight.

- C. Finish: Exterior, manufacturer's standard gray enamel finish; interior, white enamel finish.
- D. Covers: Continuous hinge, held closed by flush latch operable by hasp and staple for padlock. Where required for NEMA ratings, gaskets shall be neoprene rubber.
- E. Interior Panel for Mounting Terminal Blocks or Electrical Components: 14-gauge steel, white enamel finish.
- F. Provide protective pocket inside front cover with schematic diagram, connection diagram, and layout drawing of control wiring and components within enclosure.

2.2 CONTACTORS

- A. Acceptable Manufacturers
 - 1. General Electric Company
 - 2. Eaton
 - 3. Square D Company
 - 4. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in 26 00 00 and Division 01 for substitution requirement.
- B. Contactors: NEMA ICS 2; electrically held or mechanically held as indicated on Drawings. Two-wire control for electrically held contactors and three-wire control for mechanically held contactors.
- C. Enclosure: NEMA 1 unless indicated otherwise on Drawings.
- D. Control Transformer: Provide when indicated on Drawings. Minimum capacity shall be 100 VA. Provide primary and secondary fuse protection.
- E. Coil operating voltage; 110 volts, 60 Hz or as per drawings.
- F. Size: NEMA ICS 2; size as indicated on Drawings.
- G. Contacts: As indicated on Drawings; 600 Volts, 60 Hz.
- H. Provide solderless pressure wire terminals on bus terminals suitable for mounting in panelboard as indicated on Drawings.

2.3 CONTROL RELAYS

- A. Acceptable Manufacturers
 - 1. General Electric Type CR120A
 - 2. Eaton Type M-300
 - 3. Square D Company
 - 4. Allen-Bradley
 - 5. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in 26 00 00 and Division 01 for substitution requirement.
- B. Provide magnetic control relays, NEMA Class A: A300 (300 volts, 10 amps continuous, 7,200 VA make, 720 VA break), industrial control type with field-convertible contacts, and meeting the requirements of NEMA ICS 2.
- C. Where time delay relays are specified or required, unless otherwise noted, provide magnetic control relays with a solid-state timer attachment adjustable from 0.2 to 60 seconds (minimum) or

with range as indicated. Provide with field convertible from ON delay to OFF delay and vice versa.

- D. Where latching (mechanically held) relays or motor thermal detector relays are specified, provide magnetic control relays with mechanical latch attachment with unlatching coil and coil clearing contacts.

2.4 PUSH BUTTONS, AND SELECTOR SWITCHES

A. Acceptable Manufacturers

- 1. Allen-Bradley
- 2. Square D
- 3. Eaton
- 4. General Electric
- 5. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in 26 00 00 and Division 01 for substitution requirement.

- B. For non-hazardous, indoor, dry locations, including control panels, and individual stations, provide heavy duty, NEMA 13, oil tight type pushbuttons, indicating lights, selector switches, and stations for these devices.

- C. For non hazardous, outdoor, or normally wet locations, or where otherwise indicated, provide heavy duty corrosion resistant, NEMA 4, watertight type pushbuttons, indicating lights, or selector switches mounted in NEMA 4 watertight enclosures. Provide special gasketing required to make complete station watertight.

- D. For hazardous locations, provide control station listed by UL for Class I, Division 01, Group D. Specific type shall be in accordance with area classification as indicated on the Drawings.

- E. Provide components and enclosures meeting NEMA Type 4XSS where shown.

- F. Provide devices meeting the requirements of NEMA ICS 2, and having individual, extra large nameplates indicating their specific function. Provide push-button stations with laminated plastic nameplates indicating the drive they control. Provide contacts with NEMA designation rating A600. Install provisions for locking pushbuttons and selector switches in the OFF position wherever lockout provisions are indicated. Nameplates shall be as specified in Section 16195.

- G. Utilize selector switches having standard operating levers. All indicating lights shall be LED type, push-to-test type. Provide ON or START pushbuttons colored black. Provide OFF or STOP pushbuttons colored red.

2.5 TERMINAL BLOCKS AND ACCESSORIES

A. Signal And Control Terminals

- 1. Acceptable Manufacturers
 - a. Phoenix Contact
 - b. Buchanan
 - c. Weidmüller
 - d. Entelec

- e. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in 23 00 00 and Division 01 for substitution requirement.
 - 2. Signal and Control Terminals: Modular construction type, DIN 46 277/3 channel mounted; screw clamp compression connectors, rated 300 volts. Minimum terminal width of 0.24-inch, capable of holding two No. 12 or two No. 14 AWG conductors in each connector. Terminal identification numbers shall be thermoset characters (black) on a white background. Provide 25 percent spare terminals.
- B. Power Terminals
- 1. Acceptable Manufacturers
 - a. Buchanan
 - b. IlSCO
 - c. Square D Company
 - d. Burndy
 - e. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in 26 00 00 and Division 01 for substitution requirement.
 - 2. Power Terminals: Unit construction type, closed-back type, with tubular pressure screw connectors, rated 600 volts, size as required. Provide 25 percent spare terminals.

2.6 UL LISTING

- A. All equipment and materials shall be new and conform to the requirements of this Section. All equipment and materials shall be UL listed or equivalent, and shall bear their label whenever standards have been established and level service is regularly furnished. All equipment and materials shall be of the best grade of their respective kind for the purpose.

PART 3 EXECUTION

3.1 FABRICATION - CONTROL ENCLOSURES AND CABINETS

- A. Shop assemble enclosures and cabinets housing terminal blocks or electrical components in accordance with NEMA ICS 6.

3.2 INSTALLATION - ENCLOSURES AND CABINETS

- A. Install cabinets and enclosures plumb; anchor securely to wall and structural supports at each corner, minimum. Direct attachment to dry wall is not permitted.
- B. Provide accessory feet for freestanding equipment enclosures.
- C. Install trim plumb.

3.3 ERECTION OF EQUIPMENT

- A. Manufacturer's Installation Instructions: Where furnished or called for by the manufacturer equipment manufacturer's installation instructions shall be considered a part of this specification and fully complied with. Where the Contractor damages the finishing coat of paint in existing or completed areas, he shall refinish with matching paint.

- B. Mounting Heights: Individual safety switches and buttons and devices shall normally be installed at the following mounting heights, when not specified on the Drawings.
1. Safety Switches: 6 feet 0 inches (to top).
 2. Pushbuttons: 4 feet 0 inches (to center).
 3. Control Panels: 6 feet 0 inches (to top).
- C. Mounting: Equipment and control devices shall be supported independent of conduit connections. Panels or cabinets shall be mounted on metal frame supports independently of equipment. Control devices and metal enclosures shall be bolted or welded to steel channel or steel plate. All electrical equipment and devices not covered by the above, such as miscellaneous switches, thermostats, duct switches, temperature switches, floats, photoelectrical devices, and similar electrical devices shall be located and set as suitable for the application. Where control panels are provided as part of the equipment racks mounted on the floor, they shall be provided to support conduits and flexible connections to control panels.

3.4 COORDINATION

- A. Exact location of all electrical equipment, devices and fixtures shall be determined in field by contractor and verified by Engineer's field representative prior to installation.

END OF SECTION

SECTION 26 05 19
CABLE, WIRE AND CONNECTORS, 600 VOLT

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Building wire.
 - 1. Power distribution circuitry.
 - 2. Control system circuitry.
 - 3. Lighting circuitry.
 - 4. Appliance and equipment circuitry.
 - 5. Motor-branch circuitry.
 - 6. Outdoors lighting and power.
 - 7. Other systems circuitry as designated.
- B. Cable.
- C. Wiring connections and terminations.

1.2 REFERENCES

- A. NEMA WC 3 - Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
- B. NEMA WC 5 - Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
- C. ANSI/UL 83 – Thermoplastic-Insulated Wire and Cables
- D. NFPA 70 – National Electrical Code, latest edition
- E. NEFA – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- F. Where application of National Electrical Code, trade association standards or publications appears to be in conflict with the requirements of this Section, the Architect/Engineer shall be asked for an interpretation.

1.3 SUBMITTALS

- A. Provide submittals in accordance with and in additional to Section 26 00 00, Basic Electrical Requirements, and Division 01 for submittal requirement.
- B. Submit manufacturer's literature and specification data sheets for each item of cable, wire connectors.
- C. Qualification of cable and wire manufacturer: Company specializing in manufacturing products specified in this Section with minimum ten years experience.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Provide factory-wrapped waterproof flexible barrier material for covering wire and cable wood reels, where applicable; and weather resistant fiberboard containers for factory packaging of cable, wire and connectors, to protect against physical damage in transit. Damaged cable, wire or connectors shall be removed from project site.

- B. Store cable, wire and connectors in a clean, dry indoor space in their factory-furnished coverings, which provides protection against the weather and elements.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Generally, cable, wire and connectors shall be of manufacturer's standard materials, as indicated by published product information.
- B. Provide factory-fabricated wire of the size, rating, material and type as indicated for each service. Where not indicated, provide proper selection as required to comply with installation requirements and with NEC standards. The minimum size wire to be used for power or lighting circuits shall be #12 copper with insulation as noted below. Minimum size for control shall be #14 copper.
- C. The conductors of wires and cables shall be of copper (tinned where specified), and have conductivity in accordance with the standardization rules of the IEEE. The conductor and each strand shall be round and free of kinks and defects.
- D. Grounding conductors, where insulated, shall be colored solid green or identified with green color as required by the NEC. Conductors intended as a neutral shall be colored solid white, or identified as required by the NEC. All motor or equipment power wiring shall be colored according to Section 26 05 53, Electrical Identification.
- E. Use compression lugs for all wiring termination's, except on breakers or terminal strips in panel boards.

2.2 BUILDING WIRE

- A. Thermoplastic-insulated Building Wire: NEMA WC 5.
- B. Rubber-insulated Building Wire: NEMA WC 3.
- C. Feeders and Branch Circuits Larger Than 10 AWG: 98% conductivity copper, soft-drawn, stranded conductor, 600 volt insulation, THHN/THWN Use XHHW conductors where installed in conduit underground.
- D. Feeders and Branch Circuits 10 AWG and Smaller: 98% conductivity copper, soft-drawn, stranded conductor, 600-volt insulation, THWTHHN/THWN.
- E. Use RHH/RHW for 250 KCM or larger conductors.

2.3 REMOTE CONTROL AND SIGNAL CABLE

- A. 600 Volt Insulation Control Cable for Class 1 Remote Control and Signal Circuits.
 - 1. Individual Conductors: 14 AWG, stranded copper, XHHW insulation. Rated 90 degrees C dry, 75 degrees C wet, color-coded per ICEA Method 1 plus one green equipment grounding conductor.
 - 2. Assembly: Bundle wrapped with cable tape and covered with an overall PVC jacket. Cable shall pass IEEE-1202 vertical tray ribbon-burner flame test (210,000 BTU) VW-1.
- B. Instrumentation Cable
 - 1. 300 Volt Instrumentation Cable, Multiple Pairs, Overall Shield, Type PLTC:

- a. Individual Conductors: 18 AWG, stranded, tinned copper, flame retardant polyethylene or PVC insulated, rated 105 degrees C, black and white numerically printed and coded pairs.
- b. Assembly: Individual twisted pairs having a 100 percent coverage aluminum-polyester shield and 20 AWG stranded tinned copper drain wire. Conductor bundle shall be shielded with 100 percent coverage overall aluminum-polyester shield complete with 20 AWG drain wire. All group shields completely isolated from each other. Bundle wrapped with cable tape and covered with an overall flame retardant PVC jacket. Cable shall pass IEEE-383 vertical tray flame test (70,000 BTU) UL1581.

2.4 WIRING CONNECTIONS AND TERMINATIONS

- A. Provide factory-fabricated, metal connectors of the size, rating, material, type and class as indicated for each service. Where not indicated, provide proper selection as required to comply with installation requirements and with NEC standards. Select from only following types, classes, kinds and styles.
 - 1. Type:
 - a. Solderless pressure connectors
 - b. Crimp.
 - c. Threaded.
 - d. Insulated spring wire connectors with plastic caps for 10 AWG and smaller.
 - 2. Class: Insulated.
 - 3. Material: Copper (for CU to CU connection).
 - 4. Style:
 - a. Insulated terminals. Use ring-terminal for control wiring. Use flange (fork) spade compression terminal for termination of stranded conductors at wiring devices, including ground connection.
 - b. Split bolt-parallel connector.
 - c. Pigtail connector.
 - d. Pre-insulated multi-tap connector.

PART 3 EXECUTION

3.1 INSPECTION

- A. Installer must examine the areas and conditions under which cable, wire and connectors are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Inspect wire and cable for physical damage. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 GENERAL WIRING METHODS

- A. Install electrical cable, wire and connectors as indicated, in accordance with the manufacturer's written instructions, the applicable requirements of NEC and the National Electrical Contractors

Association's "Standard of Installation", and as required to ensure that products serve the intended functions.

- B. Coordinate cable and wire installation work with electrical raceway and equipment installation work, as necessary for proper interface. Do not install the conductors until raceway system is complete and properly cleaned.
- C. Cables shall be selected on the basis of their purpose and UL listing. Generally, use Types THWN and THHN in building interiors and other dry locations. Outdoors and underground in raceways, use Type XHHW. Conductors subject to abrasion, such as in lighting poles, shall be Type THWN or THHN.
- D. No conductor smaller than No. 12 wire shall be used for lighting purposes. In the case of "home runs" over 50' in length (100' for 277 volt) no conductor smaller than a No. 10 wire shall be used. The sizing of all wire except remote control wire shall be accomplished in the case of both feeder and branch circuits by conforming to the following provisions. Separate dedicated neutral conductors shall be provided for each phase of the same size for 120V/277V single-phase application for heavy electrical loads, computer loads, loads fed from isolated transformers, dedicated circuits, unless noted otherwise on drawings. Voltage drop on feeders and branch circuits shall not exceed NEC requirement.
- E. Remote control wires shall be no smaller than No. 14 conductors. Control wires shall be run in separate conduits. Departures from the sizes so determined shall be made only in those cases in which the National Electrical Code requires the use of larger conductors. The sizes as determined from these tables shall be regarded as the acceptable minimum under all other circumstances. In no case, however, shall there be a voltage drop greater than that specified in any feeder or branch circuit. The Contractor may, if he deems it necessary or advisable, use larger sized conductors than those shown. Under no circumstances, however, shall the Contractor use any conductors sized in a manner which does not conform to the above mentioned tables without having first secured the written approval of the Owner's duly authorized representative.
- F. Install exposed raceways, parallel and perpendicular to surface or exposed structural members and follow the surface contours, where possible.
- G. Splice branch circuits only in accessible junction or outlet boxes. Control cable shall never be spliced except the final connection to field devices. Where terminations of cables that are installed under this Section are to be made by others, provide pigtail of adequate length for neat, trained and bundles connections, minimum 5 feet at each location, unless noted otherwise on drawings.
- H. Wiring Within An Enclosure: Contractor shall bundle ac and dc wiring separately within an enclosure. The Contractor shall utilize panel wire-ways when they are provided. Where wireways are not provided the Contractor shall neatly tag, bundle wires and secure to sub-panel at a minimum of every three inches with T&B Type TC5355 heavy duty mounting bases.
- I. Do not band any conductor either permanently or temporarily during installation to radii less than four times the outer diameter of 600-volt insulated conductors.

3.3 WIRING INSTALLATION IN RACEWAYS

- A. Wire and cable shall be pulled into clean dry conduit. Do not exceed manufacturer's recommended values for maximum pulling tension.
- B. Pull conductors together where more than one is being installed in a raceway.
- C. Use UL listed pulling compound or lubricant, when necessary; compound must not deteriorate conductor and insulation.

- D. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.
- E. Place an equal number of conductors for each phase of a circuit in same raceway.
- F. Provide separate conduit or raceway for line and load conductors of motor starters, safety disconnect switches, and similar devices. Those devices shall not share the same raceway.
- G. All conduits shall contain a green grounding conductor. Conduit, wireways, or boxes shall not be used as the equipment grounding conductor.

3.4 CABLE INSTALLATION

- A. Provide protection for exposed cables where subject to damage during construction. Do not install cable before the completion of raceway system.
- B. Use suitable cable fittings and connectors.
- C. It shall be the Contractor's responsibility to accurately measure all cable runs before the cable is cut. The Contractor shall furnish all tools and equipment, have sufficient properly trained personnel and shall exercise necessary care to ensure that the cable is not damaged during installation. Cable found to be damaged before installation shall not be installed. Cable damage during installation shall be removed and replaced. Repairs to cables can only be done with written permission from the Owner's Representative and only under special circumstances.
- D. PVC jacketed cable shall not be installed or worked in any way at temperatures below 32 degrees F, unless cable has been previously stored in a heated area 48 hours prior to being pulled and transported to a heated pulling area.
- E. Each cable entering an enclosure shall have its conductors bundled together and identified with the cable number. All groups of conductors within an enclosure shall be shaped and formed to provide a neat appearance to facilitate future additions or rework. All control conductors shall be numbered and shall be labeled at each termination with this number, using markers designed for the application.
- F. Multi-Conductor Cable Installation: Power and 120V control cable shall be installed in the same tray. When cables leave trays, they shall be protected between the trays and the cable terminal points by drawing them through conduits. Do not route 600V cables (power cable and 120V control cable) in the same conduit as low voltage cables (less than 50V, communications, security systems, or control conductors).
- G. Instrument Cable: Instrument cable shall, when conduit installation is required be installed in rigid steel conduit. They shall not be spliced at any point. The shields and drain wires of shielded signal cables shall be grounded only at one point.

3.5 WIRING CONNECTIONS AND TERMINATIONS

- A. Install splices, taps and terminations, which have equivalent-or-better mechanical strength and insulation as the conductor. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.
- B. Keep conductor splices and taps accessible and to a minimum, and in junction boxes only. Control circuit conductors shall terminate at terminal blocks only. Splices below grade shall only be in handholes or manholes and shall be made watertight with epoxy resin type splicing kits similar to Scotchcast.
- C. Use splice, tap and termination connectors, which are compatible with the conductor material.
- D. Thoroughly clean wires before installing lugs and connectors.

- E. Terminate spare conductors with electrical tape and label as spare.
- F. Power and Lighting Circuits: Use solderless pressure connectors with insulating covers for copper wire splices and taps, 8 AWG and larger. For 10 AWG and smaller, use insulated spring wire connectors with plastic caps on lighting and receptacle circuits.
- G. Use split bolt connectors for copper wire splices and taps, 6 AWG and larger. Tape un-insulated conductors and connectors with electrical tape to 150 percent of the insulation value of conductor.
- H. Connections for all wire sizes in motor terminal boxes where the motor leads are furnished with crimped-on lugs shall be made by installing ring type compression terminals on the motor branch circuit ends and then bolting the proper pairs of lugs together. First one layer of No. 33 scotch tape reversed (sticky side out), then a layer of rubber tape, then two layers of No. 33 half-lapped.
- I. Identify conductors per Section 26 05 53 - Electrical Identification.

3.6 FIELD QUALITY CONTROL

- A. Torque test conductor connections and terminations to manufacturer's recommended values.
- B. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.
- C. Conductors in vertical conduits or raceways shall be supported in the manner set forth in the appropriate section of the latest revision of the National Electrical Code. Lighting fixtures shall not be used for raceways for circuits other than parallel wiring of fixtures.
- D. Conductors may be run in parallel on sizes 1/0 to 500 MCM inclusive provided all paralleled conductors are the same size, length, and type of insulation. Except as otherwise shown on drawings, no more than three conductors may be run in parallel, and they shall be so arranged and terminated as to insure equal division of the total current between all conductors involved. Where parallel connection is contemplated, approval of the Owner's representative must be obtained before installation is made.

3.7 TESTING AND ACCEPTANCE

- A. Before final acceptance, the Contractor shall make pump motor rotation, voltage, insulation, and load tests, necessary to demonstrate to the Owner's representative the satisfactory installation and proper performance of all circuits.
- B. Test feeder conductors clear of faults. Insulation-resistance test shall be conducted per NETA – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems. Test results below 50 megohms shall be cause for rejection of the wiring installation. Replace and retest all such rejected conductors.
- C. At the completion of this project, the Contractor shall provide for the Owner three (3) complete and finally corrected sets of working drawings. These sets of working drawings shall be new, unused and in good condition, and shall include the nature, destination, path, size and type of wire and all other characteristics for complete identification of each and every conduit and circuit.

3.8 All stranded conductors shall be terminated at solderless connectors. Mains and feeders shall run their entire length in continuous pieces without joints or splices.

3.9 All joints or splices in dry locations shall be made with approved solderless connectors, and after the joint or splice is complete, it shall be covered with an insulating device to make insulation of the splice equal to that of the conductor itself.

- 3.10 After substantial completion, seal all conduit openings terminating inside control building and originating outside the control building. Use sealing foam UL approved for this application and easy to remove.

END OF SECTION

SECTION 26 05 26 GROUNDING

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Power system grounding.
- B. Communication system grounding.
- C. Electrical equipment and raceway grounding and bonding.

1.2 REFERENCES

- A. NFPA 70 – National Electrical Code, latest edition
- B. ANSI/UL 467 – Electrical Grounding and Bonding Equipment
- C. ANSI/IEEE STD 142 – Recommended Practice for Grounding of Industrial and Commercial Power Systems
- D. IEEE 81 – Guide for Measuring Earth Receptivity, Ground Impedance and earth Surface Potential of a ground System
- E. IEEE 1100 – Recommended Practice for Powering and Grounding Sensitive Electronic Equipment
- F. ANSI/TIA/EIA 607 – Commercial Building Grounding and Bonding Requirements for Telecommunications

1.3 SYSTEM DESCRIPTION

- A. Bond the electrical service system neutral at service entrance equipment to grounding electrodes. Electrical systems that are grounded shall be connected to earth in a manner that will limit the voltage imposed by lightning, line surges, or unintentional contact with higher-voltage lines and that will stabilize the voltage to earth during normal operations. Provide a completely grounded system in accordance with Article 250 of the NEC.
- B. Transformer, UPS systems or other power supplies are separately derived systems. Standby or emergency generators are separately derived systems if the neutral is bonded to the generator frame and if there is no direct connection of the generator neutral conductor to the service neutral conductor.
- C. Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, auxiliary gutters, meter fittings, boxes, ground bus in electrical rooms, metal frame of the building or structure, ground ring, grounding conductor in raceways and cables, receptacle ground connectors, and metal underground water pipe.
- D. Bonding jumpers shall be installed around non-metal fittings or insulating joints to ensure electrical continuity. Bonding shall be provided where necessary to ensure electrical continuity and the capacity to conduct safely any fault current likely to be imposed.
- E. Supplementary Grounding Electrode: Use driven ground rod on exterior of building in main service equipment. Use effectively grounded metal frame of the building.

1.4 SUBMITTALS

- A. Provide submittals in accordance with and in additional to Section 26 00 00, Basic Electrical

Requirements, and Division 01 for submittal requirement.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Grounding system components shall be as required to comply with the design and construction of the system indicated. Components shall be as indicated in manufacturer's submittal data.
- B. Ground conductors shall be stranded tinned, annealed copper cable of the sizes indicated on drawings. Bond grounding conductors at both ends of metallic conduit.
- C. Grounding clips shall be Steel City Type G, or equal.
- D. Ground Rods shall be copper-clad steel, 3/4" diameter, minimum length 10 feet.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install ground system as indicated, in accordance with the applicable requirements of the National Electrical Code and the National Electrical Contractors Association's "Standard of Installation".
- B. Install grounding conductors continuous, without splice or connection, between equipment and grounding electrodes. Install test wells as required per drawings.
- C. In feeder and branch circuits, provide a separate, insulated equipment grounding conductor. Terminate each end on a grounding lug, bus, or bushing.
- D. Install fusion welded ground connectors where they are concealed or inaccessible. Cadweld or Burndy Hy-Ground only.
- E. Ground each outlet by the use of an approved grounding clip attached to the junction box in such a position to be readily inspected on removal of the cover plate; or by the use of an approved grounding yoke type receptacle.
- F. No strap grounding clamps shall be used; connections requiring bolting shall be made up with monel metal bolts, washers and nuts. Connections shall be made only after surfaces have been cleaned, or ground to expose virgin metal.
- G. Install external ground wire on liquid tight flexible metal conduit with grounding bushings.
- H. Conductor connections shall be made by means of solderless connectors such as serrated bolted clamps or split bolt and nut type connectors. .
- I. The neutral of each transformer shall be bonded to system ground at one point only. This point shall be ahead of the first secondary protective device.
- J. Connect grounding conductors to ground rods at the upper end of the rod with the end of the rod and the connection points below finished grade. Below grade connection shall be exothermic-welded type connectors as manufactured by Cadweld, Thermoweld.
- K. Provide grounding and bonding at Utility Company's metering equipment and pad-mounted transformer in accordance with Utility Company's requirements.

3.2 FIELD QUALITY CONTROL

- A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.
 - B. Measure ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment.
- 3.3 All ground rods shall be installed such that tops are 12" below finished grade. Connections to ground rods shall be cadwelded and at 36" below finished grade. "HYGROUND" compression connectors by Burndy may be used in lieu of cad welding. Maximum resistance to ground for each ground rod shall not exceed 10 ohms measured at the point of connection to the equipment ground lug.
- 3.4 A separate dedicated grounding conductor shall be provided for each grounding electrode; structural steel and ground rod.

END OF SECTION

SECTION 26 05 29
SECURING AND SUPPORTING METHODS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Raceway and equipment supports
- B. Fastening hardware
- C. Coordinate location of concrete equipment pads

1.2 QUALITY ASSURANCE

- A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry. Support systems shall be sized adequately to support an additional 25% for future loads

1.3 COORDINATION

- A. Coordinate with other trades where conduit supports are in the same location as piping, ductwork, and work of other trades and where supports are furnished and installed under other Divisions. Supporting from the work or supports of other Contractors shall not be allowed except by express, written permission of the Owner.

1.4 SUBMITTALS

- A. Provide submittals in accordance with and in additional to Section 26 00 00, Basic Electrical Requirements, and Division 01 for submittal requirement.

PART 2 PRODUCTS

2.1 MATERIAL

- A. Support Channel:
 - 1. All non-corrosive locations: Stainless steel.
 - 2. Corrosive locations: Stainless steel.
- B. Hardware:
 - 1. All non-corrosive locations: Stainless steel.
 - 2. Corrosive locations: Stainless steel threaded rod, attachments and fasteners shall be used with fiberglass supports.
- C. Threaded Rod: used for rack support from structure above; 3/8-inch minimum diameter.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using precast insert system, expansion anchors, or beam clamps. Do not use spring steel clips and clamps. Provide necessary calculations to select proper support materials for electrical equipment, raceway.

- B. Install hangers, anchors, sleeves and seals as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to insure supporting devices comply with requirements. Comply with requirements of NEC for installation of supporting devices. Install supports with spacing in compliance with NEC requirements.
- C. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors in solid masonry walls; or concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.
- D. Do not fasten supports to piping, mechanical equipment, or conduit.
- E. Do not use powder actuated anchors without written permission from the Engineer.
- F. Do not drill structural steel members without written permission from the Structural Engineer.
- G. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.
- H. Bridge studs top and bottom with channels to support recessed mounted cabinets and panelboards in stud walls.
- I. Install surface mounted cabinets and panelboards with a minimum of four anchors. Provide strut channel supports to stand cabinet 1-5/8 inches off wall. Utilize "Post Bases" where support channel is attached to structural floor.
- J. Provide extra care in supporting PVC conduit to protect it from potential damage.
- K. Use fiberglass for nonmetallic raceway systems supports in areas subject to corrosives.
- L. All supports in contact with floor using stanchion type support shall be solidly bolted to the permanent structural floor.
- M. Conduit supports shall have at a minimum, the bottom support member constructed of double strut. This horizontal member shall be double-nutted, and the supporting all-thread rod shall be trimmed to one inch below lowest nut.
- N. Coordinate with other electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices with other work.
- O. Install freestanding electrical equipment on 4-inch concrete pads. Pad shall be a minimum four inches larger than equipment. No crevices shall be left around the pads. Equipment includes but not limited to the following:
 - 1. Floor mounted transformers
- P. Do not anchor supports to columns. Where panelboards, cables, or conduits are routed on the face of a column provide "column hugging" channel supports.

3.2 TOUCH-UP

- A. Touch-up all scratches on securing and supporting system, and paint the ends of channel after cutting with an approved zinc chromate or 90 percent zinc paint.

END OF SECTION

SECTION 26 05 33
RACEWAYS, CONDUITS AND BOXES

PART 1 GENERAL

1.1 WORK INCLUDED

A. Raceways:

1. Wireways.

B. Conduit:

1. Rigid metal conduit and fittings. (RGS)
2. Electrical metallic tubing and fittings. (EMT)
3. Flexible metal conduit and fittings.
4. Liquid-tight flexible metal conduit and fittings.
5. Non-metallic conduit and fittings. (underground use only)
6. PVC coated rigid steel conduit.

C. Boxes:

1. Wall and ceiling outlet boxes.
2. Pull and junction boxes.

1.2 REFERENCES

- A. NFPA 70 – National Electrical Code, latest edition
- B. ANSI C80.1 - Rigid Steel Conduit, Zinc-Coated
- C. ANSI C80.3 - Electrical Metallic Tubing, Zinc-Coated
- B. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies
- E. EMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing
- F. ANSI/NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports
- G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)
- H. ANSI/NEMA TC 2 – Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80)
- I. ANSI/UL 1 – Flexible Metal Conduit
- J. ANSI/UL 5 – Surface Metal Raceways and Fittings
- K. ANSI/UL 360 – Liquid-tight Flexible Steel Conduit
- L. ANSI/UL 467 – Electrical Grounding and Bonding Equipment
- M. ANSI/UL 651 – Schedule 40 and 80 Rigid PVC Conduit (underground use only)
- N. ANSI/UL 797 – Electrical Metal Tubing
- O. ANSI/UL 870 – Wireways, Auxiliary Gutters and Fittings
- P. NEMA RN 1 – Polyvinyl Chloride (PVC) Externally Coated galvanized Rigid Steel Conduit and Intermediate Metal Conduit

- Q. UL 6 – Rigid Metal Conduit
- R. ANSI/UL 498 – Attachment Plugs and Receptacles
- S. ANSI/UL 943 – Ground Fault Circuit Interrupters

1.3 SUBMITTALS

- A. Provide submittals in accordance with and in addition to Section 26 00 00, Basic Electrical Requirements, and Section Submittal Procedures.
- B. Shop drawings consisting of a complete list of equipment and materials, which will be used for the project, including manufacturer's descriptive and technical literature, catalog cuts and installation instructions.
- C. Sealing/fire stopping materials and details.

1.4 STORAGE AND HANDLING

- A. Handle materials carefully to avoid damage, breaking, denting and scoring. Damaged equipment or materials shall not be installed.
- B. Store materials in a clean dry space and protected from the weather and elements.

PART 2 PRODUCTS

2.1 WIREWAYS

- A. Wireways shall be of steel construction general purpose for indoor spaces and rain tight for outdoor applications with knockouts.
- B. Size shall be as indicated on Drawings.
- C. Cover shall be hinged or screw applied as indicated on Drawings. Rain tight wireways shall be provided with full gasketing.
- D. Fittings shall be so constructed to continue the "lay-in" feature through the entire installation.
- E. Provide all sheet metal parts with a rust inhibiting phosphatizing primer coating and finished in gray enamel. All hardware shall be cadmium plated to prevent corrosion.

2.2 CONDUIT AND FITTINGS

- A. Conduit and fittings for all electrical systems on this project shall include the following:
 - 1. Service entrance
 - 2. Electrical power and lighting feeders
 - 3. Electrical power and lighting circuits
 - 4. Control systems (other than HVAC)
 - 5. Other electrical systems
 - 6. Seal fittings
- B. For each electrical wireway system indicated, provide a complete assembly of conduit, tubing or duct with fittings including, but not necessarily limited to, connectors, nipples, couplings, locknuts, bushings, expansion fittings, other components and accessories as needed to form a complete system of the same type indicated.
- C. Conduit fittings shall be designed and approved for the specific use intended. Conduit fittings,

including flexible, shall have insulated throats or bushings. Rigid conduits shall have insulated bushings, unless grounding bushings are required by N.E.C. Article 250. Grounding bushings shall have insulated throats.

- D. Rigid aluminum conduit. Fittings shall be threaded type. Expansion fittings shall be OZ Type DX.
- E. Flexible metal conduit and fittings shall be zinc-coated steel.
- F. Liquid-tight flexible metallic conduit and fittings shall consist of single strip, continuous, flexible interlocked, double-wrapped steel, galvanized inside and outside, forming smooth internal wiring channel with liquid-tight covering of flexible polyvinyl chloride (PVC). It shall be furnished with a sealing O-ring where entering an enclosure subject to moisture. Where O-Rings are used, ground type bushings shall be used in the box or enclosure.
- G. Nonmetallic conduit and fittings shall be suitable for temperature rating of conductor but not less than 90°C. Nonmetallic conduit and fittings shall be molded of high impact PVC compound having noncombustible, nonmagnetic, non-corrosive and chemical resistant properties and shall be of the same manufacturer. Where located outdoors and above ground, the conduit and fittings shall be UV resistant. Solvent cement shall be of the same manufacturer as the conduit and shall be of the brush-on type. Spray solvents are prohibited. PVC coated metallic fittings shall not be permitted for PVC conduit connections.
- H. Crimp or set-screw type fittings are not acceptable.
- I. Minimum conduit size shall be 3/4 inch.
- J. PVC coated rigid steel conduit shall be externally coated with a 40 mil PVC coating and internal phenolic coating over a galvanized surface.
- K. All conduits entering the wet well shall be stainless steel.

2.3 WALL AND CEILING OUTLET BOXES

- A. Galvanized steel interior outlet wiring boxes of the type, shape and size, including depth of box, to suit each respective location and installation; constructed with stamped knockouts in back and sides, and with threaded holes with screws for securing box covers or wiring devices.
 - 1. Outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, compatible with outlet boxes, compatible with outlet boxes being used and meeting requirements of individual situations.
- B. Provide deep type cast metal weatherproof exterior outlet wiring boxes of the type, shape and size, including depth of box, with threaded conduit ends, cast metal face plate with spring-hinged waterproof cap suitably configured for each application, including face plate gasket and fasteners. Provide PVC type outlet boxes only in corrosive areas rated as NEMA 13X.
- C. Outlet boxes in poured concrete shall be plenum type without any holes and with reset knockouts. Where extension rings are used to offset conduit between wall reinforcing steel, joint between extension ring and box shall be sealed to prevent concrete from entering box during pour.

2.4 PULL AND JUNCTION BOXES

- A. Boxes shall be galvanized sheet metal conforming to ANSI/NEMA OS 1 with screw-on cover and welded seams, stainless steel nuts, bolts, screws and washers.
- B. Boxes larger than 12 inches in any dimension shall be panelboard code gauze galvanized steel with hinged cover.

- C. Boxes shall be sized in accordance with NEC.

PART 3 EXECUTION

3.1 INSTALLATION - CONDUIT

- A. Install products as indicated, in accordance with the applicable requirements of NEC, NEMA and the National Electrical Contractors Association's "Standard of Installation".
- B. Cut conduit square using a saw or pipe cutter. De-burr cut ends. Joints in steel conduit must be painted with T&B Kopr shield and drawn up tight. Threads for rigid metal conduit and IMC shall be deep and clean. Running threads shall not be used. Wipe plastic conduit clean and dry before joining. Apply full, even coat of cement with brush to entire area that will be inserted into fitting. Let joint cure for 20 minutes minimum. Spray type of cement is not acceptable. Install raceway and conduit system from point of origin in outlets shown, complete with support assemblies including all necessary hangers, beam clamps, hanger rods, turnbuckles, bracing, rolls, clips angles, through bolts, brackets, saddles, nuts, bolts, washers, offsets, pull boxes, junction boxes and fittings to ensure a complete functional raceway system. Where vertical drops of conduit are made to equipment in open space, the vertical conduit shall be rigidly supported from racks supported on the floor.
- C. Install rigid wall aluminum conduit for service entrance; feeders; wall or floor penetrations; mechanical rooms electrical rooms and exposed locations where there is a high potential subject to physical damage; exposed outdoor locations; damp locations or any location as per design drawing. The following exceptions permitted:
 - 1. PVC (underground use only; below finished grade)
 - a. Install PVC schedule 40 conduit where direct buried in earth.
 - 2. Liquid-tight
 - a. Install liquid-tight flexible metal conduit for connections to rotating, vibrating, moving or movable equipment, including dry-type transformers. Install external ground wire on flexible conduit with grounding bushings. Maximum length shall be 6 feet minimum of 2 feet.
 - 3. Flexible Metal Conduit
 - a. Install standard flexible metal conduit (not liquid-tight), which shall be only used for lighting fixture whips or motor vibrations, with internal ground wire. Install flexible conduit connection such that vibrations are not transmitted to adjoining conduit or building structure. Maximum length shall be 6 feet minimum of 3 feet; minimum size shall be 3/4; and minimum size shall be 1/2 inch for lay-in light fixture whips.
- D. Install conduits parallel and supported on Unistrut, or equal, trapezes and anchored with split ring hangers, conduit straps or other devices specifically designed for the purpose. No raceways or boxes shall be supported using wire. Arrange conduit to maintain headroom and present a neat appearance. Conduit routes shall follow the contour of the surface it is routed on. Route exposed conduit and tray above accessible ceilings parallel and perpendicular to walls and adjacent piping. Maintain 12-inch clearance between conduit and heat sources, such as flues, steam pipes, and heating appliances. Wire ties or "wrap lock" are not permitted to support or secure conduit system. Fasten conduit with the following material:
 - 1. Wood screws on wood

2. Toggle bolts on hollow masonry
 3. Bolts and expansion anchors in concrete or brick
 4. Machine screws, threaded rods and clamps on steel
 5. Conduit clips on steel joists.
 6. 4 inch x 4 inch penta-treated pine installed in pitch pans on roof, spaced at intervals not to exceed 5 feet.
- E. Install conduits outside of building lines at a minimum depth of 24 inches below finished grade. Maintain twelve inches earth or two inches concrete separation between electrical conduits and other services or utilities underground. Encase all plastic service entrance conduits with concrete unless otherwise specifically detailed or noted on the drawings.
- F. Install underground conduits with sealing glands equal to OZ Type FSK exterior to the conduit and OZ type CSB, or equal internally at the point where conduits enter the building to prevent water seepage into the building.
- G. Fittings shall be approved for grounding purposes or shall be jumpered with a copper grounding conductors of appropriate ampacity. Leave termination of such jumpers exposed.
- H. Install expansion fittings in metal and PVC conduit as follows:
1. Conduit Crossing Building Expansion Joints:
 - a. Aluminum all sizes
 - b. PVC all sizes
 2. Conduits entering environmental rooms and other locations subject to thermal expansion and as required by NEC.
 3. Unless expansion fitting has an integral bonding braid, as in Crouse-Hinds Type XC, a green insulated grounding conductor shall be pulled in the conduit. Both ends of this green grounding conductors shall be accessible for inspection.
- I. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.
- J. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture if cable or wire are not installed immediate after conduit run. Tape covering conduit ends is not acceptable.
- K. Provide 200 lb. nylon cord full length in empty conduit.
- L. Install no more than the equivalent of three 90-degree bends between boxes. Where four 90 degree bends are required, prior approval by the Engineer is required. Use conduit bodies to make sharp changes in direction, as around beams. Conduit bodies shall be readily accessible and sized for the cables installed. Running or rolling offsets are not approved. Use factory long radius elbows for bends in conduit larger than 2-inch size. All parallel bends shall be concentric.
- M. Pull string shall be provided full length in conduit designated for future use.
- N. All conduit buried in earth, under buildings, in or under concrete or installed in damp or wet locations shall be rigid aluminum conduit. Rigid plastic conduit PVC schedule 40, sunlight resistant, may only be used underground where allowed by the local code. All exposed and above grade conduit shall be rigid galvanized steel or EMT. Burial depth for all underground conduits shall be 30" minimum regardless of cover

material over conduits.

- O. All conduits entering the wet well shall be stainless steel.

3.2 INSTALLATION - WIREWAYS

- A. Bolt wireways to steel channels fastened to the wall or in self-supporting structure.] Install level.
- B. Gasket each joint in oil-tight wireway.
- C. Mount rain tight wireway for exterior installation in horizontal position only.

3.3 INSTALLATION - BOXES

- A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.
- B. Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, compatible with outlet boxes being used and meeting requirements of individual situations.
- C. Electrical box locations shown on Contract Drawings are approximate unless dimensioned. Verify location of outlets prior to rough-in.
- D. Locate and install boxes to allow access, minimum 12 inches above ceiling except where space dimensions do not allow.
- E. Secure boxes rigidly to the substrate upon which they are being mounted, or solidly imbed boxes in concrete or masonry. Do not support junction boxes from the raceway systems. Boxes shall not be permitted to move laterally. Boxes shall be secured between two studs. Boxes connected to one stud are not permitted.
- F. Provide knockout plugs for unused openings.
- G. Use multiple-gang boxes where more than one device is mounted together. Do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.
- H. Install boxes in walls without damaging wall insulation.
- I. Outlet boxes in plaster partitions shall be "shallow-type" set flush in wall so there is at least 5/8 inch plaster covering back of box.
- J. Outlet boxes for switch shall not be used as junction boxes.
- K. Outlet boxes supporting fixtures shall be securely anchored in place in an approved manner. Lighting fixture outlets shall be coordinated with mechanical and architectural equipment and elements to eliminate conflicts and provide a workable neat installation.

3.4 WALL AND FLOOR PENETRATIONS:

- A. Core drilling shall be approved in writing by the Structural Engineer prior to execution. Avoid anchor bolt on structural column by installing "column hugging" type of unistrut support for electrical installation. PVC shall not be used for wall and floor penetration.
- B. Wall penetrations for under floor raceway shall be sealed in accordance with Specification Section Fire-stopping and Section Joint Sealers.

END OF SECTION

SECTION 26 05 53
ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Nameplates and tape labels
- B. Wire and cable markers
- C. Conduit color coding and labeling

1.2 REFERENCES

- A. NFPA 70 – National Electrical Code (latest edition)

1.3 SUBMITTALS

- A. Provide submittals in accordance with and in addition to Section 26 00 00, Basic Electrical Requirements, and Division 01 for submittal requirement.
 - 1. Furnish nameplate identification schedules listing equipment type and nameplate data with letter sizes and nameplate material.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Equipment Nameplates:
 - 1. For normal power electrical equipment, provide engraved three-layer laminated plastic nameplates, engraved white letters on a black background.
 - 2. For emergency equipment provide engraved three-layer laminated plastic nameplates with engraved white letters on a red background.
- B. Underground Warning Tape
 - 1. Manufactured polyethylene material and unaffected by acids and alkalines.
 - 2. 3.5 mils thick and 6 inches wide, detectable, metal tracing.
 - 3. Impervious to acid, alkaline and other destructive elements found in soil.
 - 4. Printing on tape shall include an identification note BURIED ELECTRIC LINE, and a caution note CAUTION. Repeat identification and caution notes over full length of tape. Provide with black letters on a red background.
- C. Conductor Color Tape and Heat Shrink:
 - 1. Colored vinyl electrical tape shall be applied perpendicular to the long dimension of the cable or conductor.

- D. Warning labels: Provide warning labels with black lettering on red background with a minimum of 1/2" lettering.
- E. Tape Labels: Embossed adhesive tape, with minimum 1/4-inch letters for labeling receptacles, switches, control device stations, junction and pull boxes and manual motor starter units, etc.
 - 1. White letters on black background for normal power.
 - 2. White letters on red background for emergency/standby power.
 - 3. White letters on orange background for UPS power.
- F. J-Box and Cover plate Voltage Labels: Black stenciled letters 1/4" high. Adhesive back tapes may be used if a clear tape is applied over the label for protection.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Degrease and clean surfaces to receive nameplates or tape labels.
- B. Install nameplates parallel to equipment lines.
- C. Secure plastic nameplates to equipment fronts using screws or rivets. Use of adhesives shall be per Owner's approval. Secure nameplate to outside face of flush mounted panelboard doors in finished locations.

3.2 WIRE IDENTIFICATION

- A. Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits. Label control wire with number as indicated on schematic and interconnection diagrams or equipment manufacturer's shop drawings for control wiring.
- B. Conductors for power circuits to be identified per the following schedule.

Conductor	System Voltage	
	480/277V	240/120V
Phase A	Brown	Black
Phase B	Orange	Red
Phase C	Yellow	
Neutral	Gray	White
Grounding	Green	Green
IG	N/A	Green w/Yellow

3.3 NAMEPLATE ENGRAVING SCHEDULE

- A. Provide nameplates of minimum letter height as scheduled below. Nameplates shall be same as equipment names indicated on the Drawings.

- B. Individual Circuit Breakers in Distribution Panelboards, Disconnect Switches, Motor Starters, and Contactors: 1/4-inch; identify source to device and the load it serves, including location.
- C. Dry Type Transformers Not in Substations: 3/8-inch; identify equipment designation. 1/4-inch; identify primary and secondary voltages, primary source, and secondary load and location.
- D. Transfer Switches: 3/8-inch; white letters and red background; identify equipment designation 1/4-inch; identify voltage rating, normal source, standby source and load served including location.
- E. Panelboards: 3/8-inch; identify equipment designation. 1/4 -inch; identify source, voltage and bus rating.

END OF SECTION

SECTION 26 08 10
ELECTRICAL SYSTEM TESTING AND SETTINGS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall engage the services of the equipment manufacturer as required for the purpose of performing inspections and tests as herein specified.
- B. The Contractor/manufacturer shall provide all material, equipment, labor, and technical supervision to perform such tests and inspections.
- C. It is the purpose of these tests to assure that all tested electrical equipment is operational and within industry and manufacturer's tolerances and is installed in accordance with design specifications. The tests and inspections shall determine suitability for energizing equipment.
- D. Test systems and equipment furnished under Division 26 and repair or replace all defective work and equipment at no additional cost to the Owner. Refer to the individual equipment sections for additional specific testing requirements.
- E. Make adjustments to the systems furnished under Division 26 and instruct the Owner's personnel in the proper operation of the systems.
- F. In addition to the specific testing requirements listed in the individual Sections, perform the additional testing, inspections and adjust settings as specified herein.
- G. Testing shall be scheduled and coordinated with the Owner at least 2 weeks in advance.
- H. Provide qualified test personnel, instruments and test equipment.
- I. Provide a test report verifying compliance with the testing requirements included under Division 26.
- J. Before proceeding with the energization of equipment, notify the Owner to schedule the start-up of the equipment.

1.02 RELATED WORK

- A. Electric motors are provided with the driven equipment and are specified in the individual equipment specifications.
- B. Control panels are provided with the driven equipment.

1.03 SUBMITTALS

- A. Test Report
 - 1. The test report shall include the following:

- a. Summary of project
 - b. Listing of equipment tested
 - c. Test results
 - d. Recommendations
2. Furnish copies of the complete report to the owner/engineer's representative as directed in the contract documents.
- B. The report shall include a Table of Content and a data sheet for each component tested. The Table of Content shall identify each component by a unique number. The Number shall appear on the technical data sheet for identification. Submit cable test results, grounding test results, circuit breaker, fuse type and rating for each piece of equipment. Test report shall be submitted in a three-ring binder. Three copies shall be furnished.
- C. The report shall include a Table of Contents, a technical data sheet for each component (i.e., cable, circuit breaker, transformer, relay, etc.) tested. The Table of Content shall include the name of each component, location, the major piece of equipment the component is located within, and a sheet number on which the technical information is presented. Each data sheet shall include a unique sheet number, the name of the component under test, the major piece of equipment in which the component is located and the weather conditions at the time of the test including the temperature and relative humidity at the time of the test. The firm doing the testing shall include, in the report, their opinion whether or not the equipment being tested complies with the specification and recommended measures to correct the deficiency. Any discrepancies shall be noted in the concluding summary of the report. Test report forms shall be in compliance with NETA standards. Three complete copies shall be provided. Reports shall be signed by the person in responsible charge of the field testing, an officer of the firm performing the tests and an officer of the Electrical Contracting Firm.
- D. The reports shall be submitted to the Engineer for review, comment and record purposes. Each report shall include a Table of Content, a technical data sheet, for each component (i.e., cable, circuit breaker, transformer, relay, etc.) tested. The Table of Content shall include the name of each component, the major piece equipment the component is located within, and a sheet number on which the technical information is presented. Each data sheet shall include a unique sheet number, the name of the component under test, The major piece of equipment in which the component is located, the weather conditions at the time of the test (i.e., temperature, humidity, sunny, rain, etc) the tester's observation and findings, discrepancies, any remedial work performed or act to resolve problems, technical parameters obtained during the tests, as left settings of all devices, and a statement indicating the equipment is ready to be energized. The report shall contain a statement indicating the equipment was tested in accordance with the procedures outlined in the latest edition of The International Testing Association Acceptance Testing Specifications.

1.04 APPLICABLE CODES, STANDARDS AND REFERENCES

- A. All inspections and tests shall be in accordance with the following codes and standards except as provided otherwise herein:
1. National Electrical Manufacturers Association - NEMA
 2. ASTM International - ASTM

3. Institute of Electrical and Electronic Engineers - IEEE
4. InterNational Electrical Testing Association - NETA Acceptance Testing Specifications (ATS) - Latest Revision
5. American National Standards Institute - ANSI C2: National Electrical Safety Code
6. State and local codes and ordinances
7. Insulated Cable Engineers Association - ICEA
8. Association of Edison Illuminating Companies - AEIC
9. Occupational Safety and Health Administration - OSHA
10. National Fire Protection Association - NFPA
 - a. ANSI/NFPA 70: National Electrical Code
 - b. ANSI/NFPA 70B: Electrical Equipment Maintenance
 - c. NFPA 70E: Electrical Safety Requirements for Employee Workplaces

B. All inspections and tests shall utilize the following references:

1. Project design specifications
2. Project design drawings
3. Manufacturer's instruction manuals applicable to each particular apparatus
4. Project list of equipment to be inspected and tested

1.05 QUALITY ASSURANCE

A. Qualifications of testing firm

1. The testing firm shall be a corporately- and financially-independent testing organization which can function as an unbiased testing authority, professionally independent of the manufacturers, suppliers, and installers of equipment or systems evaluated by the testing firm.
2. The testing firm shall be regularly engaged in the testing of electrical equipment devices, installations, and systems.
3. The testing firm shall meet OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907, or be a Full Member company of the InterNational Electrical Testing Association.
4. The lead, on-site, technical person shall be currently certified by the InterNational Electrical Testing Association (NETA) or National Institute for Certification in Engineering Technologies (NICET) in electrical power distribution system testing.

5. The testing firm shall utilize engineers and technicians who are regularly employed by the firm for testing services. Resumes of key staff proposed for the project shall be submitted to the Engineer for review.
6. The testing firm shall submit proof of the above qualifications with bid documents, when requested.
7. The terms used here within, such as test agency, test Contractor, Engineer, testing laboratory, or Contractor's test company shall be construed to mean the testing firm.

1.06 DIVISION OF RESPONSIBILITY

- A. The Contractor shall perform routine insulation-resistance, continuity, and rotation tests for all distribution and utilization equipment prior to and in addition to tests performed by the testing firm specified herein.
- B. The Contractor shall supply a suitable and stable source of electrical power to each test site. The testing firm shall specify the specific power requirements.
- C. The Contractor shall notify the testing firm when equipment becomes available for acceptance tests. Work shall be coordinated to expedite project scheduling.
- D. The testing firm shall notify the Owner/Engineer's representative prior to commencement of any testing.
- E. Any system, material, or workmanship which is found defective on the basis of acceptance tests shall be reported to the owner/engineer's representative.
- F. The testing firm shall maintain a written record of all tests and, upon completion of project, shall assemble and certify a final test report.
- G. Safety and Precautions
 1. Safety practices shall include, but are not limited to, the following requirements:
 - a. Occupational Safety and Health Act (OSHA)
 - b. Accident Prevention Manual for Industrial Operations, National Safety Council (NSC)
 - c. Applicable state and local safety operating procedures
 - d. Owner's safety practices (Lockout/Tagout)
 - e. National Fire Protection Association - NFPA 70E
 - f. National Fire Protection Association - NFPA 79
 - g. American National Standards for Personnel Protection
 2. All tests shall be performed with apparatus de-energized. Exceptions must be thoroughly reviewed to identify safety hazards and devise adequate safeguards.
 3. The testing firm shall have a designated safety representative on the project to supervise the testing operations with respect to safety.

1.07 TEST EQUIPMENT REQUIREMENTS

A. Suitability of Test Equipment

1. All test equipment shall be in good mechanical and electrical condition.
2. Selection of metering equipment should be based on a knowledge of the waveform of the variable being measured. Digital multi-meters may be average or RMS sensing and may include or exclude the dc component. When the variable contains harmonics or dc offset and, in general, any deviation from a pure sine wave, average sensing and average measuring RMS scaled meters may be misleading. Use of RMS measuring meters is recommended.
3. Field test metering used to check power system meter calibration must have an accuracy higher than that of the instrument being checked.
4. Accuracy of metering in test equipment shall be appropriate for the test being performed.
5. Waveshape and frequency of test equipment output waveforms shall be appropriate for the test and tested equipment.

B. Test Instrument Standards

1. All equipment used for testing and calibration procedures shall exhibit the following characteristics:
 - a. Maintained in good visual and mechanical condition
 - b. Maintained in safe operating condition
2. Test equipment should have operating accuracy equal to, or better than, the following limits:
 - a. Portable multi-meters should be true RMS measuring.
 - b. Multi-meters should have the following accuracy limits, or better:
 - 1) AC voltage ranges: .75% +/-3 last single digits @ 60 Hz
 - 2) AC current ranges: .90% +/-3 last single digits @ 60 Hz, including adapters, transducers
 - 3) DC voltage ranges: .25% +/-1 last single digit
 - 4) DC current ranges: .75% +/-1 last single digit
 - 5) Resistance ranges: .50% +/-1 last single digit
 - 6) Frequency range: .10% +/-1 last single digit @ 60 Hz
 - c. Clamp-on ammeters: ac current +/-3% of range +/-1 last single digit @ 60 Hz
 - d. Dissipation/power factor field equipment
 - 1) +/-0.1% power factor for power factor values up to 2.0%
 - 2) 5% of the reading for power factor values above 2.0%
 - e. Low-range dc resistance equipment: 1.0% of reading, +/-2 last single digits
 - f. Transformer turns-ratio test equipment: 0.5% or better @ 60 Hz
 - g. Ground electrode test equipment: +/-2% of range
 - h. Insulation test sets: 0-1000V dc +/-20% of reading at mid-scale
 - i. Electrical load survey equipment
 - 1) +/-5% total error, including sensors
 - 2) 1% resolution
 - 3) Current transformers +/-2% of range @ 60 Hz

- 4) Voltage transformers +/-0.5% of range @ 60 Hz
- j. Liquid dielectric strength test equipment: +/-2% of scale
- k. Infrared scanning equipment: sensitivity of 2 degrees C
- l. Phase shifting equipment: +/-1.0 degree C over entire range
- m. High-current test equipment: +/-2% of range
- n. DC high potential test equipment: +/-2% of full scale
- o. AC high potential test equipment (60 Hz): +/-2% of full scale

C. Test Instrument Calibration

1. The testing firm shall have a calibration program which assures that all applicable test instruments are maintained within rated accuracy.
2. The accuracy shall be directly traceable to the National Institute of Standards and Technology.
3. Instruments shall be calibrated in accordance with the following frequency schedule:
 - a. Field instruments: 6 months maximum
 - b. Laboratory instruments: 12 months
 - c. Leased specialty equipment: 12 months (Where accuracy is guaranteed by lessor)
 - d. Dated calibration labels shall be visible on all test equipment.
 - e. Records, which show date and results of instruments calibrated or tested, must be kept up-to-date and available upon request.
 - f. Up-to-date instrument calibration instructions and procedures shall be maintained for each test instrument.
 - g. Calibrating standard shall be of higher accuracy than that of the instrument tested.
 - h.

PART 2 PRODUCTS

2.01 NOT USED

PART 3 EXECUTION

3.01 PREPARATION

- A. Testing shall be scheduled and coordinated with the Owner at least 2 weeks in advance

3.02 ACCEPTANCE TESTING

- A. Provide acceptance testing for all equipment provided under Division 26 in accordance with the individual specification sections.
- B. Provided acceptance testing for all motors provided under other Divisions.

3.03 ACCEPTANCE TESTING

- A. Test all electrical equipment is operational and within industry and manufacturer's tolerances and is installed in accordance with design specifications prior to energizing equipment.
- B. Test systems and equipment furnished under Division 26 and repair or replace all defective work and equipment at no additional cost to the Owner. Refer to the individual equipment sections for additional specific testing requirements.
- C. Make adjustments to the systems furnished under Division 26 and instruct the Owner's personnel in the proper operation of the systems.
- D. Provided mechanical inspection of equipment and operational testing of control circuits to confirm proper operation of equipment.
- E. Check and record the full load current draw of each motor. Check ampere rating of thermal overloads for motors and submit a typed record to the Engineer, if using ambient compensated thermal overloads, submit the ambient temperature used at the time of the test. Include driven load designation, motor service factor, horsepower, and Code letter. If incorrect thermal overloads are installed replace with the correct size overload.
- F. Check power and control power fuse ratings for correct size and type. Replace fuses if they are found to be of the incorrect size/ratings.
- G. Check settings of the motor circuit protectors. Adjust settings to lowest setting that will allow the motor to be started when under load conditions.
- H. Check motor nameplates for correct phase and voltage.
- I. Check rotation of motors prior to testing the driven load. Disconnect the driven equipment if damage could occur due to wrong rotation. If the rotation of the motor shaft is not correct, for the driven equipment, change the motor connections at the motor terminal box.
- J. Check interlocking, control and instrument wiring for each system and/or part of a system to prove that the system will function properly as indicated by control schematic and wiring diagrams.
- K. Verify all terminations at transformers, equipment, panels and enclosures are connected to the proper terminals by producing a 1, 2, 3 rotation on a phase sequenced motor when connected to "A," "B" and "C" phases.
- L. Verify all circuit breaker ratings are as required by the Contract Documents or as amended during shop drawing review. Advise the Engineer of discrepancies and make changes as directed by the Engineer.
- M. Verify proper operation of manual transfer switches, accessories devices and associated motor interlocks provided to either delay or prevent motor starting after transfer. Verify that the upstream protective device for each manual transfer switch is of the proper type and rating to achieve the specified short-circuit withstand rating. If a specific upstream protective device is required to obtain the proper short circuit withstand rating, verify that

the proper signage is installed on the upstream protective device and on the manual transfer switch enclosures indicating the proper replacement parts. If signage is not installed on both the upstream protective device and the transfer switch, advise the Owner and provide the signage.

- N. Verify grounding of instrumentation equipment and line surge protection equipment.

END OF SECTION

SECTION 26 22 13

DRY TYPE TRANSFORMERS

PART 1 GENERAL

1.1 WORK INCLUDED

This Section includes enclosed dry type distribution transformers rated 600 volts and less, sizes up to 500 kVA.

- A. Dry type Two-Winding transformers.

1.2 REFERENCES

- A. NEMA ST 1 - Specialty Transformers (Except General Purpose Type)
- B. NEMA ST 20 - Dry Type Transformers for General Applications
- C. IEEE C57.12.01 - General Requirements for Dry-Type Distribution and Power Transformers.
- D. IEEE C57.12.91 - Test Code for Dry-Type Distribution and Power Transformers
- E. IEEE C57.96 – Guide for Loading Dry-Type Distribution and Power Transformers
- F. IEEE Std. 519 - Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
- G. UL 506 – Specialty Transformers
- H. UL 1561 - Dry Type General Purpose and Power Transformers
- I. NEMA TP 1 – Guide for Determining Energy Efficiency for Distribution Transformers
- J. NEMA TP 2 – Standard Test Method for Measuring the Energy Consumption for Distribution Transformers

1.3 SUBMITTALS

- A. Provide submittals in accordance with and in additional to Section 26 00 00, Basic Electrical Requirements, and Division for submittal requirement.
- B. Submit manufacturer's data on dry type transformers, vibration isolators and accessories.
- C. Include outline and support point dimensions of enclosures and accessories; unit weight; voltage; kVA; impedance ratings and characteristics; loss data; efficiency at 25, 50, 75 and 100 percent rated load; sound level; tap configurations; insulation system type, and rated temperature rise.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Store transformers in a clean and dry space and protected from weather in accordance with manufacturer's instructions. Cover ventilating openings to keep out dust.
- B. Transformer shall not be used as work tables, scaffolds or ladders.
- C. Handle transformers carefully to avoid damage to material components, enclosure and finish. Use only lifting eyes and brackets provided for that purpose. Damaged transformers shall be

rejected and not be installed on project.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Transformers shall be of dry type complying with the design function requirements of the project. Design characteristics shall be as noted in manufacturer's submittal data.
- B. Provide barrel type coils vacuum impregnated with high grade insulating varnish, non-hydroscopic thermo-setting type.
- C. Furnish copper windings, continuous without splice.
- D. Use non-aging silicon steel cores held together with steel channels or angles, with low flux density, quiet operating, and vibration isolated from enclosure and support channels.
- E. All transformers shall be designed, manufactured, and tested in accordance with all the latest applicable ANSI, NEMA, IEEE and UL standards, and shall be UL listed and bear the UL label.

2.2 DRY TYPE TWO-WINDING TRANSFORMERS

- A. Acceptable manufacturers
 - 1. Square D
 - 2. Eaton
 - 3. General Electric Company
 - 4. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in 26 00 00, and Division 01 for substitution requirement.
- B. Dry type transformers shall be NEMA ST 20; factory-assembled, air cooled dry type transformers; ratings as shown on the Drawings.
- C. Insulation system and average winding temperature rise (in a 40 degree C maximum ambient) for rated kVA as follows:

kVA Rating	Insulation Class (degree C)	Temperature Rise (degree C)
1-15 kVA	185	80
25-500 kVA	220	80

- D. The maximum temperature of the top of the enclosure shall not exceed 50 degrees C rise above a 40 degree ambient.
- E. Winding Taps, Transformers 15 kVA and Less: Two 5 percent below rated voltage, full capacity taps on primary winding.
- F. Winding Taps, Transformers 25 kVA and Larger: Two 2.5 percent above rated voltage and four 2.5 percent below rated voltage, full capacity taps on primary.
- G. Sound Levels: Maximum sound levels are as follows:

kVA Rating	Sound Level
0-9	40 db
10-50	45 db
51-150	50 db
151-300	55 db
301-500	60 db

- H. Basic impulse level shall be 10 KV.
- I. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.
- J. Transformers 75 kVA and less shall be suitable for wall, floor, or trapeze mounting; transformers larger than 75 kVA shall be floor mounted.
- K. Enclosure shall be NEMA Type 2 Indoor. Provide lifting eyes or brackets.
- L. Nameplate on transformer shall include transformer connection data, kVA ratings, impedance, and overload capacity based on rated allowable winding temperature rise. Identify primary and secondary voltages.
- M. Isolate core and coil from enclosure using vibration absorbing mounts.
- N. Provide identification nameplate in accordance with Section 26 05 53 Electrical Identification.
- O. Efficiency shall comply with NEMA TP-1 Class.

PART 3 EXECUTION

3.1 INSPECTION

- A. Installer shall examine the areas and conditions under which dry type transformers are to be installed and notify the contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install dry type transformers as indicated, in accordance with the applicable requirements of the NEC and the National Electrical Contractors Association's "Standard of Installation".
- B. Check for damage and tight connections prior to energizing transformer.
- C. Measure primary and secondary voltages and make appropriate tap adjustments.
- D. Set transformer plumb and level.
- E. Use flexible liquid-tight conduit, 2 ft. minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.
- F. Mount transformers on vibration isolating pads suitable for isolating the transformer noise from the building structure.

1. For floor transformer installations, use one pad type Korfund Elasto-Grip, waffle, or equal, at each corner of the transformer, sized for load of 50 lbs./sq. in.
 2. For wall hung transformer installations, use spring type Korfund Series P, or equal. Provide sound pads at each corner of the transformer, sized for 1/2 inch deflection.
- G. Ground transformers in accordance with Section 26 05 26 Grounding and NEC requirements.
- H. Provide a 4" concrete pad for all dry-type transformers.
- I. A 6" clearance shall be provided on both sides and on rear of all transformers for ventilation purposes.
- J. Provide vibration isolators at each corner of all transformers. Isolators shall be bolted to the 4" concrete pad.

END OF SECTION

SECTION 26 24 16 PANELBOARDS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Distribution panelboards.
- B. Branch circuit panelboards.

1.2 REFERENCES

- A. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
- B. NAME KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
- C. NEMA PB 1 - Panelboards.
- D. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
- E. NEMA PB 1.2 - Application Guide for Ground-fault Protective Devices for Equipment.
- F. NEMA AB 3 – Molded Case Breakers and Their Application
- G. ANSI/UL 67 – Electric Panelboards
- H. ANSI/UL 50 – Cabinets and Boxes
- I. ANSI/UL 508 – Industrial Control Equipment

1.3 SUBMITTALS

- A. Provide submittals in accordance with and in additional to Section 26 00 00, Basic Electrical Requirements, and Division for submittal requirement.
- B. Submit dimensioned drawings showing size, circuit breaker arrangement and equipment ratings including, but not limited to, voltage, main bus ampacity, integrated short circuit ampere rating, and temperature rating of circuit breaker terminations.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver distribution panelboards in factory-fabricated water-resistant wrapping.
- B. Handle panelboards carefully to avoid damage to material component, enclosure and finish.
- C. Store in a clean, dry space and protected from the weather and elements.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Square D Company
- B. General Electric Company
- C. Eaton

- D. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in 26 00 00, and Division for substitution requirement.

2.2 PANELBOARD CONSTRUCTION

- A. General: Provide flush or surface mounted, or surface mounted deadfront circuit breaker type distribution or branch circuit panelboards with electrical ratings and configurations, as indicated on the drawings and schedules. Load center type panelboards are not acceptable.

- B. Enclosure:

1. Enclosure shall be proper NEMA type as shown on the drawings.
2. NEMA 1
 - a. Back box shall be galvanized steel for flush mounted branch circuit panelboards. Back box shall have gray enamel electro-deposited finish over cleaned phosphatized steel for all other type panelboards.
 - b. Provide panelboard fronts as scheduled with flush lock.
 - c. Where power monitors or metering are specified on the Drawings, the manufacturer shall cut the doors for field mounting of the unit.
3. NEMA 3R, 3S and 12
 - a. Enclosure and doors shall have gray enamel electro-deposited finish over cleaned phosphatized steel.
 - b. Doors shall be gasketed and equipped with tumbler type vault lock and two trunk latches where required by UL standard. Interior trim shall consist of four pieces, each covering one gutter top, bottom and both sides.
4. Construct cabinet in accordance with UL 50. Use not less than 16-gauge galvanized sheet steel, with all cut edge galvanized. Provide a minimum 4-inch gutter wiring space on each side. Provide large gutter where required to accommodate the size and quantity of conductors to be terminated in the panel, and where required by code.
5. Exterior and interior steel surfaces shall be cleaned and finished with gray enamel over rust inhibiting phosphatized coating. Color shall be ANSI 61 gray.
6. Doors shall be equipped with flush-type combination catch and key lock. All locks shall be keyed alike. Hinged door over door type.
7. Branch circuit panelboards shall be 5 ¾ inches deep.
8. A directory holder with heavy plastic plate, metal frame, and index card shall be mounted inside of each door.
9. Reinforce enclosure and securely support bus bars and overcurrent devices to prevent vibration and breakage in handling.
10. Rating: Minimum integrated short-circuit rating, voltage and current rating as shown on drawings.
11. Labeling: The Contractor shall furnish and install engraved, laminated plastic nameplates on the trim per Section 26 05 53, Electrical Identification

- C Bus:

1. Provide panelboards with rounded edge phase, neutral and ground buses, rated full capacity as scheduled on drawings. Buses shall be tin-plated, full-length copper and braced for the maximum available fault current as shown on drawings. Silver plating is not acceptable.
 2. Phase bussing shall be stacked front-to-back, A-B-C.
 3. The neutral and ground bus bars shall have termination locations for each of the individual feeders and the lugs sized appropriately. In addition, space shall be provided to terminate the neutrals and grounds in two feeders equal to the largest size circuit breaker that can be installed in the panelboard. The ground bus shall be mounted in the panelboard, opposite the incoming line and neutral lugs and shall be accessible to allow easy installation of bolts, nuts and lock washers used to attach ground lugs. The neutral and ground buses in branch circuit panelboards shall have spaces to terminate 42 neutral and 42 ground wires.
 4. All lugs for phase, neutral, and ground buses shall be tin-plated copper.
- D. Panelboards shall consist of an interior and an enclosure to form a complete assembly. This assembly shall be the product of a single manufacturer regularly engaged in the manufacture of such assemblies. The interior and enclosure shall each be U.L. listed. The assembly shall be U.L. recognized and shall have a corresponding U.L. File Number. Interiors and enclosures purchased separately by the contractor and assembled by the contractor shall not be acceptable. File numbers for each panelboard shall be provided to the Owner if requested to prove compliance. Panelboards shall be manufactured in accordance with NEMA standards.

2.3 SWITCHING AND OVERCURRENT PROTECTIVE DEVICES

- A. Provide molded case circuit breakers with manufacturer's standard construction, bolt on type, with integral inverse time delay thermal and instantaneous magnetic trip in each pole. Circuit breakers shall be constructed using glass reinforced polyester insulating material providing superior dielectric strength. Provide circuit breakers UL listed as Type HACR for air-conditioning equipment branch circuits.
- B. Circuit breakers shall have an over center, trip-free, toggle operating mechanism that will provide a quick-make, quick-break contact action.
- C. Provide handle padlock attachments on circuit breakers where indicated on drawings. Device shall be capable of accepting a single padlock. All circuit breakers shall be capable of being individually padlocked in the off position.
- D. The circuit breakers shall be connected to the bus by means of solidly bolted connection. In multi-pole breakers, the phase connections on the bussing shall be made simultaneously without additional connectors or jumpers. Multi-pole breakers shall be two or three pole as specified. Handle ties are not permitted. The circuit breaker shall have common tripping for all poles.
- E. All circuit breakers shall be provided with visible ON and OFF indications.
- F. Provide GFI circuit breakers as indicated on drawing or per NEC requirement.
- G. Breaker voltage and trip rating shall be per drawings. Breaker faceplate shall indicate UL certificate standards with applicable voltage systems and corresponding short current rating as per drawings.
- H. Molded Case Circuit Breakers:
 1. Breakers 400 ampere frame and less shall be manufacturer's standard industrial construction, bolt-on type, integral inverse time delay thermal and instantaneous magnetic trip. Breakers

225 ampere through 400 ampere shall have continuously adjustable magnetic pick-ups of approximately five to ten times trip rating.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install panelboards in accordance with manufacturer's written instructions and the applicable requirements of the NEC, NEMA, ANSI and the National Electrical Contractors Association's "Standard of Installation".
- B. Anchor enclosed firmly to walls and structural surfaces, ensuring that they are permanently and mechanically secured. Direct attachment to dry wall is not permitted. Freestanding panelboards shall be installed on a concrete housekeeping pad with anchors per manufacturer's recommendation.
- C. Mounting height:
 - 1. Distribution Panelboards: As per Drawings, but such that highest operating handle is no greater than 79 inches above finished floor.
 - 2. Branch Circuit Panelboards: As per Drawings, but such that highest operating handle is no greater than 79 inches above finished floor.
- D. Install panelboards plumb. Adjust trim to cover all openings. Seal all conduit openings and cap all used knockout holes.
- E. Provide blank plates for unused open spaces in panelboards. Keep the front door closed after work to protect from damage, dirt, and debris at all times.
- F. Install identification nameplates in accordance with Section 26 05 53, Electrical Identification.

3.2 FIELD QUALITY CONTROL

- A. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers and lugs.

3.3 PANELBOARD SCHEDULE

- A. The Contractor shall provide engraved, laminated plastic nameplates for circuit identification as indicated on the Drawings for distribution panelboards.
- B. The Contractor shall fill the index directory inside the front door of branch circuit panelboards identifying each circuit as shown on Panel Schedule drawings. Where changes are made, the schedule shall reflect the changes. At the end of the job, these schedules shall reflect as-built record conditions.
- C. Branch breakers shall be arranged as scheduled on the plans so that these plans can serve as "AS-BUILT" drawings of record. Each and every circuit shall be connected to panelboards as shown and as scheduled on the Panel Schedules. Install typewritten Circuit Index in each panelboard indicating loads being served by each branch breaker and location of loads. Use actual room numbers used by the Owner.

END OF SECTION

SECTION 26 27 26 WIRING DEVICES

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Wiring Devices:
 - 1. Wall switches.
 - 2. Receptacles.
 - 3. Device plates and box covers.

1.2 REFERENCES

- A. Americans with Disabilities Act (ADA)
- B. ANSI/NEMA OS 1- Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
- C. ANSI/UL 20 – General Use Snap Switches.
- D. ANSI/UL 498 – Attachment Plugs and Receptacles.
- E. ANSI/UL 943 – Ground Fault Circuit Interrupters.
- F. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts maximum).
- G. NEMA WD 1 – General-Purpose Wiring Devices.
- H. NEMA WD 2 - Semiconductor Dimmers for Incandescent Lamps.
- I. NEMA WD 5 - Specific-Purpose Wiring Devices.
- J. Texas Accessibility Standards. (TAS)

1.3 SUBMITTALS

- A. Provide submittals in accordance with and in addition to Section 26 00 00, Basic Electrical Requirements, and Division 01 for submittal requirement.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver wiring devices individually wrapped in factory-fabricated containers.
- B. Handle wiring devices carefully to avoid damage, breaking and scoring.
- C. Store in a clean dry space and protected from the weather and elements.

PART 2 PRODUCTS

2.1 GENERAL

- A. Provide factory fabricated wiring devices in the type and electrical rating for the service indicated. Where type and grade are not indicated, provide proper selection to correspond with branch circuit wiring and over-current protection. Attachment of wires to devices shall be by screw pressure under the head of binding screws. Arrangements depending on spring pressure or tension are not acceptable. All binding screws shall be brass or bronze.
- B. Device color:
 - 1. Receptacles power shall be white.

2.2 RECEPTACLES

A. Acceptable manufacturers

1. Arrow-Hart
2. Hubbell
3. General Electric
4. Leviton
5. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in Section 26 00 00 and Division 01 for substitution requirement.

B. Material

1. Dedicated circuit and convenience duplex receptacles shall be rated 20 amperes, 125 volt AC, specification grade.
2. GFCI receptacles shall be rated 20 amperes, 125 volt with integral ground fault current interrupter. Downstream GFI protection of devices will not be acceptable.
3. Specific-use receptacles shall have volts, amps, poles and NEMA configuration as noted on drawings.
4. Heavy-duty lock-blade receptacles shall be NEMA WD5 heavy-duty specification grade.
5. Weatherproof receptacles as specified shall be mounted in a cast steel box with gasketed, weatherproof device plate as specified.

2.3 WALL PLATES

A. Acceptable manufacturers

1. Arrow-Hart
2. Hubbell
3. General Electric
4. Leviton
5. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in Section 26 00 00 and Division 01 for substitution requirement.

B. Material

1. Wall plates shall be 316 or 302 stainless steel. Where switches or outlets are shown adjacent to each other, they shall be ganged with partitions between different type services and covered by a single custom wall plate.
2. Exposed boxes:
 - a. Dry interior spaces: Use cast metal plates with cast metal box. Use heavy cadmium-plated sheet steel plates with steel boxes and copper-free aluminum with aluminum boxes. All screws shall be stainless steel. Edges of plates must be flush with edges of boxes.
 - b. Other locations: Use weatherproof devices plates. Provide cast metal plates with gasketed spring door

3. Jumbo plates are not permitted.
4. Weatherproof cover plate shall be in-use type gasketed cast aluminum or feraloy with hinged gasketed device covers.

PART 3 EXECUTION

3.1 INSPECTION

- A. Installer must examine the areas and conditions under which wiring devices and floor boxes are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Inspect devices for physical damage. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 DEVICE COORDINATION

- A. Where items of equipment are provided under other sections of this specification or by the Owner, provide a compatible receptacle and/or device plate for the cap or plug, and cord of the equipment.

3.3 INSTALLATION

A. General:

1. Install wiring devices and floor boxes as indicated, in accordance with the applicable requirements of the latest release of NEC, NEMA, and ANSI.
2. The approximate location of switches, power outlets, floor boxes, etc., is indicated on the drawings. These drawings, however, may not give complete and accurate information in regard to locations of such items. Determine exact locations by reference to the general building drawings and by actual measurements during construction of the building before rough-in, subject to the approval of the Constructor Inspector.
3. Where more than one device occurs in one outlet box, causing 300 volts or more voltage difference between them, a barrier must be provided for isolation to meet NEC Article 380.

B. Receptacles:

1. Location:

- a. Install convenience outlets in suitable steel outlet boxes at the height of 18 inches above the finished floor to the bottom, 6 inches above countertop or at the backsplash level, or as indicated on the drawings. Coordinate with equipment and architectural drawings.
- b. Install receptacles generally where indicated on drawings. The Owner's representative reserves the right to make any reasonable changes in receptacle locations without change in the contract sum.
- c. Install specific-use receptacles at heights shown on Drawings.

2. Position:

- a. Install receptacles vertically with ground pole on bottom. Install receptacles horizontally, where field condition does not allow vertical installation, with ground pole on left.

C. Plates:

1. Where cover plates do not completely conceal the rough openings for the devices, it shall be the responsibility of the General Contractor to patch, paint, etc. around the opening to the satisfaction of the Owner's representative.
2. All devices and cover plates shall be plumb and parallel to adjacent surfaces or trim. Devices must be flush with the finished trim cover plates and plates must be tight to surfaces over which they are installed.

END OF SECTION

SECTION 26 28 13
FUSES, 600 VOLT

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Dual-element, current limiting Class R fuses for loads up to 600 volts, 0-600 Amps.

1.2 REFERENCES

- A. UL 248-12 - Standard For Safety For Low-Voltage Fuses-Part 12: Class R Fuses
- B. Where application of local codes, trade association standard or publications appears to be in conflict with the requirements of this Section, the Architect/Engineer shall be asked for an interpretation.

1.3 SUBMITTALS

- A. Provide submittals in accordance with and in addition to Section 26 00 00, Basic Electrical Requirements, and Division for submittal requirement.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Store fuses in a clean and dry space and protected from weather. When necessary to store outdoors, elevate materials well above grade and enclose with durable, waterproof wrapping.

PART 2 PRODUCTS

2.1 MATERIAL AND EQUIPMENT

- A. Furnish fuses manufactured by Buss, or equal, in accordance with the following:
 - 1. Motors and Transformers, 0 to 600 Amp:
 - a. 250 volt - Buss LPN-RK, UL Class RK1.
 - b. 600 volt - Buss LPS-RK, UL Class RK1.
 - 2. Lighting Loads, 0 to 600 Amp:
 - a. 250 volt - Buss KTN-R, UL Class RK1.
 - b. 600 volt - Buss KTS-R, UL Class RK1.
 - 3. All Applications, 601 to 6000 Amp:
 - a. 600 volt - Buss KRP-C, UL Class L.
- B. Size fuses serving motor loads as specifically recommended by motor or equipment manufacturer or in the range of 150% to 175% of motor nameplate rating per NEC in accordance to the type of motor.
- C. Interrupting Rating: 300,000 RMS Amps, current limiting.
- D. Maintenance Stock, Fuses:
 - 1. Furnish the following:
 - a. Three spare fuses of each size and type for a spare set.

- b. Furnish spare fuse cabinet sized to contain required spare fuse stock.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install fuses where indicated, in accordance with the manufacturer's written instructions, the applicable requirements of NEC, national and local codes, regulations, and requirements.
- B. Provide quantity of spare fuses and fuse cabinet per the requirement of this Section at the location per drawing or the direction of Owner's Representative, in addition to replace blown or defective fuses during installation, startup and acceptance.

END OF SECTION

SECTION 26 28 16 DISCONNECT SWITCHES

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Disconnect switches, fusible and non-fusible.
- B. Enclosures.

1.2 REFERENCES

- A. Federal Spec. W-S-865 - Switch, Box (Enclosed), Surface-Mounted.
- B. NEMA KS 1 - Enclosed Switches.
- C. NFPA 70 - National Electrical Code
- D. NFPA 70E - Electrical Safety Requirement for Employee Workplaces
- E. UL 98 - Enclosed Switches1.

1.3 SUBMITTALS

- A. Provide submittals in accordance with and in additional to Section 26 00 00, Basic Electrical Requirements, and Division for submittal requirement.
- B. Submit manufacturer's product data. Submit dimensioned drawings and equipment ratings for voltage, capacity, horsepower, and short circuit.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver switches individually wrapped in factory-fabricated water-resistant type containers.
- B. Handle switches carefully to avoid damage to material components, enclosure and finish. Damaged switches shall not be installed on project.
- C. Store switches in a clean and dry space and protected from weather and elements.

PART 2 PRODUCTS

2.1 FABRICATED SWITCHES

- A. NEMA KS 1; Type HD quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Handle lockable in ON position for service entrance disconnect. Provide defeater so that qualified personnel can open door while switch is in the closed position.
- B. Use switches that have number of poles required as per drawings.
- C. Switches shall be Underwriters' approved for duty shown and enclosure type per drawings. NEMA 3R switches shall be provided where exposed to weather. NEMA 3R switches shall have weatherproof threaded hubs for all conduit entries into switch.
- D. Use fuse clips that are rejecting type to accept Class RK or L fuses only.
- E. Identify switches, as to equipment served, with engraved laminated plastic plates. Refer to 26 05 53 Electrical Identification Section of this specification.

- F. Voltage rating: 240VAC or 600VAC as per drawings.

PART 3 EXECUTION

3.1 INSPECTION

- A. Installer shall examine the areas and conditions under which safety and disconnect switches are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF SAFETY AND DISCONNECT SWITCHES

- A. Install safety or disconnect switches, where required by NEC, where indicated on drawings, and where required by equipment manufacturer, in a location convenient for maintenance on switch and adjacent equipment.
- B. For equipment with motors larger than 1/8 hp, install disconnect switches within sight of the motor.
- C. Provide fused disconnect switches, whether or not indicated on drawings, when required to maintain equipment manufacturer's warranty.
- D. Install fuses in fusible disconnect switches. Provide permanent marking inside switch enclosure for fuse type.
- E. Wall mount switches, where possible, or mount on unistrut supports.

END OF SECTION

3. Uninterrupted Power Supplies shall be panel mounted 24VDC input and 24 VDC output as specified herein.

1.02 QUALITY ASSURANCE

A. REFERENCES

1. This section contains references to the following documents that are part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid or on the effective date of the Agreement if there were no Bids. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued.
3. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
EIA RS-310C	Racks, Panels, and Associated Equipment
NEMA 250	Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
UL 94	Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
UL 508A	Industrial Control Panels

B. FACTORY TESTING:

1. Prior to shipment, the manufacturer shall test the functional operation of the control panel.

1.03 SUBMITTALS

A. GENERAL:

1. Submittals and transmittal procedures for submittals are defined herein. Submittal information shall be included in one complete submittal.
 - a. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements.

- b. A check mark shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation.
- c. The Owners Construction Manager shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. *Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.*
- d. A copy of the contract document Process and Instrumentation diagrams and Loop diagrams relating to the submitted equipment, with addendum updates that apply to the equipment in this section, marked to show specific changes necessary for the equipment proposed in the submittal. If no changes are required, the drawing or drawings shall be marked "no changes required". *Failure to include copies of the relevant drawings with the submittal shall be cause for rejection of the entire submittal with no further review.*
- e. Marked contract document Control Schematic diagrams related to the submitted equipment.
- f. Marked product literature of all the enclosure electrical devices and components mounted on or within the control panel.
- g. List of miscellaneous items, cables, spare and replenishment parts, and chemicals to be provided, including MSDS information.
- h. Panel assembly drawings including sections showing clearances between face and rear mounted equipment.
- i. Nameplate engraving schedule:
 - 1. Indicate engraving by line
 - 2. Character size
 - 3. Nameplate size
 - 4. Panel and equipment tag number and description
- j. Wiring drawings:
 - 1. Schematic diagrams
 - 2. Loop diagrams

PART 2--PRODUCTS

2.01 FABRICATION

A. GENERAL:

- 1. Panels shall be designed for the seismic requirements of Section XXXX. Structures, equipment, and devices shall be braced to prevent damage from specified forces. Equipment panels shall be capable of operation following a disturbance.
- 2. Nameplates with tag number and equipment description shall identify face-mounted instruments. Instruments shall be mounted for access to components and ease of removal. Cutouts for future equipment shall be blanked off with suitable covers. Instrument tag numbers shall be identified on the panel rear.

B. PANEL LAYOUT:

1. Provide spare terminal blocks, with a minimum of 2 analog, 2 discrete, 2 power.

2.02 HEATING, VENTILATING AND COOLING

- A. Forced air ventilation shall be provided for panels where indicated in the Panel Schedule and if the cabinet's heat load calculations indicate that the interior temperature of the cabinet will exceed 115 degrees-F, under worst case conditions.

2.03 NAMEPLATES

- A. External door-mounted components and the panel description shall be identified with plastic nameplates. Machine embossed metallic adhesive labels shall identify tag number of instruments inside panels. Nameplates shall be attached to panel surfaces, not to instruments.
- B. The machine engraved laminated **white phenolic nameplates with black lettering** shall be provided for panel-mounted equipment. Nameplate engraving shall include the instrument tag number and description in 1/4-inch minimum size lettering.
- C. The machine embossed metallic adhesive labels shall identify tag number of instruments inside panels. Nameplates shall be attached to panel surfaces, not to instruments.
- D. The nameplates shall be attached to the panel with a minimum of two self-tapping 316 stainless steel screws. Provide RTV sealant for nameplates for NEMA-4X stainless steel panels.
- E. The nameplate wording may be changed without additional cost or time prior to commencement of engraving. Submit nameplate legend with the panel submittal.

2.04 PANEL FEATURES

A. INTERCONNECTION WIRING:

Panel Interconnecting Wiring:

1. Panel control wiring: Single conductor stranded copper NFPA No. 70 Type MTW No. 16 AWG minimum, with an exception for factory supplied PLC wiring harnesses that are U.L. approved.
2. Panel instrument wiring: Twisted No. 16 AWG shielded pair or tri conductors.
3. Panel power wiring: Conductors specified in Division 16 and meet the NFPA No. 70 NEC requirements for power including phase, grounded, and grounding conductors.
4. Wiring shall be supported independently of terminations by lacing to panel support structure or by slotted flame retardant plastic wiring channels.
5. Wiring channels shall comply with UL 94, Type V.
6. Wiring channel fill shall not exceed 50 percent.

B. CONDUCTOR IDENTIFICATION:

Wiring shall be tagged at terminations with machine printed plastic sleeves with three-part wire numbers for instrument and control panel internal conductors:

1. Part-1: Prefix of the wire number shall be the instrument loop number or equipment tag number.
2. Part-2: Code letter and wire colors per the following tables.
3. Part-3: Number that identifies individual circuit conductor Terminal Number.

Code	120 Vac Conductor	Color
L	Power	Black
C	Control	Red
N	Neutral	White
PG	Ground	Green

Code	V dc Conductor	Color
PS	24 Vdc Power	Blue (24VDC+)
		White/Blue (0VDC)
S+	Signal (+)	Red or Clear
SG	Signal Ground	Black
EG	Equipment Ground	Green
FV	Panel Foreign Voltage	Yellow

C. CONDUCTOR INSTALLATION AND PROTECTION:

1. Power and control wiring shall be carried in covered channels separate from low voltage signal circuits. An interior steel barrier shall be provided between AC control devices and the electronic equipment.
2. Terminal blocks shall be strap screw type rated for 600 volts. Each terminal trip shall have a unique identifying alphanumeric code at one end and a vinyl-marking strip running the entire length of the terminal strip with a unique number for each terminal. Numbers shall be machine printed and 1/8 inch high.
3. No more than two connections shall be made to one terminal.
4. Wire connectors shall be locking fork tongue or ring tongue insulated crimp type terminals.

5. Terminal blocks shall be;
 - a. Allen-Bradley, Phoenix-Contact or equal products.

D. FIELD WIRING:

1. Field wiring shall be connected to separate dedicated terminal blocks in a dedicated part of the panel where the field cables enter the panel.

E. FUSE AND FUSE HOLDERS:

1. Fuses for 120 Vac circuits shall have a minimum of 12,000-amperes interrupting capacity and blown fuse indicators.
2. Fuses for 24VDC circuits shall be fast acting glass tube type rated 1/8 or 1/10 amp for 4-20 mA loops.
3. Fuses for 24VDC circuits shall be 1/2 amp for the power supply to individual instruments.
4. Fuse holders shall be tip-out or draw-out type.
5. Provide Allen Bradley or equal products.

F. CONTROL POWER:

120VAC control power source: Single power source for all control and DC power. Dual power sources, one for control power and one for DC power. Dual power sources, one for PLC and DC power and one for PLC output [and input] control power.

1. Provide control power transformers, as required for the load.
2. Provide direct current power supplies, as required for the load.
3. Provide UPS for PLC and derived loop power as defined above, as required for the load.

G. PANEL POWER:

Panel power source:

1. Provide a 120Vac circuit for the, receptacle, , fan, cooling load as required.

H. ACCESSORIES:

1. **Panels greater than 30" high x 30" wide shall include GFCI convenience receptacles**
2. **Receptacles shall not be powered by the UPS.**

3. Print pocket.

2.05 SURGE PROTECTION

120VAC Surge protectors shall be multi-stage, plug-in type selected to protect the equipment. Surge protectors shall be removable without changing the impedance of the circuit. Surge protectors product manufactures shall be:

1. Sola STV series
2. Phoenix Contact
3. Telematic
4. Siemens SITOP
5. Or equal.

2.06 PANEL GROUNDING

- A. Each panel shall be provided with two copper ground bars.
 1. One bar (NEC required) shall be bonded to the panel or panel frame or back-plate and to the facility grounding system.
 2. Second (signal) ground bar shall be mounted on insulated stand-offs and shall be bonded to the panel ground bar only at one point.
- B. Signal circuits, signal cable shields, and low-voltage DC power supply commons shall be bonded to the signal ground bar.
- C. Field analog wiring shields shall only be grounded at the signal ground bar. Test to verify that single ground point at panel signal ground bar.
- D. Surge protectors and separately derived AC power supplies shall be bonded to the frame ground bar.
- E. Panels exceeding 36-inches width shall contain ground bars shall be 1/4- by 1-inch copper bars extending the entire length of the panel interior at the bottom of the panel.

2.07 PANEL DRAWING PROTECTION

- A. Provide a panel-wiring diagram and schematic for each panel in a plastic bag or plastic container to avoid water damage and aging.

2.08 DIRECT-CURRENT POWER SUPPLIES

Manufacturer: PULS
Model Number: Dimensions QS5.
Input Voltage: 100 to 240 volts
Current Range: 5,0 A
Signaling: Green LED for OK - Red LED for Overload
Output voltage:

- Rated: 24 Vdc

- Adjustable Range: 24 ... 28 Vdc

Manufacturer: Siemens
 Model Number: SITOP PSU-8200 6EP3334-8SB00-0AY0.
 Input Voltage: 85 to 132 volts
 Current Range: 0 -10 A
 Overload Capacity: 25 ms
 Signaling: Green LED for OK - Yellow LED for Overload
 Constant Overload Current: 12 A
 Parallel Switching Units: 2 units
 Output voltage:

- Rated: 24 Vdc
- Adjustable Range: 24 ... 28.8 Vdc

2.09 UNINTERRUPTIBLE POWER SYSTEM

UPS

Manufacturer: PULS
 Model Number: Dimension UBC10.241.
 Rated Input Voltage: 24 vdc
 Rated Output Current: 10 A
 Output Voltage: 22.3 VDC
 Signaling: Green LED for Status – Red LED for Check Wiring

UPS

Manufacturer: Siemens
 Model Number: SITOP UPS-1600 6EP4134-3AB00-1AY0.
 Rated Input Voltage: 24 vdc
 Rated Output Current: 0 ... 10 A
 Output Voltage: 22 ... 27 VDC (18.5 Exhaustive Discharge)
 Signaling: Green LED for OK – Red LED for Alarm
 Interface: USB

Battery Module

Manufacturer: PULS
 Model Number: .
 Rated Output Voltage: 12 V
 Rated Output Current: 5.0 Ah
 Ambient Temperature: 0 ... +40 °C

Battery Module

Manufacturer: Siemens
 Model Number: SITOP UPS-1100 6EP4133-0GB00-0AY0.
 Rated Output Voltage: 24 ... 27 Vdc (no load)
 Rated Output Current: 10 A
 Ambient Temperature: 0 ... +40 °C
 Signaling: Green LED for OK – Flashing Green LED for Error

2.10 PRODUCT DATA

The following data shall be provided:

1. Manufacturer's operation and maintenance information which must include final reviewed submittal and separate record of all final configuration, jumper, and switch settings and As-Built panel drawings .
2. Test results as specified in Sections 25 and 40.

2.11 SPARE PARTS

The following spare parts shall be provided:

1. Five of each type and rating of fuse used in the panels.

PART 3--EXECUTION

3.01 GENERAL

Provide panels with the Record As-built schematic, connection, and interconnection diagrams. Place documentation in a water proof clear bag in the panel print pocket.

3.02 OUTDOOR PANEL SHADE COVERS

Fabricate the custom aluminum panel shade cover and mount the panels facing away from the prevailing sun or wind.

Provide Sun/Rain covers per Electrical Detail for outdoor vendor, manufacture, and custom panels. Fabricate based upon known panel dimensions or accepted submittal drawing dimensions.

3.03 FACTORY TESTING

The control panel shall be assembled, interconnected, and functionally tested at the assembly shop prior to shipment. The Owner/Engineer shall have the option of witnessing the functional shop test. The Contractor shall notify the Owner/Engineer at least two (2) weeks in advance prior of the scheduled functional shop test.

3.04 FIELD TESTING

Field verify the following for Instrument and Control Panels:

1. Control circuits grounded with one terminal of each load device connected to the grounded conductor.
2. Control contacts installed in the ungrounded side of the circuit.
3. Signal and control wiring installed in separate wireways.
4. Barriers between the power wiring and the signal and control wiring.
5. Connected to the plant grounding system, as specified.
6. Center-line of wall-mounted panels shall be 48 inches above the floor.
7. Inner door contains a copy of the Record elementary and wiring diagrams.
8. Inner door contains a protected drawing holder.
9. Drawings enclosed in a transparent, protective jacket.
10. Functions as specified.

****END OF SECTION****

SECTION 40 71 00

FLOW MEASUREMENT

PART 1--GENERAL

1.01 DESCRIPTION

- A. This section specifies requirements for magnetic flow meters to measure and record effluent flow for the LVWD Panorama Village Lift Station.

1.02 REFERENCES

- A. These sections contain references to the following documents and are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

Reference	Title
IEEE 100	Dictionary of Electrical and Electronic Terms
IEEE C37.90.1	Guide to Surge Withstand Capability (SWC) Tests
ISA S5.4	Instrument Loop Diagrams
ISA S51.1	Process Instrumentation Terminology
NEMA 250	Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA ICS 1	General Standards for Industrial Control and Systems
NEMA ICS 2	Industrial Control Devices, Controllers, and Assemblies
NFPA 70	National Electrical Code (NEC)

1.03 REQUIREMENTS

- A. The Contractor shall provide, install, calibrate, functionally test, and document field and panel instrumentation calibration and functional tests for the well system.
 - 1. Provide the services of trained instrument technician for purchased instruments for verification of instrument installation and calibration.
 - 2. Provide wiring connections and final adjustments to instruments during start-up.
 - 4. Provide functional verification of correct operation of all signal loops.
 - 5. Provide start-up and system commissioning support.

1.04 DEFINITIONS

- A. Specialized terms not explicitly defined herein shall be interpreted in accordance with ISA

S51.1, NEMA ICS 1, ANSI/IEEE Standard100.

- B. SYSTEMS INTEGRATOR: A firm engaged in the business of detailed control system design and engineering, instrumentation component purchase, system and panel assembly, programming, and implementing the specified process control and industrial automation systems.

1.05 PROJECT REQUIREMENTS

- A. The drawings in this project manual are functional in nature and do not show exact locations of equipment, equipment connections, or interconnections between equipment.
- B. Terminate all instrument outputs on terminal strips in an Instrument Termination Cabinet. Label cables, wires, and terminations as specified.
- C. Work shall be in compliance with the NFPA 70.
- D. Spacing between signal conductors and alternating current power conductors shall be maintained at not less than 12 inches, except:
 - 1. at terminations of equipment.
 - 2. where both power and signal conductors cross at 90 degrees.

1.06 PROCUREMENT RESTRICTION

- A. The Contractor's procurement of instrumentation type equipment is restricted to the selling agent service area where the equipment will be installed, thus assuring the Owner of the availability of local after sales service.
- B. Instrument and equipment manufacturers that have marketing operations based on local agents shall have sales restriction terms that require the selling agent with the responsibility for after-sales service

1.07 SUBMITTALS

The following information shall be submitted in accordance with Section 01 33 00. Provide submittals assembled in a folder or three ring binder. Each folder shall contain a cover sheet, indexed by item, and cross-referenced to the appropriate specification paragraph:

- A. SHOP DRAWINGS
 - 1. Provide a copy of this specification section with addenda updates, and all referenced sections with addenda updates, with each paragraph check marked to show specification compliance or marked to show deviations.
 - 2. Catalog cuts of equipment, devices, and materials shall include technical specifications and application information, including ratings, range, weight, accuracy, and other pertinent product information. Catalog cuts shall be edited to show only the items, model numbers, and information which apply.
 - 3. Nameplate engraving schedule for instruments showing engraving by line, character size,

and nameplate size.

4. Documentation of training and certification by the Instrument Society of America of the technicians who will perform the testing and adjustment.

B. TEST PROCEDURES

1. Test procedure as specified in Section 01 45 20.

PART 2--PRODUCTS

2.01 GENERAL

A. MATERIALS AND QUALITY:

1. Material shall be new, free from defects, and of the quality specified. Each type of instrument, instrument accessory, and device shall be by the same manufacturer throughout the work.
2. Electronic equipment shall be of solid-state construction. Components of standard electronic assemblies shall not be replaced with components of different characteristics in order to meet the performance requirements of this specification. Parts shall be as shown in the instruction manuals and shall be replaceable with standard commercial components of the same description without degrading the performance of the completed assembly.

C. INSTRUMENTATION SPECIFICATION SHEETS (INSTRUSPEC):

1. General requirements for instruments specified in this section are listed on INSTRUSPEC sheets in paragraph 3.03.

B. UL REQUIREMENTS:

1. The UL label shall be provided with all equipment and assemblies.

2.02 TRANSMITTERS

A. GENERAL:

Unless otherwise specified, measuring elements and transmitters shall comply with the following requirements:

1. Transmitter output shall be 4-20mA.
2. Transmitters shall be two-wire type with operating power derived from the signal transmission circuit.
3. Transmitter output shall be 4 to 20 milli-amperes, current regulated and shall drive any load between 0 and 550 ohms with the power supply at 24 volts DC.
4. Transmitters shall meet specified performance requirements with load variations within the range of 0 to 600 ohms with the power supply at 24 volts DC.
5. Transmitter output shall be galvanically isolated.
6. Time constant of transmitters used for flow or pressure measurement, including level transmitters used for flow measurement, shall be adjustable from 0.5 to 5.0 seconds.
7. Transmitter output shall increase with increasing measurement.

8. Transmitter enclosures shall be rated NEMA 250, Type 4, unless otherwise specified.

B. SIGNAL CURRENT ISOLATOR:

1. Isolator shall provide galvanic isolation of milli-ampere transmission signals from transmitters with inadequately isolated output circuits. Where shown in the plans, dual channel isolators shall be provided. Input and output signals shall be 4 to 20 milli-amperes, and error shall not exceed 0.1 percent of span. Input resistance shall not exceed 550 ohms with an output load of 250 ohms. Isolators shall be Phoenix Contact, AGM Products or Moore Industries equivalent.

2.03 PROCESS SWITCHES

A. Process switches and setpoint relays shall comply with the following requirements:

1. Contact outputs used for alarm actuation shall be ordinarily closed and shall open to initiate the alarm.
2. Contact outputs used to control equipment shall be ordinarily open and shall close to start the equipment.
3. Contacts monitored by solid state equipment such as programmable controllers or annunciators shall be hermetically sealed and designed for switching currents from 20 to 100 mA at 24 volts DC.
4. Contacts monitored by electro-magnetic devices such as mechanical relays shall be rated NEMA ICS 2, designation B300.

2.04 NAMEPLATES

- A. Nameplates shall be machine engraved white phenolic (FIT) and stainless steel tag (FE) with black lettering. Nameplate engraving shall include the equipment or instrument loop title and the instrument or equipment tag number.
- B. Lettering shall be 1/4-inch minimum unless otherwise specified. Nameplate wording may be changed without additional cost or time during the submittal process.

2.05 PRODUCT DATA

A. OPERATION AND MAINTENANCE INFORMATION:

Applicable operation and maintenance information shall be provided in accordance with Section 01 78 23, including flow meter calibration record from manufacturer.

B. TEST DATA:

Test data sheets, printouts, and other records of testing as specified in paragraph 01 99 90.

2.06 INSTRUMENT TRANSFORMERS

A. GENERAL:

1. Instrument transformers shall be molded dry-type in accordance with ANSI C57.13. Transformer volt-ampere rating shall be suitable for carrying the specified load without overheating or

exceeding the permissible accuracy for the transformer.

PART 3--EXECUTION

3.01 INSTALLATION

A. GENERAL:

Equipment shall be installed in accordance with manufacturer's instructions, NFPA 70, and Divisions 25 and 26. Equipment shall be located so that it is readily accessible. Refer to Section 01 45 20 and 01 99 90 for additional requirements.

B. PANELS:

Floor-mounted cabinets, except in dry rooms, shall be mounted on 4-inch minimum height concrete pads or grouted bases as specified.

As-built Record Connection and Interconnection Diagrams mounted on the inside of the door(s).

C. ELECTRICAL POWER SUPPLY AND CONDITIONING EQUIPMENT:

Electric power wiring and equipment shall be in compliance with Section 26 00 00.

D. PROCESS CONNECTIONS:

Process connections shall be arranged, where possible, such that instruments may be readily removed for maintenance without disruption of process units or draining of large tanks or vessels.

E. FIELD EQUIPMENT:

1. Equipment shall be provided as specified on the drawings such that ports and adjustments are accessible for in-place testing and calibration. Where possible, equipment shall be located between 48 inches and 60 inches above the floor or a permanent work platform. Instrumentation equipment shall be mounted for unobstructed access, but mounting shall not obstruct walkways.
2. Equipment shall not be mounted where shock or vibration will impair its operation. Support systems shall not be attached to handrails, process piping or mechanical equipment except for measuring elements and valve positioners. Instruments and cabinets supported directly by concrete or concrete block walls shall be spaced out not less than 5/8 inch by framing channel between instrument and wall. Steel used for support of equipment shall be hot-dip galvanized after fabrication.
3. Nameplates shall be provided for all field mounted equipment. Nameplates shall be attached to support hardware with a minimum of two self-tapping Type 316 stainless steel screws in a readily visible location, but such that if the field device is changed out, the nameplate will remain to identify the service.
3. Electric signal connections to equipment shall be made on terminal blocks or by locking plug and receptacle assemblies.

4. Jacketed flexible conduit shall be used between equipment and rigid raceway systems except that flexible cable assemblies may be used where plug and receptacle assemblies are provided and the installation is not subject to mechanical damage in normal use.
5. The length of flexible conduit or cord assemblies shall not exceed 2 feet. Flexible cable, receptacle and plug assemblies shall be used only where specified.

F. SIGNAL TRANSMISSION:

Signal transmission between electric or electronic instruments not located within a common panel shall be 4 to 20 milli-amperes and shall operate at 24 volts DC unless otherwise specified. Milli-ampere signals shall be current regulated and shall not be affected by changes in load resistance within the unit's rating.

Measurement loops shall be grounded at external terminals by bonding to the instrument panel signal ground bus. The Contractor shall provide isolating amplifiers for field equipment possessing a grounded input or output.

3.02 TESTS AND INSPECTIONS

A. GENERAL REQUIREMENTS:

1. Materials, equipment, and construction included under this specification shall be inspected in accordance with this section and subsequent sections of this division. Testing shall be performed by the Contractor in accordance with this and subsequent sections of this division.
2. No required test shall be applied without prior notice to the Engineer and the submittal, approved by the Engineer, of the completed Preoperational Checklist and Functional Test Sections from the Equipment Test Report.
3. Schedule a meeting between the technicians who will be performing the testing and adjustment and the Owners technical staff not less than thirty (30) days prior to commencement of start-up.
4. Fifteen (15) working days before the commencement of any testing activity, the Contractor shall provide a detailed step-by-step test procedure complete with forms for the recording of test results and documenting functional verification, testing equipment used, and a place for identification of the individual performing or, if applicable, witnessing the test.

B. DELIVERY INSPECTION:

1. The Contractor shall notify the Engineer upon arrival of any material or equipment to be incorporated into the work and shall remove protective covers or otherwise provide access in order that the Engineer may inspect such items.

C. INSTALLED TESTS AND INSPECTION:

1. TEST FORMS: Contractor shall provide detailed forms shall be developed as necessary to suite more complex instrumentation. Usage of terms used on test forms shall be in compliance with ISA S51.1.

2. TEST EQUIPMENT: Test equipment used to simulate inputs and read outputs shall have a rated accuracy at the point of measurement at least three times greater than the component under test. Each test instrument shall be calibrated prior to the commencement of a testing activity and at the completion of a testing activity.
3. Certified calibration reports traceable to the National Institute of Standards and Measurements shall be included with the test report.
4. Where required, buffer solutions and reference fluids shall be provided by the Contractor for all tests of analytical equipment.

5. TESTING STAGES:

- a. GENERAL: Each instrument loop shall be tested in the following sequence:

Testing sequence

- Wiring and piping
- Individual components
- Individual loops
- Loop commissioning
- System acceptance

Testing of piping and wiring and individual components shall be completed with certified test reports provided to the Engineer prior to commencement of individual loop testing, which shall be completed with certified test reports provided to the Engineer prior to commencement of loop commissioning.

- b. INDIVIDUAL COMPONENT CALIBRATION AND TEST: Each instrument and final element shall be field calibrated in accordance with the manufacturer's recommended procedure and then tested in accordance with the Contractor's test procedure.

Data shall be entered on the applicable test form at the time of testing. Alarm trips, control trips, and switches shall be set to initial values specified by manufacturer. Adjustments may be made based on actual process conditions. Final elements shall be checked for range, dead-band, and speed of response.

Any component which fails to meet the required tolerances shall be repaired by the manufacturer or replaced, and the above tests repeated until the component is within tolerance.

- c. LOOP TEST: Each instrument loop shall be tested as an integrated system. This test shall check operation from transmitter to readout components and to Instrument Termination Cabinet. Test signals shall be injected at the process impulse line connection where the measuring technique permits, and otherwise at the most primary signal access point.

If any output device fails to indicate properly, corrections to the loop circuitry shall be made as necessary and the test repeated until all instruments operate properly

- d. **CLOSED-LOOP COMMISSIONING TEST:** Commissioning test shall be performed as part of the system test and shall demonstrate stable operation of the loop under actual plant operating conditions. This test shall include adjustment of loop tuning parameters.
- e. **SYSTEM ACCEPTANCE TEST:** The system test shall be executed after all component and subsystem tests have been completed, and shall be designed to place the completed system in full operation and demonstrate that all functional requirements of this specification have been met. The system test shall, as a minimum demonstrate the following:
 - 1. That each component of the system operates correctly with all other components of the system
 - 2. That analog control loops operate in a stable manner
 - 3. That all interlocks perform correctly
 - 4. That all control sequences perform correctly
 - 5. That the complete system is reliable and consistent under all conditions of plant operation

3.03 INSTRUMENT SPECIFICATION SHEET--INSTRUSPEC

Instrument Identification:	FE/FIT
Manufacturers:	Endress+Hauser Promag W400 No substitute
Instrument Function:	Flow Measurement
Instrument Description:	Magnetic Flow Metering System
Power Supply:	120VAC/24VDC
Signal Output:	ETHERNET/IP and 4-20 mA
Housing:	Polycarbonate
Liner:	Hard Rubber
Process Connection:	Class 150 Carbon Steel Fixed Flange With DK5GD-2HAHL ground discs and DK5GD-2HL cable kit
Installation:	Install in accordance with manufacturer's instructions and the specified functional requirements.
Cable:	Signal cable between the flow tube and transmitter provided by the system manufacturer with sufficient length of cable for continuous installation between the flow tube and the transmitter.

Model No.:

8" 5W4C2H-AAILNP5DHA1KGA+CQ

INSTRUMENT INDEX			
PREFIX	TAG NO.	DESCRIPTION	RANGE
FE/FIT	1	Discharge Flow Rate	Field Adjustable

END OF SECTION